

NASDAQ, INC.
Form 10-K
February 22, 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2018

OR
TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF
1934

For the transition period from _____ to _____
Commission file number: 000-32651

Nasdaq, Inc.

(Exact name of registrant as specified in its charter)

Delaware

52-1165937

(State or Other Jurisdiction of Incorporation or Organization) (I.R.S. Employer Identification No.)

One Liberty Plaza, New York, New York

10006

(Address of Principal Executive Offices)

(Zip Code)

Registrant's telephone number, including area code:

+1 212 401 8700

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

Title of each class Name of each exchange on which registered

Common Stock, \$.01 par value per share The Nasdaq Stock Market

Securities registered pursuant to Section 12(g) of the Act: None

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 Exchange 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 if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will

not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

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

Large accelerated filer Accelerated filer

Non-accelerated filer Smaller reporting company

Emerging growth company

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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

As of June 30, 2018, the aggregate market value of the registrant's common stock held by non-affiliates of the registrant was approximately \$10.5 billion (this amount represents approximately 114.8 million shares of Nasdaq, Inc.'s common stock based on the last reported sales price of \$91.27 of the common stock on The Nasdaq Stock Market on such date).

Indicate the number of shares outstanding of each of the issuer's classes of common stock, as of the latest practicable date.

Class	Outstanding at February 14, 2019
Common Stock, \$.01 par value per share	165,420,039 shares

DOCUMENTS INCORPORATED BY REFERENCE

Document	Parts Into Which Incorporated
Certain portions of the Definitive Proxy Statement for the 2019 Annual Meeting of Stockholders of Nasdaq, Inc.	Part III

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About This Form 10-K

Throughout this Form 10-K, unless otherwise specified:

•“Nasdaq,” “we,” “us” and “our” refer to Nasdaq, Inc.

•“Nasdaq Baltic” refers to collectively, Nasdaq Tallinn AS, Nasdaq Riga, AS, and AB Nasdaq Vilnius.

•“Nasdaq BX” refers to the cash equity exchange operated by Nasdaq BX, Inc.

•“Nasdaq BX Options” refers to the options exchange operated by Nasdaq BX, Inc.

•“Nasdaq Clearing” refers to the clearing operations conducted by Nasdaq Clearing AB.

•“Nasdaq GEMX” refers to the options exchange operated by Nasdaq GEMX, LLC.

•“Nasdaq ISE” refers to the options exchange operated by Nasdaq ISE, LLC.

•“Nasdaq MRX” refers to the options exchange operated by Nasdaq MRX, LLC.

•“Nasdaq Nordic” refers to collectively, Nasdaq Clearing AB, Nasdaq Stockholm AB, Nasdaq Copenhagen A/S, Nasdaq Helsinki Ltd, and Nasdaq Iceland hf.

•“Nasdaq PHLX” refers to the options exchange operated by Nasdaq PHLX LLC.

•“Nasdaq PSX” refers to the cash equity exchange operated by Nasdaq PHLX LLC.

•“The Nasdaq Options Market” refers to the options exchange operated by The Nasdaq Stock Market LLC.

•“The Nasdaq Stock Market” refers to the cash equity exchange operated by The Nasdaq Stock Market LLC.

* * * * *

Nasdaq also provides as a tool for the reader the following list of abbreviations and acronyms that are used throughout this Annual Report on Form 10-K.

401(k) Plan: Voluntary Defined Contribution Savings Plan

2016 Credit Facility: \$400 million senior unsecured term loan facility which matures on November 25, 2019

2017 Credit Facility: \$1 billion senior unsecured revolving credit facility which matures on April 25, 2022

2019 Notes: \$500 million aggregate principal amount of senior unsecured floating rate notes due March 22, 2019 with an interest rate equal to the three-month U.S. dollar LIBOR plus 0.39%

2020 Notes: \$600 million aggregate principal amount of 5.55% senior unsecured notes due January 15, 2020

2021 Notes: €600 million aggregate principal amount of 3.875% senior unsecured notes due June 7, 2021

2023 Notes: €600 million aggregate principal amount of 1.75% senior unsecured notes due May 19, 2023

2024 Notes: \$500 million aggregate principal amount of 4.25% senior unsecured notes due June 1, 2024

2026 Notes: \$500 million aggregate principal amount of 3.85% senior unsecured notes due June 30, 2026

ASU: Accounting Standards Update

ATS: Alternative Trading System

BWise: BWise Beheer B.V. and its subsidiaries

CCP: Central Counterparty

CFTC: U.S. Commodity Futures Trading Commission

DEA: Designated Examining Authority

DWA: Dorsey, Wright & Associates, LLC

EMIR: European Market Infrastructure Regulation

Equity Plan: Nasdaq Equity Incentive Plan

ESPP: Nasdaq Employee Stock Purchase Plan

ETF: Exchange Traded Fund

ETP: Exchange Traded Product

eVestment: eVestment, Inc. and its subsidiaries

Exchange Act: Securities Exchange Act of 1934, as amended

FASB: Financial Accounting Standards Board

FICC: Fixed Income and Commodities Trading and Clearing

FINRA: Financial Industry Regulatory Authority

IPO: Initial Public Offering

ISE: U.S. Exchange Holdings, Inc. and its subsidiaries

LCH: LCH Group Holdings Limited

LIBOR: London Interbank Offered Rate
MiFID II: Update to the Markets in Financial Instruments Directive
MiFIR: Markets in Financial Instruments Regulation
MTF: Multilateral Trading Facility
NFX: Nasdaq Futures, Inc.
NPM: The NASDAQ Private Market, LLC
NSCC: National Securities Clearing Corporation
OCC: The Options Clearing Corporation
OTC: Over-the-Counter
Proxy Statement: Nasdaq's Definitive Proxy Statement for the 2019 Annual Meeting of Stockholders
PSU: Performance Share Unit
Regulation NMS: Regulation National Market System
Regulation SCI: Regulation Systems Compliance and Integrity

SEC: U.S. Securities and Exchange Commission
SERP: Supplemental Executive Retirement Plan
SFSA: Swedish Financial Supervisory Authority
SMARTS: SMARTS Group Holdings Pty
S&P: Standard & Poor's
S&P 500: S&P 500 Stock Index
SRO: Self-regulatory Organization
SSMA: Swedish Securities Markets Act 2007:528
TSR: Total Shareholder Return
U.S. GAAP: U.S. Generally Accepted Accounting Principles
UTP: Unlisted Trading Privileges
UTP Plan: Joint SRO Plan Governing the Collection, Consolidation, and Dissemination of Quotation and Transaction Information for Nasdaq-Listed Securities Traded on Exchanges on a UTP Basis
VAT: Value Added Tax
* * * * *

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* * * * *

This Annual Report on Form 10-K includes market share and industry data that we obtained from industry publications and surveys, reports of governmental agencies and internal company surveys. Industry publications and surveys generally state that the information they contain has been obtained from sources believed to be reliable, but we cannot assure you that this information is accurate or complete. We have not independently verified any of the data from third-party sources nor have we ascertained the underlying economic assumptions relied upon therein. Statements as to our market position are based on the most currently available market data. For market comparison purposes, The Nasdaq Stock Market data in this Annual Report on Form 10-K for IPOs is based on data generated internally by us, which includes best efforts underwritings; therefore, the data may not be comparable to other publicly-available IPO data. Data in this Annual Report on Form 10-K for new listings of equity securities on The Nasdaq Stock Market is based on data generated internally by us, which includes best efforts underwritings, issuers that switched from other listing venues, closed-end funds and ETPs. Data in this Annual Report on Form 10-K for IPOs and new listings of equity securities on the Nasdaq Nordic and Nasdaq Baltic exchanges also is based on data generated internally by us. IPOs and new listings data is presented as of period end. While we are not aware of any misstatements regarding industry data presented herein, our estimates involve risks and uncertainties and are subject

to change based on various factors, including those discussed in “Item 1A. Risk Factors” in this Annual Report on Form 10-K.

* * * * *

Nasdaq intends to use its website, ir.nasdaq.com, as a means for disclosing material non-public information and for complying with SEC Regulation FD and other disclosure obligations. These disclosures will be included on Nasdaq’s website under “Investor Relations.”

Forward-Looking Statements

The SEC encourages companies to disclose forward-looking information so that investors can better understand a company's future prospects and make informed investment decisions. This Annual Report on Form 10-K contains these types of statements. Words such as "may," "will," "could," "should," "anticipates," "envisions," "estimates," "expects," "intends," "plans," "believes" and words or terms of similar substance used in connection with any discussion of future expectations as to industry and regulatory developments or business initiatives and strategies, future operating results or financial performance, and other future developments identify forward-looking statements. These include, among others, statements relating to:

- our strategy, growth forecasts and 2019 outlook;
- the integration of acquired businesses, including accounting decisions relating thereto;
- the scope, nature or impact of acquisitions, divestitures, investments, joint ventures or other transactional activities;
- the effective dates for, and expected benefits of, ongoing initiatives, including transactional activities and other strategic, restructuring, technology, de-leveraging and capital return initiatives;
- our products, order backlog and services;
- the impact of pricing changes;
- tax matters;
- the cost and availability of liquidity and capital; and
- any litigation, or any regulatory or government investigation or action, to which we are or could become a party or which may affect us.

Forward-looking statements involve risks and uncertainties. Factors that could cause actual results to differ materially from those contemplated by the forward-looking statements include, among others, the following:

- our operating results may be lower than expected;
- our ability to successfully integrate acquired businesses or divest sold businesses or assets, including the fact that any integration or transition may be more difficult, time consuming or costly than expected, and we may be unable to realize synergies from business combinations, acquisitions, divestitures or other transactional activities;
- loss of significant trading and clearing volumes or values, fees, market share, listed companies, market data products customers or other customers;
- our ability to keep up with rapid technological advances and adequately address cybersecurity risks;
- economic, political and market conditions and fluctuations, including interest rate and foreign currency risk, inherent in U.S. and international operations;
- the performance and reliability of our technology and technology of third parties on which we rely;
- any significant error in our operational processes;
- our ability to continue to generate cash and manage our indebtedness; and
- adverse changes that may occur in the litigation or regulatory areas, or in the securities markets generally.

Most of these factors are difficult to predict accurately and are generally beyond our control. You should consider the uncertainty and any risk related to forward-looking statements that we make. These risk factors are discussed under the caption "Item 1A. Risk Factors," in this Annual Report on Form 10-K. You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this report. You should carefully read this entire Annual Report on Form 10-K, including "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations," and the consolidated financial statements and the related notes. Except as required by the federal securities laws, we undertake no obligation to update any forward-looking statement, release publicly any revisions to any forward-looking statements or report the occurrence of unanticipated events. For any forward-looking statements contained in any document, we claim the protection of the safe harbor for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995.

PART I

Item 1. Business

Overview

Nasdaq, Inc. is a leading provider of trading, clearing, marketplace technology, regulatory, securities listing, information and public and private company services. Our global offerings are diverse and include trading and clearing across multiple asset classes, trade management services, data products, financial indexes, capital formation solutions, corporate solutions, and market technology products and services. Our technology powers markets across the globe, supporting equity derivative trading, clearing and settlement, cash equity trading, fixed income trading, trading surveillance and many other functions.

History

Nasdaq was founded in 1971 as a wholly-owned subsidiary of FINRA. Beginning in 2000, FINRA restructured and broadened ownership in Nasdaq by selling shares to FINRA members, investment companies and issuers listed on The Nasdaq Stock Market. In connection with this restructuring, FINRA fully divested its ownership of Nasdaq in 2006, and The Nasdaq Stock Market became fully operational as an independent registered national securities exchange in 2007. In 2006, Nasdaq also reorganized its operations into a holding company structure.

In February 2008, Nasdaq and OMX AB combined their businesses. This transformational combination resulted in the expansion of our business from a U.S.-based exchange operator to a global exchange company offering technology that powers our own exchanges and markets as well as many other marketplaces around the world. In connection with this acquisition, we changed our corporate name to The NASDAQ OMX Group, Inc. We operated under this name until we rebranded our business as Nasdaq, Inc. in 2015.

Growth Strategy

Since our transformative combination with OMX AB in 2008, we have grown our business both organically and through acquisitions that have expanded our operations globally and increasingly diversified our product and service offerings. This evolution was driven by our ability to create opportunities in areas adjacent to our core businesses, many of which are non-transaction based and rooted in innovative technology. To keep pace with our understanding of future trends and to ensure our continued success in the evolving business environment, we have focused on refining our vision, mission and strategy:

Our Vision: We reimagine markets to realize the potential of tomorrow.

Our Mission: We bring together ingenuity, integrity and insights to deliver markets that accelerate economic progress and empower people to achieve their greatest ambitions.

Our Strategy: Our strategic direction is driven by our continuous examination of: (i) key macroeconomic, regulatory and technology trends, (ii) consultation with our clients about

short- and long-term trends in their businesses and (iii) the competitive landscape.

Under the strategic direction that we have been implementing over the past two years, we have focused on maximizing the resources, people and capital allocated to our largest growth opportunities, particularly in our Market Technology and Information Services businesses. In addition, we are committed to maintaining and enhancing the marketplace platform businesses that are core to Nasdaq, and reducing capital and resources in areas that we believe are not as strategic to our clients and have less growth potential within Nasdaq.

Increasing Investment in Businesses Where We See the Highest Growth Opportunity. We have increased investment in areas that we believe help solve our clients' biggest challenges and are likely to generate growth for our stockholders. In 2018, these businesses included: the data analytics business within our Information Services segment, NPM, within our Corporate Services segment, and our Market Technology segment (including our regulatory technology business).

Consistent with this objective, we recently acquired eVestment and Quandl, Inc., which are part of our Information Services segment, and Sybenetix and Cinnober Financial Technology AB, or Cinnober, which are now part of our Market Technology segment. We also are investing further in the Market Technology segment through the Nasdaq Financial Framework, the expansion of our SMARTS products and customers, and our efforts to commercialize disruptive technologies, including blockchain, machine intelligence and the cloud.

•

Sustaining Our Foundation. As we strive to grow our business, we also have focused on enhancing our leadership position in the marketplaces in which we operate as we continue to innovate with new functionality and strong market share in our core markets.

Optimizing Slower Growth Businesses. We continually review areas that are not critical to our core. In these areas, we expect to target resiliency and efficiency versus growth, and free up resources when possible to redirect toward greater opportunities. In furtherance of this strategy, in April 2018 we sold the public relations (Public Relations Solutions) and webcasting and webhosting (Digital Media Services) businesses within our Corporate Solutions business to West Corporation. In addition, in December 2018, we sold our 5.0% ownership interest in LCH.

Products and Services

We manage, operate and provide our products and services in four business segments: Market Services, Corporate Services, Information Services and Market Technology.

Market Services

Our Market Services segment includes our Equity Derivative Trading and Clearing, Cash Equity Trading, FICC and Trade Management Services businesses.

Equity Derivative Trading and Clearing

We operate six electronic options exchanges in the U.S.: Nasdaq PHLX, The Nasdaq Options Market, Nasdaq BX Options, Nasdaq ISE, Nasdaq GEMX and Nasdaq MRX. These exchanges facilitate the trading of equity, ETF, index and foreign currency options. Together, our combined options market share in 2018 represented the largest share of the U.S. market for multiply-listed options on equities and ETFs. Our options trading platforms provide trading opportunities to both retail investors, algorithmic trading firms and market makers, who tend to prefer electronic trading, and institutional investors, who typically pursue more complex trading strategies and often trade on the floor. In Europe, Nasdaq offers trading in derivatives, such as stock options and futures, index options and futures and fixed-income options and futures. Nasdaq Clearing offers clearing services for fixed-income options and futures, stock options and futures, index options and futures, and interest rate swaps by serving as the CCP. Nasdaq Clearing also operates a clearing service for the resale and repurchase agreement market.

Cash Equity Trading

In the U.S., we operate three cash equity exchanges: The Nasdaq Stock Market, Nasdaq BX and Nasdaq PSX. The Nasdaq Stock Market is the largest single venue of liquidity for trading U.S.-listed cash equities.

Our U.S. cash equity exchanges offer trading of both Nasdaq-listed and non-Nasdaq-listed securities. Market participants include market makers, broker-dealers, ATs and registered securities exchanges. In addition, we operate a Canadian exchange with three independent markets, CXC, CX2 and CXD, for the trading of Canadian-listed securities.

In Europe, Nasdaq operates exchanges in Stockholm (Sweden), Copenhagen (Denmark), Helsinki (Finland), and Reykjavik (Iceland). We also operate exchanges in Tallinn (Estonia), Riga (Latvia) and Vilnius (Lithuania).

Collectively, the Nasdaq Nordic and Nasdaq Baltic exchanges offer trading in cash equities, depository receipts, warrants, convertibles, rights, fund units and ETFs. Our platform allows the exchanges to share the same trading system, which enables efficient cross-border trading and settlement, cross membership and a single source for Nordic data products. Settlement and registration of cash equity trading takes place in Sweden, Finland, Denmark and Iceland via the local central securities depositories. In addition, Nasdaq owns two central securities depositories that provide notary, settlement, central maintenance and other services in the Baltic countries and Iceland.

FICC

Our FICC business includes the Nasdaq Fixed Income business, NFX and Nasdaq Commodities.

The U.S. portion of Nasdaq Fixed Income includes an electronic platform for trading U.S. Treasuries. The electronic trading platform provides real-time institutional trading of benchmark

U.S. Treasury securities. Through this business, we provide trading access to the U.S. Treasury securities market with an array of trading instruments to meet various investment goals across the fixed income spectrum.

The European portion of Nasdaq Fixed Income provides a wide range of products and services, such as trading and clearing, for fixed income products in Sweden, Denmark, Finland, Iceland, Lithuania and Latvia. Nasdaq Stockholm is the largest bond listing venue in the Nordics, with more than 7,000 listed retail and institutional bonds. In addition, Nasdaq Nordic facilitates the trading and clearing of Nordic fixed income derivatives in a unique market structure.

Buyers and sellers agree to trades in fixed income derivatives through bilateral negotiations and then report those trades to Nasdaq Clearing for CCP clearing. Nasdaq Clearing acts as the counterparty to both the buyer and seller. Nasdaq Commodities is the brand name for Nasdaq's European commodity-related products and services. Nasdaq Commodities' offerings include derivatives in oil, power, natural gas and carbon emission markets, tanker and dry cargo freight, seafood, iron ore, electricity certificates and clearing services. These products are listed on two of Nasdaq's derivatives exchanges.

Nasdaq Oslo ASA, which is authorized by the Norwegian Ministry of Finance and supervised by the Norwegian Financial Supervisory Authority, is the commodity derivatives exchange for European products. All trades with Nasdaq Oslo ASA are subject to clearing with Nasdaq Clearing, which is a CCP authorized under EMIR by the SFSA to conduct clearing operations.

We also operate NFX, which is a U.S. based designated contract market authorized by the CFTC. NFX currently lists cash-settled derivatives in freight and energy (including oil, natural gas and U.S. power). All trades with NFX are subject to clearing with OCC.

Trade Management Services

We provide market participants with a wide variety of alternatives for connecting to and accessing our markets for a fee. Shifting connectivity from proprietary networks to third-party networks has significantly reduced technology and network costs and increased our systems' scalability while maintaining performance and reliability.

Our marketplaces may be accessed via a number of different protocols used for quoting, order entry, trade reporting and connectivity to various data feeds. We also offer the Nasdaq Workstation, a browser-based, front-end interface that allows market participants to view data and enter orders, quotes and trade reports. In addition, we offer a variety of add-on compliance tools to help firms comply with regulatory requirements.

We provide co-location services to market participants, whereby we offer firms cabinet space and power to house their own equipment and servers within our data centers. Additionally, we offer a number of wireless connectivity routes between select data centers using millimeter wave and

microwave technology. We also earn revenues from annual and monthly exchange membership and registration fees. Our broker services operations offer technology and customized securities administration solutions to financial participants in the Nordic market. Broker services provides services through a registered securities company that is regulated by the SFSA. Services primarily consist of flexible back-office systems, which allow customers to entirely or partly outsource their company's back-office functions.

We offer customer and account registration, business registration, clearing and settlement, electronic Nordic mutual fund service, corporate action handling for reconciliations and reporting to authorities. Available services also include direct settlement with the Nordic central securities depositories, real-time updating and communication via the Society for Worldwide Interbank Financial Telecommunication (SWIFT) to deposit banks.

Corporate Services

Our Corporate Services businesses deliver critical capital market and governance solutions across the lifecycle of public and private companies.

Corporate Solutions

Our Corporate Solutions business serves corporate clients, including companies listed on our exchanges and private companies. We help organizations enhance their ability to understand and expand their global shareholder base, and improve corporate governance through our suite of advanced technology, analytics, and consultative services.

As of December 31, 2018, we provided Corporate Solutions products and services in the following key areas:

Investor Relations Intelligence. We offer a global team of consultative experts that deliver advisory services including Strategic Capital Intelligence, Shareholder Identification and Perception Studies as well as an industry-leading software, Nasdaq IR Insight®, to investor relations professionals. These solutions allow investor relations officers to better manage their investor relations programs, understand their investor base, target new investors, manage meetings and consume key data elements such as equity research, consensus estimates and news.

Board & Leadership. We provide a global technology offering that streamlines the meeting process for board of directors and executive leadership teams and helps them accelerate decision making and strengthen governance. Our solutions protect sensitive data and facilitate productive collaboration, so board members and teams can work faster and more effectively.

Governance, Risk & Compliance. We offer a global suite of managed services and solutions for risk management, internal audit and regulatory compliance.

In April 2018, we sold the Public Relations Solutions and Digital Media Services products and services that formerly

were part of our Corporate Solutions business to West Corporation.

In February 2019, we entered into an agreement with SAI Global to sell B Wise, our internal audit, regulatory compliance management, and operational risk management software that comprises our governance, risk and compliance product offering. Subject to regulatory approvals, works council and other representative body consultations and notifications in applicable jurisdictions, as well as other customary closing conditions, the transaction is expected to close in the first half of 2019.

Listing Services

We operate a variety of listing platforms around the world to provide multiple global capital raising solutions for private and public companies. Companies listed on our markets represent a diverse array of industries including, among others, health care, consumer products, telecommunication services, information technology, financial services, industrials and energy. Our main listing markets are The Nasdaq Stock Market and the Nasdaq Nordic and Nasdaq Baltic exchanges.

Companies seeking to list securities on The Nasdaq Stock Market must meet minimum listing requirements, including specified financial and corporate governance criteria. Once listed, companies must meet continued listing standards.

The Nasdaq Stock Market currently has three listing tiers: The Nasdaq Global Select Market, The Nasdaq Global Market and The Nasdaq Capital Market. All three market tiers maintain rigorous listing and corporate governance standards (both initial and ongoing).

As of December 31, 2018, a total of 3,058 companies listed securities on The Nasdaq Stock Market, with 1,418 listings on The Nasdaq Global Select Market, 852 on The Nasdaq Global Market and 788 on The Nasdaq Capital Market.

We aggressively pursue new listings from companies, including those undergoing IPOs as well as companies seeking to switch from alternative exchanges. In 2018, The Nasdaq Stock Market attracted 303 new listings, including 186 IPOs, representing 72% of U.S. IPOs in 2018. The new listings were comprised of the following:

Switches from the New York Stock Exchange LLC, or NYSE, and NYSE American LLC, or NYSE American IPOs	18
Upgrades from OTC	186
ETPs and Other Listings	43
Total	56
	303

The 18 NYSE or NYSE American listed companies that switched to The Nasdaq Stock Market, represented approximately \$111.3 billion in market capitalization. Notable switches included Xcel Energy, Inc., United Continental Holdings, Inc., and Regency Centers Corporation.

We also offer listings on the exchanges that comprise Nasdaq Nordic and Nasdaq Baltic. For smaller companies and growth

companies, we offer access to the financial markets through the Nasdaq First North alternative marketplaces. As of December 31, 2018, a total of 1,019 companies listed securities on our Nordic and Baltic exchanges and Nasdaq First North.

Our European listing customers include companies, funds and governments. Customers issue securities in the form of cash equities, depository receipts, warrants, ETPs, convertibles, rights, options, bonds or fixed-income related products. In 2018, a total of 73 new companies listed on our Nordic and Baltic exchanges and Nasdaq First North. In addition, 13 companies upgraded their listings from Nasdaq First North to the Nordic and Baltic exchanges.

Our Listing Services business also includes NPM, which provides liquidity solutions for private companies and private funds. NPM's platform helps employees, investors, companies, funds and institutions execute transactions, whether for private companies, private investment funds, or other private asset classes.

In December 2018, we launched a Corporate Bond exchange for the listing and trading of corporate bonds. The new exchange operates pursuant to The Nasdaq Stock Market exchange license and is powered by the Nasdaq Financial Framework, similar to the Nasdaq Fixed Income platform. Surveillance is conducted by the Nasdaq regulatory team, assisted by our SMARTS surveillance solution.

Information Services

Beginning in the second quarter of 2018, our Information Services segment was recategorized into the following businesses:

Market Data;

Index; and

Investment Data & Analytics.

Prior to the second quarter, our Information Services segment was comprised of our Data Products and our Index Licensing and Services businesses.

Market Data

Our Market Data business sells and distributes historical and real-time quote and trade information to the sell-side, the buy-side, retail online brokers, proprietary trading shops, other venues, internet portals and data distributors. Our market data products enhance transparency of market activity within our exchanges and provide critical information to professional and non-professional investors globally.

We collect, process and create information and earn revenues as a distributor of our own, as well as select, third-party content. We provide varying levels of quote and trade information to our customers who in turn provide subscriptions for this information. Our systems enable distributors to gain access to our market depth, mutual fund valuation, order imbalances, market sentiment and other analytical data.

We distribute this proprietary market information to both market participants and non-participants through a number of

proprietary products, including Nasdaq TotalView, our flagship market depth quote product. TotalView shows subscribers quotes, orders and total anonymous interest at every displayed price level in The Nasdaq Stock Market for Nasdaq-listed securities and critical data for the opening, closing, halt and IPO crosses. We also offer TotalView products for our Nasdaq BX, Nasdaq PSX, Nasdaq Fixed Income and other Nordic markets.

We operate several other proprietary services and data products to provide market information, including Nasdaq Basic, a low cost alternative to the industry Level 1 feed and Nasdaq Canada Basic, a low cost alternative to other high priced data feeds. We also provide a plethora of other data, including data relating to our six U.S. options exchanges, Nordic and U.S. futures, Nordic commodities, and U.S. Treasuries.

Our Market Data business also includes revenues from U.S. tape plans. The plan administrators sell quotation and last sale information for all transactions in Nasdaq-listed securities, whether traded on The Nasdaq Stock Market or other exchanges, to market participants and to data distributors, who then provide the information to subscribers. After deducting costs, the plan administrators distribute the tape revenues to the respective plan participants based on a formula required by Regulation NMS that takes into account both trading and quoting activity.

The Nasdaq Nordic and Nasdaq Baltic exchanges, as well as Nasdaq Commodities, also offer data products and services. These data products and services provide critical market transparency to professional and non-professional investors who participate in European marketplaces and, at the same time, give investors greater insight into these

markets.

Much like the U.S. products, European data products and services are based on trading information from the Nasdaq Nordic and Nasdaq Baltic exchanges, as well as Nasdaq Commodities, for the following classes of assets: cash equities, bonds, derivatives and commodities. We provide varying levels of quote and trade information to market participants and to data distributors, who in turn provide subscriptions for this information. Significant European data products include Nordic Equity TotalView, Nordic Derivative TotalView, and Nordic Fixed Income TotalView, Level 2, Analytics and Fixings.

Index

Our Index business develops and licenses Nasdaq-branded indexes, associated derivatives, and financial products and also provides custom calculation services for third-party clients. License fees for our trademark licenses vary by product based on a percentage of underlying assets, dollar value of a product issuance, number of products or number of contracts traded. We also license cash-settled options, futures and options on futures on our indexes.

As of December 31, 2018, we had 365 ETPs licensed to Nasdaq's indexes which had \$172 billion in assets under management. Our flagship index, the Nasdaq-100 Index, includes the top 100 non-financial securities listed on The Nasdaq Stock Market.

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We provide index data products based on Nasdaq indexes. Index data products include our Global Index Data Service, which delivers real-time index values throughout the trading day, and Global Index Watch/Global Index File Delivery Service, which delivers weightings and components data, corporate actions and a breadth of additional data. We also operate the Nasdaq Global Index Family, which includes more than 40,000 indexes. The family consists of global securities broken down by market segment, region, country, size and sector. The Nasdaq Global Index Family covers 45 countries and approximately 9,000 securities.

Nasdaq Dorsey Wright, or NDW, a market leader in data analytics, passive indexing, smart beta strategies, provides model-based strategies and analysis to support the financial advisor community, as well as Systematic Relative Strength strategies to manage separately and unified managed accounts. NDW strengthens Nasdaq's position as a leading smart beta index provider in the U.S. As of December 31, 2018, there were \$7 billion in assets under management, or AUM, in ETPs that track Nasdaq smart beta indexes and \$2 billion in AUM and assets under advisement tracking NDW investment strategies and research.

Investment Data & Analytics

Our Investment Data & Analytics business is a leading content and analytics cloud-based solutions provider used by asset managers, investment consultants and asset owners to help facilitate better investment decisions. Through eVestment, we offer leading content and analytics used by asset managers, investment consultants and asset owners to help facilitate institutional investment decisions. eVestment provides a flexible suite of cloud-based solutions to help the institutional investing community identify and capitalize on global investment trends and select and monitor investment managers. eVestment's products also enable asset managers to market their funds worldwide. Additionally the Nasdaq Fund Network gathers and distributes daily net asset values from over 35,000 funds and other investment vehicles across North America.

In November 2018, we acquired Quandl, Inc., a premier marketplace for unique, alpha-generating alternative datasets as well as for economic and financial datasets.

Market Technology

Powering over 100 market infrastructure operators in more than 50 countries, our Market Technology business is a leading global technology solutions provider and partner to exchanges, clearing organizations, central securities depositories, regulators, banks, brokers, buy-side firms and corporate businesses. Our solutions can handle a wide array of assets, including but not limited to cash equities, equity derivatives, currencies, various interest-bearing securities, commodities, energy products and digital currencies. Our solutions can also be used in the creation of new asset classes, and in 2018, Nasdaq partnered with non-capital markets customers, including those in insurance liabilities securitization and digital advertising futures trading.

Nasdaq's market technology is utilized by leading markets in the U.S., Europe and Asia as well as emerging markets in the Middle East, Latin America, and Africa. Additionally, more than 160 market participants leverage our surveillance technology globally to manage their integrity obligations and assist them in complying with market rules, regulations and internal market surveillance policies.

In January 2019, we completed a public offer to acquire Cinnober, a major Swedish financial technology provider to brokers, exchanges and clearinghouses worldwide that provides technology solutions similar and complimentary to our Market Technology business. We expect the integration of Cinnober into our business to strengthen our position as a leading market infrastructure technology provider.

Market Infrastructure Operators (MIO) & New Markets Portfolio

For MIO's, we provide and deliver mission-critical solutions across the trade lifecycle via the Nasdaq Financial Framework, which is our flexible and modular architecture and technology that provides next generation capital markets capabilities in an open and agile environment. The Nasdaq Financial Framework is designed to cover all aspects of a market operator's needs, from trading and clearing to risk management, market surveillance, index development, data, management, testing and quality assurance. During 2018, we continued to invest in the Nasdaq Financial Framework by enabling emerging technologies, including integrating blockchain technology for issuance and settlement of securities, cloud-enabled trading and clearing, and other blockchain and machine learning applications.

In 2018, we launched our New Markets initiative, which is focused on extending the Nasdaq Financial Framework's capabilities outside of capital markets. Market Technology currently offers its services to a loyalty points exchange, digital advertising exchange, reinsurance market and three horse racing operators.

Many MIO and New Markets projects involve complex delivery management and systems integration. Through our integration services, we can assume responsibility for projects that involve migration to a new system and the establishment of entirely new marketplaces. We also offer operation and support for the applications, systems platforms, networks and other components included in an information technology solution, as well as advisory services.

Buy- and Sell-side Portfolio

In 2018, we continued to make progress in expanding our Nasdaq Financial Framework offering to the bank and broker community. Regulatory pressure across multiple jurisdictions has made outsourcing of front-office infrastructure an attractive option for sell-side organizations and, as a result, we offer trading and execution infrastructure for systematic internalizers, single-dealers platforms and both multi-lateral and organized trading facilities.

We also continue to gain market share for our SMARTS Trade Surveillance solution, which is a managed service designed for brokers and other market participants to assist them in complying with market rules, regulations and internal market surveillance policies, and TradeGuard, which is a suite of products that offer a real-time, multi-tiered risk solution that integrates pre-, at- and on-trade risk management, including margining. In 2018, SMARTS received four industry awards and is now used by over 160 client firms globally. In 2018, we completed the integration of Sybenetix, our market surveillance and fair investor allocation solution for the buy-side, and have begun deploying this solution to an expanded customer base.

Technology

Technology plays a key role in ensuring the growth, reliability and regulation of financial markets. We have established a technology risk program to evaluate the resiliency of critical systems, including risks associated with cybersecurity. This program is focused on (i) identifying areas for improvement in systems and (ii) implementing changes and upgrades to technology and processes to minimize future risk. We have continued our focus on improving the security of our technology with an emphasis on employee awareness through training, targeted phishing campaigns, and new tool deployment for our securities operations team. See “Item 1A. Risk Factors,” in this Annual Report on Form 10-K for further discussion.

Core Technology. The Nasdaq Financial Framework is Nasdaq’s approach to delivering end-to-end solutions for market infrastructure operators, buy-side firms, sell-side firms and other non-financial markets. The framework consists of a single operational core platform that ties together Nasdaq’s portfolio of functionality across the trade lifecycle, in an open framework whereby exchanges, clearinghouses, CSDs and other entities can easily integrate Nasdaq’s business applications with each other, as well as other third-party solutions. In addition to being able to integrate a broad range of business functions, the Nasdaq Financial Framework enables end users to leverage recent technology developments, such as blockchain and machine learning. During 2018, Nasdaq Fixed Income was replatformed using the Nasdaq Financial Framework Core Platform.

Competitive Strengths

We are a global financial technology company that in recent years, through building on capital markets experience, technological expertise, and clear understanding of our client's needs, has diversified its product and service offerings.

A Unique Value Proposition

We operate a diverse and resilient capital markets franchise with a marketplace core. Our businesses provide capital-markets infrastructure services to industry players, allowing us to:

- Develop efficient and reliable technologies to facilitate capital markets activity;
- Manage the complexities and costs of business on a global scale; and

• Provide data, tools and insights that drive sound decision making.

Technological Strength

We are living through a time where innovative technologies are transforming financial services. We have come a long way in trading since Nasdaq launched the first fully electronic exchange in 1971 and we see forces accelerating that will bring major changes to the capital markets. The strength and resiliency of our technology, enhanced by our leading Market Technology business, in meeting the advancing demands of our global customer base is vital to the continued success of our business and distinguishes us from our competitors.

A Focus on Client Needs Throughout the Marketplace

We strive to serve a diverse range of clients by:

- Brokers and Traders - Helping brokers and traders to confidently plan, optimize and execute their business vision.
- Market Participants - Enabling market participants to monitor and capitalize on real-time market changes.
- Investors and Asset Managers - Offering products and services to assist investors and asset managers in optimizing their portfolios and offerings.
- Listed Companies - Promoting the capital health of our listed companies.
- Private Companies - Working with private companies to meet liquidity needs, manage relationships with long-term institutional investors and oversee their entire equity program.
- Market Infrastructure Players - Assisting market infrastructure players (exchanges, regulators, clearinghouses, and Central Securities Depositories) in increasing efficiency, meeting customer needs and growing revenue.

Capital-Markets - Delivering efficiencies through economies of scale (cost, speed, connectivity) to all members of the capital-markets ecosystem.

Competition

Market Services

We face intense competition in North America and Europe in businesses that comprise our Market Services segment. We seek to provide market participants with greater functionality, trading system stability, speed of execution, high levels of customer service, and efficient pricing. In both North America and Europe, our competitors include other exchange operators, operators of non-exchange trading systems and banks and brokerages that operate their own internal trading pools and platforms.

In the U.S., our options markets compete with exchanges operated by Cboe Global Markets, Inc., or CBOE, Miami International Holdings, Inc., or Miami, and Intercontinental Exchange, Inc., or ICE. In cash equities, we compete with

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exchanges operated by CBOE and ICE. In addition, competitors recently have launched, or announced a plan to launch, new exchanges, including one to be established by a group of our customers. In equities we also face competition from ATSS and other less-heavily regulated broker-owned systems, some of which are also known as “dark pools,” and from other types of OTC trading. In Canada, our cash equities exchange competes with exchanges such as the Toronto Stock Exchange, or TSX, and other marketplaces.

In Europe, our cash equities markets compete with exchanges such as CBOE, Euronext N.V., Deutsche Börse A.G. and London Stock Exchange Group plc, or LSE, and MTFs. Our competitors in the trading and clearing of options and futures on European equities include the Eurex Group companies, or Eurex, ICE Futures Europe and the MTFs. In addition, in equities we face competition from other broker-owned systems, some of which are also known as systematic internalizers, and from other types of OTC trading. Competition among exchanges for trading European equity derivatives tends to occur where there is competition in the trading of the underlying equities. In addition to exchange-based competition, we face competition from OTC derivative markets.

The implementation of MiFID II and MiFIR is expected to lead to further competitive pressure on our European trading business. MTFs are already attracting a significant share of electronically matched volume. With the regulatory environment likely to become more favorable to alternative trading venues, we expect such venues to compete aggressively for the trading of equity securities listed on our Nordic exchanges. Electronic trading systems pursuing block business also remain active in Europe. Trading on systematic internalizers has increased markedly as volume migrates from other types of trading venues. In responding to current and potential competition, we constantly review our pricing and product offerings.

Our FICC business also operates in an intensely competitive environment. Our trading platform for benchmark U.S. treasuries faces competition from both long-established competitors, such as Brokertec, and newly emerging electronic and voice brokerages, and the operating environment remains extremely challenging. Our European fixed income products and services are subject to relentless competitive pressure from OTC dealers as well as exchanges. Our suite of commodity-related products and services is in many cases designed to challenge the more established players.

Our Trade Management Services business competes with other exchange operators, extranet providers, and data center providers.

Corporate Services

In our Corporate Solutions business, competition is varied and can be fragmented. For our Investor Relations Intelligence business, there are many regional competitors and relatively few global providers. Other exchange operators are partnering with firms that have capabilities in this area and seeking to acquire relevant assets in order to provide investor relations

services to customers alongside listing services. The competitive landscape for our Governance Solutions business varies by customer sector and geography. Most participants offer software-as-a-service solutions that are supported by a data center strategy. Some firms offer specialized services that focus on a single niche sector. The larger players often offer additional services. Customers frequently seek single-source providers that are able to address a broad range of needs within a single platform.

Our Listing Services business in both the U.S. and Europe provides a means of facilitating capital formation through public capital markets. There are competing ways of raising capital, and we seek to demonstrate the benefits of listing shares on an exchange. Our primary competitor for larger company stock share listings in the U.S. is NYSE. The Nasdaq Stock Market competes with local and international markets located outside the U.S. for listings of equity securities of both U.S. and non-U.S. companies that choose to list (or dual-list) outside of their home country. For example, The Nasdaq Stock Market competes for listings with exchanges in Europe and Asia, such as LSE and The Stock Exchange of Hong Kong Limited.

The Listings Services business in Europe is characterized by a large number of exchanges competing for new or secondary listings. Each country has one or more national exchanges, which are often the first choice of companies in each respective country. For those considering an alternative, competing European exchanges that frequently attract many listings from outside their respective home countries include LSE, Euronext N.V. and Deutsche Börse A.G. In addition to the larger exchanges, companies seeking capital or liquidity from public capital markets are able to raise

capital without a regulated market listing and can consider trading their shares on smaller markets and quoting facilities.

In risk intelligence, our products must compete with solutions that are often part of larger suites, such as those related to information technology management or general business management.

Information Services

Our Market Data business in the U.S. includes both proprietary and consolidated data products. Proprietary data products are made up exclusively of data derived from each exchange's systems. Consolidated data products are distributed by SEC-mandated consolidators (one for Nasdaq-listed stocks and another for NYSE and other-listed stocks) that share the revenue among the exchanges that contribute data. In Europe, all data products are proprietary as there is no official data consolidator. Competition in the data business is intense and is influenced by rapidly changing technology and the creation of new product and service offerings.

The sale of our proprietary data products in both the U.S. and Europe is under competitive threat from alternative exchanges and trading venues that offer similar products. Our data business competes with other exchanges and third party vendors to provide information to market participants. Examples of our

competitors in proprietary data products are ICE, CBOE, TSX, and Dow Jones & Company.

The consolidated data business is under competitive pressure from other securities exchanges that trade Nasdaq-listed securities. In addition, The Nasdaq Stock Market similarly competes for the tape fees from the sale of information on securities listed on other markets.

Our Index business faces competition from providers of various competing financial indexes. For example, there are a number of indexes that aim to track the technology sector and thereby compete with the Nasdaq-100 Index and the Nasdaq Composite Index. We face competition from investment banks, dedicated index providers, markets and other product developers.

Our Investment Data & Analytics faces competition from a broad array of data and analytics suppliers, both established firms and small start-ups. The majority of the competitors today are offering only a portion of the solutions that we offer. Our primary competitors are Morningstar, Factset, Mercer and any number of smaller firms along with start-up data providers and aggregators. Additionally other large providers to the financial services industry such as Bloomberg and Refinitiv are believed to be interested in pursuing certain aspects of the services we provide.

Market Technology

Traditionally, exchanges and exchange-related businesses internally developed technology, sometimes aided by consultants. However, over time this model has changed as many operators have recognized the cost-savings made possible by buying technology from third parties. As a result, two types of competitors have emerged in our Market Technology segment: exchange operators and technology providers unaffiliated with exchanges. These organizations make available a range of off-the-shelf technology, including trading, clearing, market surveillance, settlement, depository and information dissemination, and offer customization and operation expertise. Market conditions in Market Technology are evolving rapidly, which makes continuous investment and innovation a necessity.

A wide range of providers compete with us in surveillance. In surveillance, standardization of products and budget pressures drive customers to focus on pricing.

Intellectual Property

We believe that our intellectual property assets are important for maintaining the competitive differentiation of our products, systems, software and services, enhancing our ability to access technology of third parties and maximizing our return on research and development investments.

To support our business objectives and benefit from our investments in research and development, we actively create and maintain a wide array of intellectual property assets, including patents and patent applications related to our innovations, products and services; trademarks related to our brands, products and services; copyrights in software and creative content; trade secrets; and through other intellectual

property rights, licenses of various kinds and contractual provisions. We enter into confidentiality and invention assignment agreements with our employees and contractors, and utilize non-disclosure agreements with third parties with whom we conduct business in order to secure and protect our proprietary rights and to limit access to, and disclosure of, our proprietary information.

We own, or have licensed, rights to trade names, trademarks, domain names and service marks that we use in conjunction with our operations and services. We have registered many of our most important trademarks in the U.S. and in foreign countries. For example, our primary “Nasdaq” mark is a registered trademark that we actively seek to protect in the U.S. and in over 50 other countries worldwide.

Over time, we have accumulated a robust portfolio of issued patents in the U.S. and in many other jurisdictions across the world. We currently hold rights to patents relating to certain aspects of our products, systems, software and services, but we primarily rely on the innovative skills, technical competence and marketing abilities of our personnel. No single patent is in itself core to the operations of Nasdaq or any of its principal business areas.

Corporate Venture Practice

We operate a corporate venture program to make minority investments primarily in emerging growth financial technology companies that are strategically relevant to, and aligned with, Nasdaq. Investments are made through the venture program to further our organic research and development efforts and accelerate the path to commercial viability. We expect that capital invested will continue to be modest and will not have a material impact on our consolidated financial statements, existing capital return or deployment priorities.

Regulation

We are subject to extensive regulation in the U.S., Canada and Europe.

U.S. Regulation

U.S. federal securities laws establish a system of cooperative regulation of securities markets, market participants and listed companies. SROs conduct the day-to-day administration and regulation of the nation's securities markets under the close supervision of, and subject to extensive regulation, oversight and enforcement by, the SEC. SROs, such as national securities exchanges, are registered with the SEC.

This regulatory framework applies to our U.S. business in the following ways:

- regulation of our registered national securities exchanges; and
- regulation of our U.S. broker-dealer and investment advisor subsidiaries.

National Securities Exchanges. SROs in the securities industry are an essential component of the regulatory scheme of the Exchange Act for providing fair and orderly markets and

protecting investors. The Exchange Act and the rules thereunder, as well as each SRO's own rules, impose many regulatory and operational responsibilities on SROs, including the day-to-day responsibilities for market and broker-dealer oversight. Moreover, an SRO is responsible for enforcing compliance by its members, and persons associated with its members, with the provisions of the Exchange Act, the rules and regulations thereunder, and the rules of the SRO, including rules and regulations governing the business conduct of its members.

Nasdaq currently operates three cash equity, six options markets and one corporate bond market in the U.S. We operate The Nasdaq Stock Market, The Nasdaq Options Market and the Corporate Bond Market pursuant to The Nasdaq Stock Market's SRO license; Nasdaq BX and Nasdaq BX Options pursuant to Nasdaq BX's SRO license; Nasdaq PSX and Nasdaq PHLX pursuant to Nasdaq PHLX's SRO license; and Nasdaq ISE, Nasdaq GEMX and Nasdaq MRX, each operates an options market under its own SRO license. As SROs, each entity has separate rules pertaining to its broker-dealer members and listed companies. Broker-dealers that choose to become members of our exchanges are subject to the rules of those exchanges.

All of our U.S. national securities exchanges are subject to SEC oversight, as prescribed by the Exchange Act, including periodic and special examinations by the SEC. Our exchanges also are potentially subject to regulatory or legal action by the SEC at any time in connection with alleged regulatory violations. We have been subject to a number of routine reviews and inspections by the SEC or external auditors in the ordinary course, and we have been and may in the future be subject to SEC enforcement proceedings. To the extent such actions or reviews and inspections result in regulatory or other changes, we may be required to modify the manner in which we conduct our business, which may adversely affect our business.

Section 19 of the Exchange Act provides that our exchanges must submit to the SEC proposed changes to any of the SROs' rules, practices and procedures, including revisions to provisions of our certificate of incorporation and by-laws that constitute SRO rules. The SEC will typically publish such proposed changes for public comment, following which the SEC may approve or disapprove the proposal, as it deems appropriate. SEC approval requires a finding by the SEC that the proposal is consistent with the requirements of the Exchange Act and the rules and regulations thereunder. Pursuant to the requirements of the Exchange Act, our exchanges must file with the SEC, among other things, all proposals to change their pricing structure.

Pursuant to regulatory services agreements between FINRA and our SROs, FINRA provides certain regulatory services to our markets, including the regulation of trading activity and surveillance and investigative functions. Nevertheless, we have a direct regulatory role in conducting certain real-time market monitoring, certain equity surveillance not involving cross-market activity, most options surveillance, most rulemaking and some membership functions through our Nasdaq Regulation department. We review suspicious trading behavior discovered

by our regulatory staff, and depending on the nature of the activity, may refer the activity to FINRA for further investigation. Our SROs retain ultimate regulatory responsibility for all regulatory activities performed under regulatory agreements by FINRA, and for fulfilling all regulatory obligations for which FINRA does not have responsibility under the regulatory services agreements.

In addition to its other SRO responsibilities, The Nasdaq Stock Market, as a listing market, also is responsible for overseeing each listed company's compliance with The Nasdaq Stock Market's financial and corporate governance standards. Our listing qualifications department evaluates applications submitted by issuers interested in listing their securities on The Nasdaq Stock Market to determine whether the quantitative and qualitative listing standards have been satisfied. Once securities are listed, the listing qualifications department monitors each issuer's on-going compliance with The Nasdaq Stock Market's continued listing standards.

Broker-dealer regulation. Nasdaq's broker-dealer subsidiaries are subject to regulation by the SEC, the SROs and various state securities regulators. Nasdaq operates five broker-dealers: Nasdaq Execution Services, LLC, Execution Access, LLC, NPM Securities, SMTX, LLC, and Nasdaq Capital Markets Advisory LLC. Each broker-dealer is registered with the SEC, a member of FINRA and registered in the U.S. states and territories required by the operation of its business.

Nasdaq Execution Services operates as our routing broker for sending orders from Nasdaq's U.S. cash equity and options exchanges to other venues for execution. SMTX acts as an intermediary to facilitate closings of, and introduce prospective accredited investors in connection with, private non-capital raising transactions. Nasdaq Capital Markets

Advisory acts as a third-party advisor to privately-held or publicly-traded companies during IPOs and various other offerings.,

Two of our broker-dealers also are registered with the SEC as an ATS. Execution Access operates as the broker-dealer for our fixed income business, including Nasdaq Fixed Income's registered ATS for U.S. Treasury securities. NPM Securities operates an ATS that facilitates the purchase and sale of ownership interests in primary and secondary transactions in certain funds (both registered or not registered under the Investment Company Act of 1940), business development companies, certain closed end funds and private real estate investment funds.

The SEC, FINRA and the exchanges adopt rules and examine broker-dealers and require strict compliance with their rules and regulations. The SEC, SROs and state securities commissions may conduct administrative proceedings which can result in censures, fines, the issuance of cease-and-desist orders or the suspension or expulsion of a broker-dealer, its officers or employees. The SEC and state regulators may also institute proceedings against broker-dealers seeking an injunction or other sanction. All broker-dealers have an SRO that is assigned by the SEC as the broker-dealer's DEA. The DEA is responsible for examining a broker-dealer for compliance with the SEC's

financial responsibility rules. FINRA is the current DEA for each of our broker-dealer subsidiaries. Our registered broker-dealers are subject to regulatory requirements intended to ensure their general financial soundness and liquidity, which require that they comply with certain minimum capital requirements. As of December 31, 2018, each of our broker-dealers were in compliance with all of the applicable capital requirements. Regulatory contractual relationships with FINRA. Our SROs have signed a series of regulatory service agreements covering the services FINRA provides to the respective SROs. Under these agreements, FINRA personnel act as our agents in performing the regulatory functions outlined above, and FINRA bills us a fee for these services. These agreements have enabled us to reduce our headcount while ensuring that the markets for which we are responsible are properly regulated. However, our SROs retain ultimate regulatory responsibility for all regulatory activities performed under these agreements by FINRA.

Exchange Act Rule 17d-2 permits SROs to enter into agreements, commonly called Rule 17d-2 agreements, approved by the SEC with respect to enforcement of common rules relating to common members. Our SROs have entered into several such agreements under which FINRA assumes regulatory responsibility for specifics covered by the agreement, including:

- agreements with FINRA covering the enforcement of common rules, the majority of which relate to the regulation of common members of our SROs and FINRA;
- joint industry agreements with FINRA covering responsibility for enforcement of insider trading rules;
- joint industry agreement with FINRA covering enforcement of rules related to cash equity sales practices and certain other non-market related rules; and
- joint industry agreement covering enforcement of rules related to options sales practices.

Regulation NMS and Options Intermarket Linkage Plan. We are subject to Regulation NMS for our cash equity markets, and our options markets have joined the Options Intermarket Linkage Plan. These are designed to facilitate the routing of orders among exchanges to create a national market system as mandated by the Exchange Act. One of the principal purposes of a national market system is to assure that brokers may execute investors' orders at the best market price. Both Regulation NMS and the Options Intermarket Linkage Plan require that exchanges avoid trade-throughs, locking or crossing of markets and provide market participants with electronic access to the best prices among the markets for the applicable cash equity or options order.

In addition, Regulation NMS requires that every national securities exchange on which an NMS stock is traded and every national securities association act jointly pursuant to one or more national market system plans to disseminate consolidated information, including a national best bid and national best offer, on quotations for transactions in NMS stocks, and that

such plan or plans provide for the dissemination of all consolidated information for an individual NMS stock through a single plan processor.

The UTP Plan was filed with and approved by the SEC as a national market system plan in accordance with the Exchange Act and Regulation NMS to provide for the collection, consolidation and dissemination of such information for Nasdaq-listed securities. The Nasdaq Stock Market serves as the processor for the UTP Plan pursuant to a contract that was extended for a five-year term beginning in October 2015. The Nasdaq Stock Market also serves as the administrator for the UTP Plan. To fulfill its obligations as the processor, The Nasdaq Stock Market has designed, implemented, maintained, and operated a data processing and communications system, hardware, and software and communications infrastructure to provide processing for the UTP Plan. As the administrator, The Nasdaq Stock Market manages the distribution of market data, the collection of the resulting market data revenue, and the dissemination of that revenue to plan members in accordance with the terms of the UTP Plan and of Regulation NMS. Regulation SCI. Regulation SCI is a set of rules designed to strengthen the technology infrastructure of the U.S. securities markets. Regulation SCI applies to national securities exchanges, operators of certain ATSS, market data information providers and clearing agencies, subjecting these entities to extensive new compliance obligations, with the goals of reducing the occurrence of technical issues that disrupt the securities markets and improving recovery time when disruptions occur. We implemented an inter-disciplinary program to ensure compliance with Regulation SCI. New Regulation SCI policies and procedures were created, internal policies and procedures were updated, and an information technology governance program was rolled out to ensure compliance.

Regulation of Registered Investment Advisor Subsidiary. Our subsidiary DWA is an investment advisor registered with the SEC under the Investment Advisors Act of 1940. In this capacity, DWA is subject to oversight and inspections by the SEC. Among other things, registered investment advisors like DWA must comply with certain disclosure obligations, advertising and fee restrictions and requirements relating to client suitability and custody of funds and securities. Registered investment advisors are also subject to anti-fraud provisions under both federal and state law.

CFTC Regulation. We also operate NFX, a designated contract market under the Commodity Exchange Act that is subject to regulatory oversight by the CFTC, an independent agency with the mandate to regulate commodity futures and options markets in the U.S. The National Futures Association provides regulatory services to NFX pursuant to a regulatory services agreement.

As a designated contract market, NFX is required to comply with 23 Core Principles set forth in Section 5(d) of the Commodity Exchange Act and with Part 38 of the CFTC's regulations. NFX is also subject to the requirements of Part 40

of the CFTC's regulations with respect to the adoption of new rules or rule amendments and the listing of new products.

NFX is subject to CFTC rule enforcement reviews conducted by the CFTC's Division of Market Oversight. Rule enforcement reviews may examine a designated contract market's audit trail, trade practice surveillance, disciplinary and dispute resolution programs for compliance with the relevant Core Principles.

The Dodd-Frank Wall Street Reform and Consumer Protection Act also has resulted in increased CFTC regulation of our use of certain regulated derivatives products, as well as the operations of some of our subsidiaries outside the U.S. and their customers.

Canadian Regulation

Regulation of Nasdaq Canada is performed by the Canadian Securities Administrators, an umbrella organization of Canada's provincial and territorial securities regulators. As a recognized exchange in Ontario, Nasdaq Canada must comply with the terms and conditions of its exchange recognition order. Exempted from exchange recognition in each jurisdiction in Canada other than Ontario where Nasdaq Canada carries on business, Nasdaq must comply with the terms and conditions of an exemption order granted by the other jurisdictions. Oversight of the exchange is performed by the Nasdaq Canada's lead regulator, the Ontario Securities Commission.

Nasdaq Canada is subject to several national marketplace related instruments which set out requirements for marketplace operations, trading rules and managing electronic trading risk. Exchange terms and conditions include but are not limited to, requirements for, governance, regulation, rules and rulemaking, fair access, conflict management and financial viability.

European Regulation

Regulation of our markets in the European Union and the European Economic Area focuses on matters relating to financial services, listing and trading of securities, clearing and settlement of securities and commodities as well as issues related to market abuse.

In July 2016, the European Union's Market Abuse Regulation, which is intended to prevent market abuse, entered into force. MiFID II and MiFIR entered into force in January 2018 and primarily affect our European trading businesses. Many of the provisions of MiFID II and MiFIR are implemented through technical standards drafted by the European Securities and Markets Authority and approved by the European Commission. In addition, in 2016, the European Union adopted legislation on governance and control of the production and use of benchmark indexes. The Benchmark Regulation applies in the European Union from early 2018. However, due to transitional clauses in the Benchmark Regulation, Nasdaq as a benchmark provider, does not need to be in compliance with the Benchmark Regulation until January 1, 2020. As the regulatory environment continues to evolve and related opportunities arise, we intend to continue developing our products and services development to ensure that the exchanges and

clearinghouses that comprise Nasdaq Nordic and Nasdaq Baltic maintain favorable liquidity and offer fair and efficient trading.

The entities that operate trading venues in the Nordic and Baltic countries are each subject to local regulations. As a result, we have a strong local presence in each jurisdiction in which we operate regulated businesses. The regulated entities have decision-making power and can adopt policies and procedures and retain resources to manage all operations subject to their license. In Sweden, general supervision of the Nasdaq Stockholm exchange is carried out by the SFSA, while Nasdaq Clearing's role as CCP in the clearing of derivatives is supervised by the SFSA and overseen by the Swedish central bank (Riksbanken). Additionally, as a function of the Swedish two-tier supervisory model, certain surveillance in relation to the exchange market is carried out by the Nasdaq Stockholm exchange, through its surveillance function.

Nasdaq Stockholm's exchange activities are regulated primarily by the SSMA, which implements MiFID II into Swedish law and which sets up basic requirements regarding the board of the exchange and its share capital, and which also outlines the conditions on which exchange licenses are issued. The SSMA also provides that any changes to the exchange's articles of association following initial registration must be approved by the SFSA. Nasdaq Clearing holds the license as a CCP under EMIR.

With respect to ongoing operations, the SSMA requires exchanges to conduct their activities in an honest, fair and professional manner, and in such a way as to maintain public confidence in the securities markets. When operating a

regulated market, an exchange must apply the principles of free access (i.e., that each person which meets the requirements established by law and by the exchange may participate in trading), neutrality (i.e., that the exchange's rules for the regulated market are applied in a consistent manner to all those who participate in trading) and transparency (i.e., that the participants must be given speedy, simultaneous and correct information concerning trading and that the general public must be given the opportunity to access this information). Additionally, the exchange operator must identify and manage the risks that may arise in its operations, use secure technical systems and identify and handle the conflicts of interest that may arise between the exchange or its owners' interests and the interest in safeguarding effective risk management and secure technical systems. Similar requirements are set up by EMIR in relation to clearing operations.

The SSMA also contains the framework for both the SFSA's supervisory work in relation to exchanges and clearinghouses and the surveillance to be carried out by the exchanges themselves. The latter includes the requirement that an exchange should have "an independent surveillance function with sufficient resources and powers to meet the exchange's obligations." That requires the exchange to, among other things, supervise trading and price information, compliance with laws, regulations and good market practice, participant compliance with trading participation rules, financial instrument compliance with relevant listing rules and the extent to which

issuers meet their obligation to submit regular financial information to relevant authorities.

The regulatory environment in the other Nordic and Baltic countries in which a Nasdaq entity has a trading venue is broadly similar to the regulatory environment in Sweden. Since 2005, there has been cooperation between the SFSA and the main supervisory authorities in Iceland, Denmark and Finland, which looks to safeguard effective and comprehensive supervision of the exchanges comprising Nasdaq Nordic and the systems operated by it, and to ensure a common supervisory approach.

We operate a licensed exchange, Nasdaq Oslo ASA, in Norway that trades and lists commodity derivatives. Although Norway is not a member of the EU, as a result of the European Economic Area, or EEA, agreement (agreement on the EEA entered into between the EU and European Free Trade Association) the regulatory environment is broadly similar to what applies in EU member states. In addition, in January 2019 new legislation entered into force in Norway mirroring the provisions of MiFID II and MIFIR. As a result, the regulatory environment in Norway is similar to Sweden. The Norwegian FSA supervises the Norwegian exchange on an autonomous basis and the Norwegian exchange has a separate market surveillance function overseen by the Norwegian FSA.

Confidence in capital markets is paramount for trading to function properly. Nasdaq Nordic carries out market surveillance through an independent unit that is separate from the business operations. The surveillance work is conceptually organized into two functions: one for the review and admission of listing applications and surveillance activities related to issuers (issuer surveillance) and one for surveillance of trading (trading surveillance). The real-time trading surveillance for the Finnish, Icelandic, Danish and Swedish markets has been centralized to Stockholm. In addition, there are special personnel who carry out surveillance activities at Nasdaq Oslo and each of the three Baltic exchanges. In Finland and Sweden, decisions to list new companies are made by independent listing committees that have independent members in addition to members from each respective exchange and in the other countries the decision is made by the respective president of the exchange.

If there is suspicion that a listed company or member has acted in breach of exchange regulations, the matter is handled by the respective surveillance department. Serious breaches are considered by the respective disciplinary committee in Denmark, Finland, Iceland and Sweden. Suspected insider trading is reported to the appropriate authorities in the respective country.

Employees

As of December 31, 2018, Nasdaq had 4,099 employees.

Nasdaq Website and Availability of SEC Filings

We file periodic reports, proxy statements and other information with the SEC. The SEC maintains a website that contains reports, proxy and information statements, and other

information regarding issuers that file electronically with the SEC. The address of that site is <http://www.sec.gov>. Our website is www.business.nasdaq.com. Information on our website is not a part of this Form 10-K. We make available free of charge on our website, or provide a link to, our Forms 10-K, Forms 10-Q and Forms 8-K and any amendments to these documents, that are filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. To access these filings, go to Nasdaq's website and click on "Investor Relations," then under "Financials" click on "SEC Filings."

Item 1A. Risk Factors

The risks and uncertainties described below 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. If any of the following risks actually occur, our business, financial condition, or operating results could be adversely affected. Economic conditions and market factors, which are beyond our control, may adversely affect our business and financial condition.

Our business performance is impacted by a number of factors, including general economic conditions in both the U.S. and Europe, market volatility, changes in investment patterns and priorities, and other factors that are generally beyond our control. To the extent that global or national economic conditions weaken and result in slower growth or recessions, our business is likely to be negatively impacted. Adverse market conditions could reduce customer demand for our services and the ability of our customers, lenders and other counterparties to meet their obligations to us. Poor economic conditions may result in a reduction in the demand for our products and services, including our

market technology, data, index and corporate solutions, a decline in trading volumes or values and deterioration of the economic welfare of our listed companies. Over 73% of our revenues less transaction-based expenses in 2018 were recurring or subscription-based and if adverse conditions cause our customers to delay or cancel existing orders or subscriptions, our revenues will decline.

Trading volumes and values are driven primarily by general market conditions and declines in trading volumes or values may affect our market share and impact our pricing. In addition,

our Market Services businesses receive revenues from a relatively small number of customers concentrated in the financial industry, so any event that impacts one or more customers or the financial industry in general could impact our revenues.

The number of listings on our markets is primarily influenced by factors such as investor demand, the global economy, available sources of financing, and tax and regulatory policies. Adverse conditions may jeopardize the ability of our listed companies to comply with the continued listing requirements of our exchanges.

Information Services revenues may be significantly affected by global economic conditions. Professional subscriptions to our data products are at risk if staff reductions occur in financial services companies, which could result in significant reductions in our professional user revenue. In addition, adverse market conditions may cause reductions in the number of non-professional investors with investments in the market and in ETP assets under management tracking Nasdaq indexes.

There may be less demand for our Corporate Solutions or Market Technology products if global economic conditions are weak. Our customers historically cut back on purchases of new services and technology when growth rates decline, thereby reducing our opportunities to sell new products and services or upgrade existing products and services.

A reduction in trading volumes or values, market share of trading, the number of our listed companies, or demand for Information Services, Market Technology or Corporate Services products and services due to economic conditions or other market factors could adversely affect our business, financial condition and operating results.

The industries we operate in are highly competitive.

We face significant competition in our Market Technology, Information Services and Corporate Services businesses from other market participants. We face intense competition from other exchanges and markets for market share of trading activity and listings. This competition includes both product and price competition.

The liberalization and globalization of world markets has resulted in greater mobility of capital, greater international participation in local markets and more competition. As a result, both in the U.S. and in other countries, the competition among exchanges and other execution venues has become more intense. Marketplaces in both Europe and the U.S. have also merged to achieve greater economies of scale and scope.

Regulatory changes also have facilitated the entry of new participants in the European Union that compete with our European markets. The regulatory environment, both in the U.S. and in Europe, is structured to maintain this environment of intense competition. In addition, a high proportion of business in the securities markets is becoming concentrated in a smaller number of institutions and our revenue may therefore become concentrated in a smaller number of customers.

We also compete globally with other regulated exchanges and markets, ATSS, MTFs and other traditional and non-traditional execution venues. Some of these competitors also are our customers. Competitors may develop market trading platforms that are more competitive than ours. Competitors may leverage data more effectively or enter into strategic partnerships, mergers or acquisitions that could make their trading, listings, clearing, data or technology businesses more competitive than ours.

We face intense price competition in all areas of our business. In particular, the trading industry is characterized by intense price competition. We have in the past lowered prices, and in the U.S., increased rebates for trade executions to attempt to gain or maintain market share. These strategies have not always been successful and have at times hurt operating performance. Additionally, we have also been, and may once again be, required to adjust pricing to respond to actions by competitors and new entrants, which could adversely impact operating results. We also compete with respect to the pricing of data products and with respect to products for pre-trade book data and for post-trade last sale data. In addition, pricing in our Corporate Services, Index Licensing and Services and Market Technology businesses is subject to competitive pressures.

If we are unable to compete successfully in the industries in which we do business, our business, financial condition and operating results will be adversely affected.

System limitations or failures could harm our business.

Our businesses depend on the integrity and performance of the technology, computer and communications systems supporting them. If new systems fail to operate as intended or our existing systems cannot expand to cope with

increased demand or otherwise fail to perform, we could experience unanticipated disruptions in service, slower response times and delays in the introduction of new products and services. These consequences could result in service outages, lower trading volumes or values, financial losses, decreased customer satisfaction and regulatory sanctions. Our markets and the markets that rely on our technology have experienced systems failures and delays in the past and could experience future systems failures and delays.

Although we currently maintain and expect to maintain multiple computer facilities that are designed to provide redundancy and back-up to reduce the risk of system disruptions and have facilities in place that are expected to maintain service during a system disruption, such systems and facilities may prove inadequate. If trading volumes increase unexpectedly or other unanticipated events occur, we may need to expand and upgrade our technology, transaction processing systems and network infrastructure. We do not know whether we will be able to accurately project the rate, timing or cost of any volume increases, or expand and upgrade our systems and infrastructure to accommodate any increases in a timely manner.

While we have programs in place to identify and minimize our exposure to vulnerabilities and work in collaboration with the technology industry to share corrective measures with our business partners, we cannot guarantee that such events will not

occur in the future. Any system issue that causes an interruption in services, decreases the responsiveness of our services or otherwise affects our services could impair our reputation, damage our brand name and negatively impact our business, financial condition and operating results.

We must continue to introduce new products, initiatives and enhancements to maintain our competitive position.

We intend to launch new products and initiatives and continue to explore and pursue opportunities to strengthen our business and grow our company. We may spend substantial time and money developing new products, initiatives and enhancements to existing products. If these products and initiatives are not successful, we may not be able to offset their costs, which could have an adverse effect on our business, financial condition and operating results.

In our technology operations, we have invested substantial amounts in the development of system platforms, the rollout of our platforms and the adoption of new technologies, such as blockchain, machine intelligence and the cloud. Although investments are carefully planned, there can be no assurance that the demand for such platforms or technologies will justify the related investments. If we fail to generate adequate revenue from planned system platforms or the adoption of new technologies, or if we fail to do so within the envisioned timeframe, it could have an adverse effect on our results of operations and financial condition. In addition, clients may delay purchases in anticipation of new products or enhancements.

A decline in trading and clearing volumes or values or market share will decrease our trading and clearing revenues. Trading and clearing volumes and values are directly affected by economic, political and market conditions, broad trends in business and finance, unforeseen market closures or other disruptions in trading, the level and volatility of interest rates, inflation, changes in price levels of securities and the overall level of investor confidence. In recent years, trading and clearing volumes and values across our markets have fluctuated significantly depending on market conditions and other factors beyond our control. Current initiatives being considered by regulators and governments could have a material adverse effect on overall trading and clearing volumes or values. Because a significant percentage of our revenues is tied directly to the volume or value of securities traded and cleared on our markets, it is likely that a general decline in trading and clearing volumes or values would lower revenues and may adversely affect our operating results if we are unable to offset falling volumes or values through pricing changes. Declines in trading and clearing volumes or values may also impact our market share or pricing structures and adversely affect our business and financial condition.

If our total market share in securities decreases relative to our competitors, our venues may be viewed as less attractive sources of liquidity. If our exchanges are perceived to be less liquid, then our business, financial condition and operating results could be adversely affected.

Since some of our exchanges offer clearing services in addition to trading services, a decline in market share of trading could lead to a decline in clearing revenues. Declines in market share also could result in issuers viewing the value of a listing on our exchanges as less attractive, thereby adversely affecting our listing business. Finally, declines in market share of Nasdaq-listed securities could lower The Nasdaq Stock Market's share of tape pool revenues under the consolidated data plans, thereby reducing the revenues of our Data Products business.

Our role in the global marketplace may place us at greater risk for a cyberattack.

Our systems and operations are vulnerable to damage or interruption from security breaches. Some of these threats include attacks from foreign governments, hacktivists, insiders and criminal organizations. Foreign governments may seek to obtain a foothold in U.S. critical infrastructure, hacktivists may seek to deploy denial of service attacks to bring attention to their cause, insiders may pose a risk by human error or malicious activity and criminal organizations may seek to profit from stolen data. Computer viruses and worms also continue to be a threat with ransomware increasingly being used by criminals to extort money. Given our position in the global securities industry, we may be more likely than other companies to be a direct target, or an indirect casualty, of such events.

While we continue to employ resources to monitor our systems and protect our infrastructure, these measures may prove insufficient depending upon the attack or threat posed. Any system issue, whether as a result of an intentional breach, collateral damage from a new virus or a non-malicious act, could damage our reputation and cause us to lose customers, experience lower trading volumes or values, incur significant liabilities or otherwise have a negative impact on our business, financial condition and operating results. Any system breach may go undetected for an extended period of time. We also could incur significant expense in addressing any of these problems and in

addressing related data security and privacy concerns.

The success of our business depends on our ability to keep up with rapid technological and other competitive changes affecting our industry. Specifically, we must complete development of, successfully implement and maintain platforms that have the functionality, performance, capacity, reliability and speed required by our business and our regulators, as well as by our customers.

The markets in which we compete are characterized by rapidly changing technology, evolving industry and regulatory standards, frequent enhancements to existing products and services, the adoption of new services and products and changing customer demands. We may not be able to keep up with rapid technological and other competitive changes affecting our industry. For example, we must continue to enhance our platforms to remain competitive as well as to address our regulatory responsibilities, and our business will be negatively affected if our platforms or the technology solutions we sell to our customers fail to function as expected. If we are unable to develop our platforms to include other

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products and markets, or if our platforms do not have the required functionality, performance, capacity, reliability and speed required by our business and our regulators, as well as by our customers, we may not be able to compete successfully. Further, our failure to anticipate or respond adequately to changes in technology and customer preferences or any significant delays in product development efforts, could have a material adverse effect on our business, financial condition and operating results.

We may not be able to successfully integrate acquired businesses, which may result in an inability to realize the anticipated benefits of our acquisitions.

We must rationalize, coordinate and integrate the operations of our acquired businesses, including Quandl and Cinnober. This process involves complex technological, operational and personnel-related challenges, which are time-consuming and expensive and may disrupt our business. The difficulties, costs and delays that could be encountered may include:

- difficulties, costs or complications in combining the companies' operations, including technology platforms, which could lead to us not achieving the synergies we anticipate or customers not renewing their contracts with us as we migrate platforms;

- incompatibility of systems and operating methods;

- reliance on, or provision of, transition services;

- inability to use capital assets efficiently to develop the business of the combined company;

- difficulties of complying with government-imposed regulations in the U.S. and abroad, which may be conflicting;

- resolving possible inconsistencies in standards, controls, procedures and policies, business cultures and compensation structures;

- the diversion of management's attention from ongoing business concerns and other strategic opportunities;

- difficulties in operating businesses we have not operated before;

- difficulties of integrating multiple acquired businesses simultaneously;

- the retention of key employees and management;

- the implementation of disclosure controls, internal controls and financial reporting systems at non-U.S. subsidiaries to enable us to comply with U.S. GAAP and U.S. securities laws and regulations, including the Sarbanes Oxley Act of 2002, required as a result of our status as a reporting company under the Exchange Act;

- the coordination of geographically separate organizations;

- the coordination and consolidation of ongoing and future research and development efforts;

- possible tax costs or inefficiencies associated with integrating the operations of a combined company;

- pre-tax restructuring and revenue investment costs;

- the retention of strategic partners and attracting new strategic partners; and

- negative impacts on employee morale and performance as a result of job changes and reassignments.

For these reasons, we may not achieve the anticipated financial and strategic benefits from our acquisitions and initiatives. Any actual cost savings and synergies may be lower than we expect and may take a longer time to achieve than we anticipate, and we may fail to realize the anticipated benefits of acquisitions.

We will need to invest in our operations to maintain and grow our business and to integrate acquisitions, and we may need additional funds, which may not be readily available.

We depend on the availability of adequate capital to maintain and develop our business. Although we believe that we can meet our current capital requirements from internally generated funds, cash on hand and borrowings under our revolving credit facility and commercial paper program, if the capital and credit markets experience volatility, access to capital or credit may not be available on terms acceptable to us or at all. Limited access to capital or credit in the future could have an impact on our ability to refinance debt, maintain our credit rating, meet our regulatory capital requirements, engage in strategic initiatives, make acquisitions or strategic investments in other companies, pay dividends, repurchase our stock or react to changing economic and business conditions. If we are unable to fund our capital or credit requirements, it could have an adverse effect on our business, financial condition and operating results.

In addition to our debt obligations, we will need to continue to invest in our operations for the foreseeable future to integrate acquired businesses and to fund new initiatives. If we do not achieve the expected operating results, we will

need to reallocate our cash resources. This may include borrowing additional funds to service debt payments, which may impair our ability to make investments in our business or to integrate acquired businesses. Should we need to raise funds through issuing additional equity, our equity holders will suffer dilution. Should we need to raise funds through incurring additional debt, we may become subject to covenants even more restrictive than those contained in our credit facilities, the indentures governing our notes and our other debt instruments. Furthermore, if adverse economic conditions occur, we could experience decreased revenues from our operations which could affect our ability to satisfy financial and other restrictive covenants to which we are subject under our existing indebtedness. We operate in a highly regulated industry and may be subject to censures, fines and enforcement proceedings if we fail to comply with regulatory obligations that can be ambiguous and can change unexpectedly.

We operate in a highly regulated industry and are subject to extensive regulation in the U.S., Europe and Canada. The securities trading industry is subject to significant regulatory oversight and could be subject to increased governmental and public scrutiny in the future that can change in response to global conditions and events.

Our ability to comply with complex and changing regulation is largely dependent on our establishment and maintenance of compliance, audit and reporting systems that can quickly adapt and respond, as well as our ability to attract and retain qualified compliance and other risk management personnel. While we have policies and procedures to identify, monitor and manage our risks and regulatory obligations, 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.

Our regulated markets are subject to audits, investigations, administrative proceedings and enforcement actions relating to compliance with applicable rules and regulations. Regulators have broad powers to impose fines, penalties or censure, issue cease-and-desist orders, prohibit operations, revoke licenses or registrations and impose other sanctions on our exchanges, broker-dealers and markets for violations of applicable requirements.

For example, during 2016, the SFSA and the other Nordic financial supervisory authorities conducted investigations of cybersecurity processes at our Nordic exchanges and clearinghouse. In December 2016, we were issued a \$6 million fine by the SFSA as a result of findings in connection with its investigation. The SFSA's conclusions related to governance issues rather than systems and platform security. We have appealed this decision and the final outcome is still pending.

In the future, we could be subject to regulatory investigations or enforcement proceedings that could result in substantial sanctions, including revocation of our operating licenses. Any such investigations or proceedings, whether successful or unsuccessful, could result in substantial costs, the diversion of resources, including management time, and potential harm to our reputation, which could have a material adverse effect on our business, results of operations or financial condition. In addition, our exchanges could be required to modify or restructure their regulatory functions in response to any changes in the regulatory environment, or they may be required to rely on third parties to perform regulatory and oversight functions, each of which may require us to incur substantial expenses and may harm our reputation if our regulatory services are deemed inadequate.

Our clearinghouse operations expose us to risks, including credit or liquidity risks that may include defaults by clearing members, or insufficiencies in margins or default funds.

We are subject to risks relating to our operation of a clearinghouse, including counterparty and liquidity risks, risk of defaults by clearing members and risks associated with adequacy of the customer margin and of default funds. Our clearinghouse operations expose us to counterparties with

differing risk profiles. We may be adversely impacted by the financial distress or failure of a clearing member, which may cause us negative financial impact, reputational harm or regulatory consequences, including litigation or regulatory enforcement actions.

In September 2018, a member of the Nasdaq Clearing commodities market defaulted due to an inability to post sufficient collateral to cover increased margin requirements for the positions of the relevant member, which had experienced losses due to sharp adverse movements in the Nordic - German power market spread. Nasdaq Clearing followed default procedures and offset the future market risk on the defaulting member's positions. The default resulted in a loss of \$133 million which was allocated to Nasdaq Clearing and the members of the commodities default fund in accordance with the liability waterfall.

To the extent that our regulatory capital and risk management policies are not adequate to manage future financial and operational risks in our clearinghouse, we may experience adverse consequences to our operating results or ability to conduct our business.

We are exposed to credit risk from third parties, including customers, counterparties and clearing agents.

We are exposed to credit risk from third parties, including customers, counterparties and clearing agents. These parties may default on their obligations to us due to bankruptcy, lack of liquidity, operational failure or other reasons.

We clear or stand as riskless principal to a range of equity-related and fixed-income-related derivative products, commodities and resale and repurchase agreements. We assume the counterparty risk for all transactions that are cleared through our markets and guarantee that our cleared contracts will be honored. We enforce minimum financial

and operational criteria for membership eligibility, require members and investors to provide collateral, and maintain established risk policies and procedures to ensure that the counterparty risks are properly monitored and proactively managed; however, none of these measures provides absolute assurance against experiencing financial losses from defaults by our counterparties on their obligations. No guarantee can be given that the collateral provided will at all times be sufficient. Although we maintain clearing capital resources to serve as an additional layer of protection to help ensure that we are able to meet our obligations, these resources may not be sufficient.

In addition, one of our broker-dealer subsidiaries, Execution Access, has a clearing arrangement with the Industrial and Commercial Bank of China Financial Services LLC, or ICBC. As of December 31, 2018, we have contributed \$15 million of clearing deposits to ICBC in connection with this clearing arrangement. Some of the trading activity in Execution Access is cleared by ICBC through the Fixed Income Clearing Corporation. Execution Access assumes the counterparty risk of clients that do not clear through the Fixed Income Clearing Corporation. Counterparty risk of clients exists for Execution Access between the trade date and settlement date of the

individual transactions, which is at least one business day (or more, if specified by the U.S. Treasury issuance calendar). Counterparties that do not clear through the Fixed Income Clearing Corporation are subject to a credit due diligence process and may be required to post collateral, provide principal letters, or provide other forms of credit enhancement to Execution Access for the purpose of mitigating counterparty risk. Daily position trading limits are also enforced for such counterparties. Although we believe that the potential for us to be required to make payments under these arrangements is mitigated through the pledged collateral and our risk management policies, no guarantee can be provided that these arrangements will at all times be sufficient.

We also have credit risk related to transaction and subscription-based revenues that are billed to customers on a monthly or quarterly basis, in arrears.

Credit losses such as those described above could adversely affect our consolidated financial position and results of operations.

The regulatory framework under which we operate and new regulatory requirements or new interpretations of existing regulatory requirements could require substantial time and resources for compliance, which could make it difficult and costly for us to operate our business.

Under current U.S. federal securities laws, changes in the rules and operations of our securities markets, including our pricing structure, must be reviewed and in many cases explicitly approved by the SEC. The SEC may approve, disapprove, or recommend changes to proposals that we submit. In addition, the SEC may delay either the approval process or the initiation of the public comment process. Favorable SEC rulings and interpretations can be challenged in and reversed by federal courts of appeals, reducing or eliminating the value of such prior interpretations. NFX, our futures exchange, is also regulated by the CFTC and subject to a requirement to self-certify changes to these rules by filing with the CFTC. Any delay in approving changes, or the altering of any proposed change, could have an adverse effect on our business, financial condition and operating results.

We must compete not only with ATSS that are not subject to the same SEC approval process but also with other exchanges that may have lower regulation and surveillance costs than us. There is a risk that trading will shift to exchanges that charge lower fees because, among other reasons, they spend significantly less on regulation.

In 2016, the SEC approved a plan for Nasdaq and other exchanges to establish a market-wide consolidated audit trail, or CAT, to improve regulators' ability to monitor trading activity. In addition to increased regulatory obligations, implementation of a consolidated audit trail has resulted in significant additional expenditures, including to implement the new technology to meet any plan's requirements. Creating CAT has required the development and implementation of complex and costly technology. This development effort has been funded by the SROs (including Nasdaq) in exchange for promissory

notes that Nasdaq expects to be repaid at such time that the SEC approves the assessment of fees for the funding of CAT. The SEC could determine not to approve the assessment of such fees in which case some or all of the promissory notes would not be repaid. In addition, the ongoing failure to timely launch or properly operate such technology exposes Nasdaq and other exchanges to SEC fines.

In addition, our registered broker-dealer subsidiaries are subject to regulation by the SEC, FINRA and other SROs. These subsidiaries are subject to regulatory requirements intended to ensure their general financial soundness and liquidity, which require that they comply with certain minimum capital requirements. The SEC and FINRA impose rules that require notification when a broker-dealer's net capital falls below certain predefined criteria, dictate the ratio of debt to equity in the regulatory capital composition of a broker-dealer and constrain the ability of a broker-dealer to expand its business under certain circumstances. Additionally, the SEC's Uniform Net Capital Rule and FINRA rules impose certain requirements that may have the effect of prohibiting a broker-dealer from distributing or withdrawing capital and requiring prior notice to the SEC and FINRA for certain withdrawals of capital. Any failure to comply with these broker-dealer regulations could have a material adverse effect on the operation of our business, financial condition and operating results.

Our non-U.S. business is subject to regulatory oversight in all the countries in which we operate regulated businesses, such as exchanges, clearinghouses or central securities depositories. In these countries, we have received authorization from the relevant authorities to conduct our regulated business activities. The authorities may revoke this authorization if we do not suitably carry out our regulated business activities. The authorities are also entitled to

request that we adopt measures in order to ensure that we continue to fulfill the authorities' requirements. Furthermore, certain of our customers operate in a highly regulated industry. Regulatory authorities could impose regulatory changes that could impact the ability of our customers to use our exchanges. The loss of a significant number of customers or a reduction in trading activity on any of our exchanges as a result of such changes could have a material adverse effect on our business, financial condition and operating results.

Regulatory changes and changes in market structure could have a material adverse effect on our business.

Regulatory changes adopted by the SEC or other regulators of our markets, and regulatory changes that our markets may adopt in fulfillment of their regulatory obligations, could materially affect our business operations. In recent years, there has been increased regulatory and governmental focus on issues affecting the securities markets, including market structure, technological oversight and transaction fees. The SEC, FINRA and the national securities exchanges have introduced several initiatives to ensure the oversight, integrity and resilience of markets.

Industry responses to the MiFID II and MiFIR rules, EU Benchmark Regulation or other applicable rules could affect our operations in Europe. Changes to the rules themselves could also affect our operations in Europe. In addition, actions on any of the specific regulatory issues currently under review in the U.S. and Europe could have a material impact on our business.

With respect to our regulated businesses, our business model can be severely impacted by policy decisions. For example, the SEC has recently proposed an exchange transaction fee pilot program that could result in future regulatory changes and we, along with other stock exchanges, have challenged the SEC's order adopting the program in a court action. Our opponents in some market are larger and better funded and, if successful in influencing certain policies, may successfully advocate for positions that adversely impact our business. While we support regulatory efforts to review and improve the structure, resilience and integrity of the markets, these proposed regulatory changes and future reforms could impose significant costs, including litigation costs, and other obligations on the operation of our exchanges and processor systems and have other impacts on our business.

Regulatory changes or future court rulings may have an adverse impact on our revenue from proprietary data products. Regulatory and legal developments could reduce the amount of revenue that we earn from our proprietary data products. In the U.S., we generally are required to file with the SEC to establish or modify the fees that we charge for our data products. In recent years, certain industry groups have objected to the ability of exchanges to charge for certain data products.

In October 2018, the SEC determined that we had not established that a fee for one of our data products was fair and reasonable, and also directed us to establish a procedure for reviewing other challenged fees. We have appealed both SEC actions to a federal appeals court. If the results of appeals, or further actions by the SEC, are detrimental to our U.S. exchanges' ability to charge for data products, there could be a negative impact on our revenues. We cannot predict whether, or in what form, any regulatory changes will be implemented, or their potential impact on our business. A determination by the SEC, for example, to link data fees to marginal costs, to take a more active role in the data rate-setting process, or to reduce the current levels of data fees could have an adverse effect on our Data Products revenues.

In Canada, all new marketplace fees and changes to existing fees, including trading and data fees, must be filed with and approved by the Ontario Securities Commission. In 2016, the Canadian Securities Administrators approved amendments adopting a Data Fees Methodology that restricts the total amount of fees that can be charged by all marketplaces to a reference level that is not yet defined. When a reference is established, all marketplaces will be subject to annual reviews of their market data fees tying market data revenues to market share.

Our European exchanges currently offer data products to customers on a non-discriminatory and reasonable commercial basis. The MiFID II/MiFIR rules entail that the price for regulated data such as pre- and post-trade data shall be based on cost plus a reasonable margin. However, what constitutes "reasonable margin" is not clearly defined. There is a risk that a different interpretation of this term may influence the fees for European data products adversely. In addition, any future actions by the European Commission or European court decisions could affect our ability to offer data products in the same manner as today, thereby causing an adverse effect on our Data Products revenues.

Technology issues relating to our role as exclusive processor for Nasdaq-listed stocks could affect our business. Nasdaq, as technology provider to the UTP Operating Committee, implemented in 2016 measures to enhance the resiliency of the existing processor system. Additionally, the UTP Operating Committee approved Nasdaq's proposal to transfer the processor technology from its current enhanced platform to our INET platform. The migration, which was completed in late 2016, further enhanced the resiliency of the processor systems. In 2018, we further improved the systems resiliency by adding the UTP SnapShot service. However if, despite these improvement measures, future outages occur or the processor systems fail to function properly while we are operating the systems, it could have an adverse effect on our business, reputation, financial condition or operating results.

Our operational processes are subject to the risk of error, which may result in financial loss or reputational damage. We have instituted extensive controls to reduce the risk of error inherent in our operations; however, such risk cannot completely be eliminated. Our businesses are highly dependent on our ability to process and report, on a daily basis, a large number of transactions across numerous and diverse markets. Some of our operations require complex processes, and the introduction of new products or services or changes in processes or reporting due to regulatory

requirements may result in an increased risk of errors for a period after implementation.

Data, other content or information that we distribute may contain errors or be delayed, causing reputational harm. Use of our products and services as part of the investment process creates the risk that clients, or the parties whose assets are managed by our clients, may pursue claims against us in the event of such delay or error. Even with a favorable outcome, significant litigation against us might unduly burden management, personnel, financial and other resources. In addition, the sophisticated software we sell to our customers may contain undetected errors or vulnerabilities, some of which may be discovered only after delivery. These errors may result in negative customer experiences that could damage our reputation, thereby causing loss of customers, loss of revenues and liability for damages, thereby adversely affecting our business and financial results.

Uncertainty relating to the United Kingdom's exit from the European Union could cause uncertainty and adversely impact our business.

We continue to evaluate the potential effect of the United Kingdom's planned departure from the European Union (commonly referred to as Brexit) on our business operations and financial results. If the United Kingdom's membership in the European Union terminates without an agreement for the United Kingdom's orderly departure from the European Union there could be unfavorable consequences including a deterioration of general economic conditions, increased costs from re-imposition of tariffs on trade between the United Kingdom and European Union, volatility of foreign exchange rates and legal uncertainty. Brexit may also have adverse tax effects on movement of products or activities between the UK and EU.

Currently, we do not anticipate that Brexit will have a material impact on our operations or our financial results. While we have operations in the UK, these operations are limited in scope and not material to our overall business. However, we may be impacted if our customers in the UK are subject to additional costs or restrictions in accessing our products or services. In addition, the overall impact of Brexit may create further global economic uncertainty, which may adversely impact the activities of our customers.

Laws and regulations regarding the handling of personal data and information may affect our services or result in increased costs, legal claims or fines against us.

Our business relies on the processing of data in many jurisdictions and the movement of data across national borders. Legal and contractual requirements relating to the collection, storage, handling, use, disclosure, transfer and security of personal data continue to evolve; regulatory scrutiny in this area is increasing around the world. Significant uncertainty exists as privacy and data protection laws may be interpreted and applied differently across jurisdictions and may create inconsistent or conflicting requirements.

The European Union General Data Protection Regulation, or GDPR, which became effective in May 2018, extends the scope of the European Union data protection law and requires companies to meet new requirements regarding the handling of personal data. In addition to directly applying to certain Nasdaq business activities, this regulation impacts many of our customers, which may affect their requirements and decisions related to services that we offer. Although we have implemented a program to address GDPR requirements, our efforts to comply with GDPR and other privacy and data protection laws may entail substantial expenses, may divert resources from other initiatives and projects, and could impact the services that we offer. Furthermore, enforcement actions and investigations by regulatory authorities related to data security incidents and privacy violations continue to increase. The enactment of more restrictive laws, rules or regulations or future enforcement actions or investigations could impact us through increased costs or restrictions on our business, and noncompliance could result in regulatory penalties and significant legal liability.

Stagnation or decline in the listings market could have an adverse effect on our revenues.

The market for listings is dependent on the prosperity of companies and the availability of risk capital. A stagnation or decline in the number of new listings on The Nasdaq Stock Market and the Nasdaq Nordic and Nasdaq Baltic exchanges could cause a decrease in revenues for future years. Furthermore, a prolonged decrease in the number of listings could negatively impact the growth of our transactions revenues. Our Corporate Solutions business is also impacted by declines in the listings market or increases in acquisitions activity as there will be fewer publicly-traded customers that need our products.

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, and their ratings of our long-term debt and commercial paper are based on a number of factors, including our financial strength and corporate development activity, as well as factors not entirely within our control, including conditions affecting our industry generally. There can be no assurance that we will maintain our current ratings. Our failure to maintain those ratings could reduce or eliminate our ability to issue commercial paper and adversely affect the cost and other terms upon which we are able to obtain funding and increase our cost of capital. A reduction in credit ratings would also result in increases in the cost of our commercial paper and other outstanding debt as the interest rate on the outstanding amounts under our credit facilities and most tranches of our senior notes fluctuates based on our credit ratings.

Damage to our reputation or brand name could have a material adverse effect on our businesses.

One of our competitive strengths is our strong reputation and brand name. Various issues may give rise to reputational risk, including issues relating to:

- our ability to maintain the security of our data and systems;
- the quality and reliability of our technology platforms and systems;
- the ability to fulfill our regulatory obligations;
- the ability to execute our business plan, key initiatives or new business ventures and the ability to keep up with changing customer demand;
- the representation of our business in the media;
- the accuracy of our financial statements and other financial and statistical information;
 - the accuracy of our financial guidance or other information provided to our investors;
- the quality of our corporate governance structure;
- the quality of our products, including the reliability of our transaction-based, Corporate Solutions and Market

Technology products, the accuracy of the quote and trade information provided by our Data Products business and the accuracy of calculations used by our Index Licensing and Services business for indexes and unit investment trusts; the quality of our disclosure controls or internal controls over financial reporting, including any failures in supervision;

extreme price volatility on our markets;

any negative publicity surrounding our listed companies;

any negative publicity surrounding the use of our products or services by our customers, including in connection with emerging asset classes such as crypto assets; and

any misconduct, fraudulent activity or theft by our employees or other persons formerly or currently associated with us.

Damage to our reputation could cause some issuers not to list their securities on our exchanges, as well as reduce the trading volumes or values on our exchanges or cause us to lose customers in our Data Products, Index Licensing and Services, Corporate Solutions or Market Technology businesses. This, in turn, may have a material adverse effect on our business, financial condition and operating results.

We may be required to recognize impairments of our goodwill, intangible assets or other long-lived assets in the future.

Our business acquisitions typically result in the recording of goodwill and intangible assets, and the recorded values of those assets may become impaired in the future. As of December 31, 2018, goodwill totaled \$6.4 billion and intangible assets, net of accumulated amortization, totaled \$2.3 billion. The determination of the value of such goodwill and intangible assets requires management to make estimates and assumptions that affect our consolidated financial statements.

We assess goodwill and intangible assets, as well as other long-lived assets, including equity and cost method investments and property and equipment, for impairment on an annual basis or more frequently if indicators of impairment arise. We estimate the fair value of such assets by assessing many factors, including historical performance, capital requirements and projected cash flows. Considerable management judgment is necessary to project future cash flows and evaluate the impact of expected operating and macroeconomic changes on these cash flows. The estimates and assumptions we use are consistent with our internal planning process. However, there are inherent uncertainties in these estimates.

There was no impairment of goodwill for the years ended December 31, 2018, 2017 and 2016, and there were no indefinite-lived intangible asset impairment charges in 2018 and 2017. As discussed in “Goodwill and Indefinite-Lived Intangible Assets,” of Note 2, “Summary of Significant Accounting Policies,” to the consolidated financial statements, we recorded an indefinite-lived intangible asset impairment charge of \$578 million in 2016.

We may experience future events that may result in asset impairments. Future disruptions to our business, prolonged economic weakness or significant declines in operating results at any of our reporting units or businesses, may result in impairment charges to goodwill, intangible assets or other long-lived assets. A significant impairment charge in the future could have a material adverse effect on our operating results.

For additional discussion of our goodwill, indefinite-lived intangible assets and other long-lived assets, including related impairment, see “Goodwill and Related Impairment,” “Indefinite-Lived Intangible Assets and Related Impairment,” and “Other Long-Lived Assets and Related Impairment,” of “Critical Accounting Policies and Estimates,” of Item 7. “Management’s Discussion and Analysis of Financial Condition and Results of Operations,” and “Goodwill and Indefinite-Lived Intangible Assets,” and “Valuation of Other Long-Lived Assets,” of Note 2, “Summary of Significant Accounting Policies,” and Note 5, “Goodwill and Acquired Intangible Assets,” to the consolidated financial statements. We may experience fluctuations in our operating results, which may adversely affect the market price of our common stock.

Our industry is risky and unpredictable and is directly affected by many national and international factors beyond our control, including:

economic, political and geopolitical market conditions;

natural disasters, terrorism, war or other catastrophes;

broad trends in finance and technology;

- changes in price levels and volatility in the stock markets;
- the level and volatility of interest rates;
- changes in government monetary or tax policy;
- the perceived attractiveness of the U.S. or European capital markets; and
- inflation.

Any one of these factors could have a material adverse effect on our business, financial condition and operating results by causing a substantial decline in the financial services markets and reducing trading volumes or values.

Additionally, since borrowings under our credit facilities bear interest at variable rates, any increase in interest rates on debt that we have not fixed using interest rate hedges will increase our interest expense, reduce our cash flow or increase the cost of future borrowings or refinancings. Other than variable rate debt, we believe our business has relatively large fixed costs and low variable costs, which magnifies the impact of revenue fluctuations on our operating results. As a result, a decline in our revenue may lead to a relatively larger impact on operating results. A substantial portion of our operating expenses is related to personnel costs, regulation and corporate overhead, none of which can be adjusted quickly and some of which cannot be adjusted at all. Our operating expense levels are based on our

expectations for future revenue. If actual revenue is below management's expectations, or if our expenses increase before revenues do, both revenues less transaction-based expenses and operating results would be materially and adversely affected. Because of these factors, it is possible that our operating results or other operating metrics may fail to meet the expectations of stock market analysts and investors. If this happens, the market price of our common stock may be adversely affected.

Our leverage limits our financial flexibility, increases our exposure to weakening economic conditions and may adversely affect our ability to obtain additional financing.

Our indebtedness as of December 31, 2018 was \$3.8 billion. We may borrow additional amounts by utilizing available liquidity under our existing credit facilities or issuing short-term, unsecured commercial paper notes through our commercial paper program.

Our leverage could:

- reduce funds available to us for operations and general corporate purposes or for capital expenditures as a result of the dedication of a substantial portion of our consolidated cash flow from operations to the payment of principal and interest on our indebtedness;

- increase our exposure to a continued downturn in general economic conditions;

- place us at a competitive disadvantage compared with our competitors with less debt;

- affect our ability to obtain additional financing in the future for refinancing indebtedness, acquisitions, working capital, capital expenditures or other purposes; and

- increase our cost of debt and reduce or eliminate our ability to issue commercial paper.

In addition, we must comply with the covenants in our credit facilities. Among other things, these covenants restrict our ability to incur additional indebtedness, grant liens on assets, dispose of assets and pay dividends (although we are permitted to pay cash dividends on our common stock). Failure to meet any of the covenant terms of our credit facilities could result in an event of default. If an event of default occurs, and we are unable to receive a waiver of default, our lenders may increase our borrowing costs, restrict our ability to obtain additional borrowings and accelerate all amounts outstanding.

We are subject to litigation risks and other liabilities.

Many aspects of our business potentially involve substantial liability risks. Although under current law we are immune from private suits arising from conduct within our regulatory authority and from acts and forbearances incident to the exercise of our regulatory authority, this immunity only covers certain of our activities in the U.S., and we could be exposed to liability under national and local laws, court decisions and rules and regulations promulgated by regulatory agencies.

Some of our other liability risks arise under the laws and regulations relating to the tax, employment, intellectual

property, anti-money laundering, technology export, foreign asset controls, foreign corrupt practices areas, employee labor and employment areas, including anti-discrimination and fair-pay laws and regulations.

Liability could also result from disputes over the terms of a trade, claims that a system failure or delay cost a customer money, claims we entered into an unauthorized transaction or claims that we provided materially false or misleading statements in connection with a securities transaction. As we intend to defend any such litigation actively, significant legal expenses could be incurred. Although we carry insurance that may limit our risk of damages in some cases, we still may sustain uncovered losses or losses in excess of available insurance that would affect our financial condition and results of operations.

We have self-regulatory obligations and also operate for-profit businesses, and these two roles may create conflicts of interest.

We have obligations to regulate and monitor activities on our markets and ensure compliance with applicable law and the rules of our markets by market participants and listed companies. In the U.S., some have expressed concern about potential conflicts of interest of "for-profit" markets performing the regulatory functions of an SRO. Although our U.S. cash equity and options exchanges outsource a portion of their market regulation functions to FINRA, we do perform regulatory functions and bear regulatory responsibility related to our listed companies and our markets. Any failure by us to diligently and fairly regulate our markets or to otherwise fulfill our regulatory obligations could significantly harm our reputation, prompt SEC scrutiny and adversely affect our business and reputation.

Our Nordic and Baltic exchanges monitor trading and compliance with listing standards in accordance with the European Union's Market Abuse Regulation and other applicable laws. The prime objective of such monitoring activities is to promote confidence in the exchanges among the general public and to ensure fair and orderly functioning markets. The monitoring functions within the Nasdaq Nordic and Nasdaq Baltic exchanges are the responsibility of the surveillance departments or other surveillance personnel. The surveillance departments or personnel are intended to strengthen the integrity of and confidence in these exchanges and to avoid conflicts of interest. Any failure to diligently and fairly regulate the Nordic and Baltic exchanges could significantly harm our reputation, prompt scrutiny from regulators and adversely affect our business and reputation.

Failure to protect our intellectual property rights, or allegations that we have infringed on the intellectual property rights of others, could harm our brand-building efforts and ability to compete effectively.

To protect our intellectual property rights, we rely on a combination of trademark laws, copyright laws, patent laws, trade secret protection, confidentiality agreements and other contractual arrangements with our affiliates, clients, strategic partners, employees and others. However, the efforts we have

taken to protect our intellectual property and proprietary rights might not be sufficient, or effective, at stopping unauthorized use of those rights. We may be unable to detect the unauthorized use of, or take appropriate steps to enforce, our intellectual property rights.

We have registered, or applied to register, our trademarks in the United States and in over 50 foreign jurisdictions and have pending U.S. and foreign applications for other trademarks. We also maintain copyright protection on our branded materials and pursue patent protection for software products, inventions and other processes developed by us. We also hold a number of patents, patent applications and licenses in the United States and other foreign jurisdictions. However, effective trademark, copyright, patent and trade secret protection might not be available or cost-effective in every country in which our services and products are offered. Moreover, changes in patent law, such as changes in the law regarding patentable subject matter, could also impact our ability to obtain patent protection for our innovations. In particular, recent amendments to the U.S. patent law may affect our ability to protect and defend our innovations. There is also a risk that the scope of protection under our patents may not be sufficient in some cases, or that existing patents may be deemed invalid or unenforceable. Failure to protect our intellectual property adequately could harm our brand and affect our ability to compete effectively. Further, defending our intellectual property rights could result in the expenditure of significant financial and managerial resources.

Third parties may assert intellectual property rights claims against us, which may be costly to defend, could require the payment of damages and could limit our ability to use certain technologies, trademarks or other intellectual property. Any intellectual property claims, with or without merit, could be expensive to litigate or settle and could divert management resources and attention. Successful challenges against us could require us to modify or discontinue our use of technology or business processes where such use is found to infringe or violate the rights of others, or require us to purchase licenses from third parties, any of which could adversely affect our business, financial condition and operating results.

We rely on third parties to perform certain functions, and our business could be adversely affected if these third parties fail to perform as expected.

We rely on third parties for regulatory, data center, data storage, data content, clearing and other services. To the extent that any of our vendors or other third-party service providers experiences difficulties, materially changes their business relationship with us or is unable for any reason to perform their obligations, our business or our reputation may be materially adversely affected.

We also rely on members of our trading community to maintain markets and add liquidity. To the extent that any of our largest members experiences difficulties, materially changes its business relationship with us or is unable for any reason to perform market making activities, our business or our reputation may be materially adversely affected.

We are a holding company that depends on cash flow from our subsidiaries to meet our obligations, and any restrictions on our subsidiaries' ability to pay dividends or make other payments to us may have a material adverse effect on our results of operations and financial condition.

As a holding company, we require dividends and other payments from our subsidiaries to meet cash requirements. Minimum capital requirements mandated by regulatory authorities having jurisdiction over some of our regulated subsidiaries indirectly restrict the amount of dividends paid upstream.

In addition, unremitted earnings of certain subsidiaries outside of the U.S. are used to finance our international operations and are considered to be indefinitely reinvested.

If our subsidiaries are unable to pay dividends and make other payments to us when needed, we may be unable to satisfy our obligations, which would have a material adverse effect on our business, financial condition and operating results.

Acquisitions, dispositions, investments, joint ventures and other transactional activities may require significant resources and/or result in significant unanticipated losses, costs or liabilities.

Over the past several years, acquisitions have been significant factors in our growth. We also may divest additional businesses or assets in the future. Although we cannot predict our transactional activities with complete accuracy, we believe that additional acquisitions, divestments, investments, joint ventures and other transactional activities will be important to our strategy. Such transactions may be material in size and scope. Many of the other potential purchasers of assets in our industry have greater financial resources than we have. Therefore, we cannot be sure that we will be

able to complete future transactions on terms favorable to us.

We also invest in startups through our Nasdaq Venture program and also hold minority interests in other entities. Given the size of these investments, we do not have operational control of these entities and may have limited visibility into risk management practices. Thus, we may be subject to additional capital requirements in certain circumstances and financial and reputational risks if there are operational failures.

We may finance future transactions by issuing additional equity and/or debt. The issuance of additional equity in connection with any such transaction could be substantially dilutive to existing shareholders. In addition, announcement or implementation of future transactions by us or others could have a material effect on the price of our common stock. The issuance of additional debt could increase our leverage substantially. We could face financial risks associated with incurring additional debt, particularly if the debt results in significant incremental leverage. Additional debt may reduce our liquidity, curtail our access to financing markets, impact our standing with credit rating agencies and increase the cash flow required for debt service. Any incremental debt incurred to finance a transaction could also place significant constraints on the operation of our business.

Furthermore, any future transactions could entail a number of additional risks, including:

- problems with effective integration of operations;
- the inability to maintain key pre-transaction business relationships;
- reliance on, or provision of, transition services;
- increased operating costs;
- the diversion of our management team from other operations;
- problems with regulatory bodies;
- risks associated with divesting employees, customers or vendors when divesting businesses or assets;
- declines in the value of investments;
- exposure to unanticipated liabilities;
- difficulties in realizing projected efficiencies, synergies and cost savings; and
- changes in our credit rating and financing costs.

Changes in tax laws, regulations or policies could have a material adverse effect on our financial results.

Like other corporations, we are subject to taxes at the federal, state and local levels, as well as in non-U.S.

jurisdictions. Changes in tax laws, regulations or policies could result in us having to pay higher taxes, which would in turn reduce our net income.

In addition, some of our subsidiaries are subject to tax in the jurisdictions in which they are organized or operate. In computing our tax obligation in these jurisdictions, we take various tax positions. We cannot assure you that upon review of these positions the applicable authorities will agree with our positions. A successful challenge by a tax authority could result in additional tax imposed on our subsidiaries.

Failure to attract and retain key personnel may adversely affect our ability to conduct our business.

Our future success depends, in large part, upon our ability to attract and retain highly qualified professional personnel.

Competition for key personnel in the various localities and business segments in which we operate is intense. Our ability to attract and retain key personnel, in particular senior officers or technology personnel, will be dependent on a number of factors, including prevailing market conditions and compensation packages offered by companies competing for the same talent. There is no guarantee that we will have the continued service of key employees who we rely upon to execute our business strategy and identify and pursue strategic opportunities and initiatives. In particular, we may have to incur costs to replace senior officers or other key employees who leave, and our ability to execute our business strategy could be impaired if we are unable to replace such persons in a timely manner.

Our non-U.S. business operates in various international markets, particularly emerging markets that are subject to greater political, economic and social uncertainties than developed countries.

Our non-U.S. business operates in various international markets, including but not limited to Northern Europe, the Baltics, the Middle East, Africa and Asia. Therefore, our non-U.S. operations are subject to the risk inherent in the international environment. Political, economic or social events or developments in one or more of our non-U.S. locations could adversely affect our operations and financial results. Some locations, such as Lithuania, India and the Philippines, may increase risk. Some of these economies may be subject to greater political, economic and social uncertainties than countries with more developed institutional structures.

Unforeseen or catastrophic events could interrupt our critical business functions. In addition, our U.S. and European businesses are heavily concentrated in particular areas and may be adversely affected by events in those areas.

We may incur losses as a result of unforeseen or catastrophic events, such as terrorist attacks, natural disasters, extreme weather, fire, power loss, telecommunications failures, human error, theft, sabotage and vandalism. Given our position in the global capital markets, we may be more likely than other companies to be a target for malicious disruption activities.

In addition, our U.S. and European business operations are heavily concentrated in the U.S. East Coast, and Stockholm respectively. Any event that impacts either of those geographic areas could potentially affect our ability to operate our businesses.

We have disaster recovery and business continuity plans and capabilities for critical systems and business functions to mitigate the risk of an interruption. In April 2018, Nasdaq activated its disaster recovery and business continuity plans when its primary data center site in Vasby, Sweden became unavailable due to an errant fire suppression system. Any

interruption in our critical business functions or systems could negatively impact our financial condition and operating results. For example, some co-location customers lack adequate disaster recovery solutions to avoid loss of trade flow from a sustained interruption of our critical systems.

Because we have operations in numerous countries, we are exposed to currency risk.

We have operations in the U.S., the Nordic and Baltic countries, the U.K., Australia and many other foreign countries. We therefore have significant exposure to exchange rate movements between the Euro, Swedish Krona and other foreign currencies towards the U.S. dollar. Significant inflation or disproportionate changes in foreign exchange rates with respect to one or more of these currencies could occur as a result of general economic conditions, acts of war or terrorism, changes in governmental monetary or tax policy, changes in local interest rates or other factors. These exchange rate differences will affect the translation of our non-U.S. results of operations and financial condition into U.S. dollars as part of the

preparation of our consolidated financial statements and could adversely affect our financial results. If our risk management methods are not effective, our business, reputation and financial results may be adversely affected.

We utilize widely-accepted methods to identify, assess, monitor and manage our risks, including oversight of risk management by Nasdaq's Global Risk Management Committee, which comprises senior executives and has responsibility for regularly reviewing risks and referring significant risks to the board of directors or specific board committees. By definition, some risk management methods require subjective evaluation of dynamic information regarding markets, customers or other matters. That variable information may not in all cases be accurate, complete, up-to-date or properly evaluated. If we do not successfully identify, assess, monitor or manage the risks to which we are exposed, our business, reputation, financial condition and operating results could be materially adversely affected. Charges to earnings resulting from acquisition, integration and restructuring costs may materially adversely affect the market value of our common stock.

In accordance with U.S. GAAP, we are accounting for the completion of our acquisitions using the acquisition method of accounting. We are allocating the total estimated purchase prices to net tangible assets, amortizable intangible assets and indefinite-lived intangible assets, and based on their fair values as of the date of completion of the acquisitions, recording the excess of the purchase price over those fair values as goodwill. Our financial results, including earnings per share, could be adversely affected by a number of financial adjustments including the following:

- we may incur additional amortization expense over the estimated useful lives of certain of the intangible assets acquired in connection with acquisitions during such estimated useful lives;
- we may have additional depreciation expense as a result of recording acquired tangible assets at fair value, in accordance with U.S. GAAP, as compared to book value as recorded;
- to the extent the value of goodwill or intangible assets becomes impaired, we may be required to incur material charges relating to the impairment of those assets;
- we may incur additional costs from integrating our acquisitions. The success of our acquisitions depends, in part, on our ability to integrate these businesses into our existing operations and realize anticipated cost savings, revenue synergies and growth opportunities; and
- we may incur restructuring costs in connection with the reorganization of any of our businesses.

Decisions to declare future dividends on our common stock will be at the discretion of our board of directors based upon a review of relevant considerations. Accordingly, there can be

no guarantee that we will pay future dividends to our stockholders.

Our board of directors regularly declares quarterly cash dividend payments on our outstanding common stock. Future declarations of quarterly dividends and the establishment of future record and payment dates are subject to approval by Nasdaq's board of directors. The board's determination to declare dividends will depend upon our profitability and financial condition, contractual restrictions, restrictions imposed by applicable law and other factors that the board deems relevant. Based on an evaluation of these factors, the board of directors may determine not to declare future dividends at all or to declare future dividends at a reduced amount. Accordingly, there can be no guarantee that we will pay future dividends to our stockholders.

Provisions of our certificate of incorporation, by-laws, exchange rules (including provisions included to address SEC concerns) and governing law restrict the ownership and voting of our common stock. In addition, such provisions could delay or prevent a change in control of us and entrench current management.

Our organizational documents place restrictions on the voting rights of certain stockholders. The holders of our common stock are entitled to one vote per share on all matters to be voted upon by the stockholders except that no person may exercise voting rights in respect of any shares in excess of 5% of the then outstanding shares of our common stock. Any change to the 5% voting limitation would require SEC approval.

In response to the SEC's concern about a concentration of our ownership, the rules of some of our exchange subsidiaries include a prohibition on any member or any person associated with a member of the exchange from beneficially owning more than 20% of our outstanding voting interests. SEC consent would be required before any investor could obtain more than a 20% voting interest in us. The rules of some of our exchange subsidiaries also

require the SEC's approval of any business ventures with exchange members, subject to exceptions. Our organizational documents contain provisions that may be deemed to have an anti-takeover effect and may delay, deter or prevent a change of control of us, such as a tender offer or takeover proposal that might result in a premium over the market price for our common stock. Additionally, certain of these provisions make it more difficult to bring about a change in the composition of our board of directors, which could result in entrenchment of current management.

Our certificate of incorporation and by-laws:

do not permit stockholders to act by written consent;

require certain advance notice for director nominations and actions to be taken at annual meetings; and

authorize the issuance of undesignated preferred stock, or "blank check" preferred stock, which could be issued by our board of directors without stockholder approval.

Section 203 of the Delaware General Corporation Law imposes restrictions on mergers and other business combinations between us and any holder of 15% or more (or, in some cases, a holder who previously held 15% or more) of our common stock. In general, Delaware law prohibits a publicly held corporation from engaging in a “business combination” with an “interested stockholder” for three years after the stockholder becomes an interested stockholder, unless the corporation’s board of directors and stockholders approve the business combination in a prescribed manner.

Finally, many of the European countries where we operate regulated entities require prior governmental approval before an investor acquires 10% or greater of our common stock.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

The following is a description of our principal properties which are all leased.

Location	Use	Size (approximate, in square feet)
Stockholm, Sweden	European headquarters	264,000
New York, New York	U.S. headquarters	113,000
Philadelphia, Pennsylvania	General office space	74,000
Atlanta, Georgia	General office space	68,000
New York, New York	Location of MarketSite	66,000
Bengaluru, India	General office space	63,000
New York, New York	General office space	53,000
Vilnius, Lithuania	General office space	51,000
Rockville, Maryland	General office space	48,000
Manila, Philippines	General office space	36,000
London, England	General office space	31,000
Sydney, Australia	General office space	29,000
Toronto, Canada	General office space	26,000

Outside the U.S., we also maintain leased locations in Belgium, China, Denmark, Estonia, Finland, France, Germany, Hong Kong, Iceland, Italy, Japan, Latvia, Netherlands, Norway, Singapore, South Korea, Spain and Ukraine. In some countries, we maintain multiple locations.

Within the U.S., we also maintain leased locations in California, Colorado, Connecticut, Illinois, Massachusetts, New Jersey, Oregon, Virginia and Washington, DC. In some states, we maintain multiple locations.

In addition to the above, we also lease approximately 67,000 square feet of space used as data centers and disaster preparedness facilities in multiple locations.

Generally, our properties are not earmarked for use by a particular segment. Instead, most of our properties are used by two or more segments. We believe the facilities we occupy are adequate for the purposes for which they are currently used and are well-maintained.

Item 3. Legal Proceedings

See “Legal and Regulatory Matters - Litigation,” of Note 19, “Commitments, Contingencies and Guarantees,” to the consolidated financial statements, 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

Market Information

Our common stock is listed on The Nasdaq Stock Market under the ticker symbol “NDAQ.” As of February 14, 2019, we had approximately 250 holders of record of our common stock.

Issuer Purchases of Equity Securities

Share Repurchase Program

See “Share Repurchase Program,” of Note 12, “Nasdaq Stockholders’ Equity,” to the consolidated financial statements for further discussion of our share repurchase program.

Purchases of Equity Securities by the Issuer and Affiliated Purchasers

The following table summarizes the share repurchase activity of our common stock during the fiscal quarter ended December 31, 2018:

Period	(a) Total Number of Shares Purchased	(b) Average Price Paid Per Share	(c) Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	(d) Maximum Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs (in millions)
October 2018				
Share repurchase program	—	\$ —	—	\$ 332
Employee transactions ⁽¹⁾	2,060	84.57	N/A	N/A
November 2018				
Share repurchase program	—	\$ —	—	\$ 332
Employee transactions ⁽¹⁾	1,370	87.33	N/A	N/A
December 2018				
Share repurchase program	—	\$ —	—	\$ 332
Employee transactions ⁽¹⁾	66,133	82.11	N/A	N/A
Total Quarter Ended December 31, 2018				
Share repurchase program	—	\$ —	—	\$ 332
Employee transactions	69,563	\$ 82.29	N/A	N/A

⁽¹⁾ Represents shares we purchased from employees in connection with the settlement of employee tax withholding obligations arising from the vesting of restricted stock and PSUs.

PERFORMANCE GRAPH

The following graph compares the total return of our common stock to the Nasdaq Composite Index, the S&P 500 and a selected peer group for the past five years. The peer group includes ASX Limited, CBOE, CME Group Inc., Deutsche Börse A.G., ICE, LSE, and TMX Group Limited. Information for the indices and the peer group is provided from December 31, 2013 through December 31, 2018. The figures represented below assume an initial investment of \$100 in the common stock or index at the closing price on December 31, 2013 and the reinvestment of all dividends.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*

Among Nasdaq, Inc., the Nasdaq Composite Index, the S&P 500, and a Peer Group

* \$100 invested on 12/31/2013 in stock or index, including reinvestment of dividends.

	Fiscal Year Ended December 31,					
	2013	2014	2015	2016	2017	2018
Nasdaq, Inc.	\$ 100	\$ 122	\$ 151	\$ 177	\$ 207	\$ 224
Nasdaq Composite	100	115	123	133	172	166
S&P 500	100	114	115	129	157	150
Peer Group	100	107	121	139	187	208

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Item 6. Selected Financial Data.

The following tables present selected financial data and should be read in conjunction with the consolidated financial statements and notes thereto of Nasdaq included elsewhere in this Form 10-K. We completed a divestiture in April 2018 and several acquisitions during the years ended December 31, 2018, 2017, 2016 and 2015 and included the financial results of such acquisitions in our consolidated financial statements from the respective acquisition dates. On January 1, 2018, we adopted Topic 606 using the full retrospective method which required restatement of 2017 and 2016 financial statements. Earlier periods were not restated.

Selected Financial Data

	Year Ended December 31,				
	2018	2017	2016	2015	2014
	(in millions, except share and per share amounts)				
Statements of Income Data:					
Total revenues	\$4,277	\$ 3,948	\$ 3,704	\$ 3,403	\$ 3,500
Transaction-based expenses	(1,751)	(1,537)	(1,428)	(1,313)	(1,433)
Revenues less transaction-based expenses	2,526	2,411	2,276	2,090	2,067
Total operating expenses	1,498	1,420	1,440	1,370	1,313
Operating income	1,028	991	836	720	754
Net income attributable to Nasdaq	458	729	106	428	414
Per share information:					
Basic earnings per share	\$2.77	\$ 4.38	\$ 0.64	\$ 2.56	\$ 2.45
Diluted earnings per share	\$2.73	\$ 4.30	\$ 0.63	\$ 2.50	\$ 2.39
Cash dividends declared per common share	\$1.70	\$ 1.46	\$ 1.21	\$ 0.90	\$ 0.58
Weighted-average common shares outstanding for earnings per share:					
Basic	165,349,476	166,364,299	165,182,290	167,285,450	168,926,733
Diluted	167,691,209	169,585,031	168,800,997	171,283,271	173,018,849
	December 31,				
	2018	2017	2016	2015	2014
	(in millions)				
Balance Sheets Data:					
Cash and cash equivalents and financial investments	\$813	\$ 612	\$ 648	\$ 502	\$ 601
Default funds and margin deposits	4,742	3,988	3,301	2,228	2,194
Goodwill	6,363	6,586	6,027	5,395	5,538
Total assets	15,700	15,354	13,411	11,257	11,542
Long-term debt	2,956	3,727	3,603	2,364	2,297
Total Nasdaq stockholders' equity	5,449	5,880	5,428	5,609	5,794

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion and analysis of the financial condition and results of operations of Nasdaq should be read in conjunction with our consolidated financial statements and related notes included in this Form 10-K, as well as the discussion under "Item 1A. Risk Factors." For further discussion of our business, including our growth strategy, see "Item 1. Business."

Overview

Our Company

We are a leading provider of trading, clearing, marketplace technology, regulatory, securities listing, information and public and private company services. Our global offerings are diverse and include trading and clearing across multiple asset classes, trade management services, market data products, financial indexes, investment data and analytics, capital formation solutions, corporate solutions, and market technology products and services. Our technology powers markets across the globe, supporting equity derivative trading, clearing and settlement, cash equity trading, fixed income trading, trading surveillance and many other functions.

Strategic Direction

Under the strategic direction that we have been implementing over the past two years, we have focused on maximizing the resources, people and capital allocated to our largest growth opportunities, particularly in our Market Technology and Information Services businesses. Our investments include our organic initiatives, notably the Nasdaq Financial Framework and related initiatives to deliver our marketplace expertise to banks, brokers and market operators outside the financial industry, as well as to provide compliance capabilities to the buy-side, and our eVestment private markets solutions. It also includes the recent acquisitions of Cinnober and Quandl.

The other pillar of our strategic direction is our continued investment and commitment to sustain our marketplace core. These foundational businesses, comprising the Market Services and Corporate Services segments, have earned Nasdaq a strategic position at the center of the capital markets in the U.S. and Europe. We have been able to create strategic relationships across broker-dealers, investment professionals, corporate clients, and other global market centers, which then provides the potential to expand those relationships with our technology and analytics capabilities. The focus for both our non-trading (which includes Market Technology, Information Services, Corporate Services and Trade Management Services) and trading (which includes all of Market Services except Trade Management Services) businesses continues to include identifying organic growth and developing adjacent opportunities to our existing businesses. In addition, our strategy includes identifying acquisitions that both complement our strengths and extend our capabilities, as well as offer opportunities for revenue and expense synergies and increased shareholder value.

Factors Affecting Our Business

In broad terms, our business performance is impacted by a number of drivers including macroeconomic events affecting the risk and return of financial assets, investor sentiment, government and private sector demands for capital, the regulatory environment for capital markets, changes in technology, and changes in investment patterns and priorities. Our future revenues and net income will continue to be influenced by a number of domestic and international economic trends including, among others:

- the challenges created by the automation of market data consumption, including competition and the quickly evolving nature of the market data business;
- regulatory changes relating to market structure, including market data, or affecting certain types of instruments, transactions, pricing structures or capital market participants;
- the demand for information about, or access to, our markets, which is dependent on the products we trade, our importance as a liquidity center, and the quality and pricing of our market data and trade management services;
- the demand for ETPs licensed to Nasdaq's indexes, enhanced analytics and other financial products based on our indexes as well as changes to the underlying assets associated with existing licensed financial products;
- the outlook of our technology customers for capital market activity;
- technological advances and members' and customers' demand for speed, efficiency, and reliability;
- the acceptance of cloud-based services and advanced analytics by our customers and global regulators;
- trading volumes and values in equity derivatives, cash equities and FICC, which are driven primarily by overall macroeconomic conditions;

the number of companies seeking equity financing, which is affected by factors such as investor demand, the global economy, and availability of diverse sources of financing, as well as tax and regulatory policies;

- the demand by companies and other organizations for the products sold by our Corporate Solutions business, which is largely driven by the overall state of the economy and the attractiveness of our offerings;

continuing pressure in transaction fee pricing due to intense competition in the U.S. and Europe; and

competition related to pricing, product features and service offerings.

The following chart presents the current consensus forecast for gross domestic product growth:

Although employment and wage data in many regions seems robust, indicating that the underlying global economy is still quite strong, leading indicators in many regions are pointing to a slowdown. Global gross domestic product growth forecasts have recently started to slow. In the last quarter of 2018, consensus 2019 growth forecasts have declined 0.1 percentage points to 2.5% for the U.S. and 0.5 percentage points to 1.3% for the Eurozone. There are a number of significant structural and political issues continuing to impact the global economy. Uncertainty surrounding the impact of China's economy, trade tariffs and Brexit contributed to an increase in market volatility in the last quarter of 2018 and continue to pose a risk to global growth.

Additional impacts on our business drivers include the international enactment and implementation of legislative and regulatory initiatives (notably MiFID II in Europe), the evolution of market participants' trading and investment strategies, and the continued rapid progression and deployment of new technology in the financial services industry. The business environment that we expect may influence our financial performance in 2019 may be characterized as follows:

- rapidly evolving technology for our businesses and their clients;
- increased demand for applications using emerging technologies and sophisticated analytics by both new entrants and industry incumbents;
- the expansion of the number of industries, and emergence of new industries, seeking to use advanced market technology;
- intense competition among U.S. exchanges and dealer-owned systems for cash equity trading and strong competition between MTFs and exchanges in Europe for cash equity trading; and

• globalization of exchanges, customers and competitors extending the competitive horizon beyond national markets.

Business Segments

We manage, operate and provide our products and services in four business segments: Market Services, Corporate Services, Information Services and Market Technology. See Note 1, "Organization and Nature of Operations," and Note 20, "Business Segments," to the consolidated financial statements for further discussion of our reportable segments and geographic data, as well as how management allocates resources, assesses performance and manages these businesses as four separate segments.

Sources of Revenues and Transaction-Based Expenses

See "Revenue Recognition and Transaction-Based Expenses," of Note 2, "Summary of Significant Accounting Policies," to the consolidated financial statements for further discussion of our sources of revenues and transaction-based expenses.

Nasdaq's Operating Results

Key Drivers

The following table includes key drivers for our Market Services, Corporate Services, Information Services and Market Technology segments. In evaluating the performance of our business, our senior management closely evaluates these key drivers.

	Year Ended December 31,			
	2018	2017	2016	
Market Services				
Equity Derivative Trading and Clearing				
U.S. equity options				
Total industry average daily volume (in millions)	18.2	14.7	14.4	
Nasdaq PHLX matched market share	15.7	% 17.3	% 16.0	%
The Nasdaq Options Market matched market share	9.4	% 9.2	% 7.8	%
Nasdaq BX Options matched market share	0.4	% 0.7	% 0.8	%
Nasdaq ISE Options matched market share	8.8	% 9.1	% 5.8	%
Nasdaq GEMX Options matched market share	4.5	% 5.2	% 1.1	%
Nasdaq MRX Options matched market share	0.1	% 0.1	% 0.1	%
Total matched market share executed on Nasdaq's exchanges	38.9	% 41.6	% 31.6	%
Nasdaq Nordic and Nasdaq Baltic options and futures				
Total average daily volume of options and futures contracts ⁽¹⁾	339,139	330,218	376,730	
Cash Equity Trading				
Total U.S.-listed securities				
Total industry average daily share volume (in billions)	7.32	6.53	7.35	
Matched share volume (in billions)	358.5	295.9	321.6	
The Nasdaq Stock Market matched market share	15.9	% 14.2	% 14.0	%
Nasdaq BX matched market share	2.8	% 3.1	% 2.4	%
Nasdaq PSX matched market share	0.8	% 0.8	% 1.0	%
Total matched market share executed on Nasdaq's exchanges	19.5	% 18.1	% 17.4	%
Market share reported to the FINRA/Nasdaq Trade Reporting Facility	31.3	% 34.5	% 33.1	%
Total market share ⁽²⁾	50.8	% 52.6	% 50.5	%
Nasdaq Nordic and Nasdaq Baltic securities				
Average daily number of equity trades executed on Nasdaq's exchanges	618,579	552,104	472,428	
Total average daily value of shares traded (in billions)	\$5.6	\$5.3	\$5.1	
Total market share executed on Nasdaq's exchanges	67.0	% 67.5	% 62.5	%
FICC				
Fixed Income				
U.S. fixed income notional trading volume (in billions)	\$15,983	\$17,800	\$21,504	
Total average daily volume of Nasdaq Nordic and Nasdaq Baltic fixed income contracts	132,475	116,357	89,252	
Commodities				
Power contracts cleared (TWh) ⁽³⁾	1,067	1,199	1,658	
Corporate Services				
Initial public offerings				
The Nasdaq Stock Market	186	136	91	
Exchanges that comprise Nasdaq Nordic and Nasdaq Baltic	53	88	62	
Total new listings				
The Nasdaq Stock Market ⁽⁴⁾	303	268	283	
Exchanges that comprise Nasdaq Nordic and Nasdaq Baltic ⁽⁵⁾	73	108	88	
Number of listed companies				
The Nasdaq Stock Market ⁽⁶⁾	3,058	2,949	2,897	

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Exchanges that comprise Nasdaq Nordic and Nasdaq Baltic ⁽⁷⁾	1,019	984	900
Information Services			
Number of licensed ETPs	365	324	298
ETP assets under management tracking Nasdaq indexes (in billions)	\$172	\$167	\$124
Market Technology			
Order intake (in millions) ⁽⁸⁾	\$223	\$249	\$235
Total order value (in millions) ⁽⁹⁾	\$695	\$717	\$691

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- (1) Includes Finnish option contracts traded on Eurex.
- (2) Includes transactions executed on The Nasdaq Stock Market's, Nasdaq BX's and Nasdaq PSX's systems plus trades reported through the FINRA/Nasdaq Trade Reporting Facility.
- (3) Transactions executed on Nasdaq Commodities or OTC and reported for clearing to Nasdaq Commodities measured by Terawatt hours (TWh).
- (4) New listings include IPOs, including those completed on a best efforts basis, issuers that switched from other listing venues, closed-end funds and separately listed ETPs.
- (5) New listings include IPOs and represent companies listed on the Nasdaq Nordic and Nasdaq Baltic exchanges and companies on the alternative markets of Nasdaq First North.
- (6) Number of total listings on The Nasdaq Stock Market at period end, including 392 ETPs as of December 31, 2018, 373 as of December 31, 2017 and 328 as of December 31, 2016.
- (7) Represents companies listed on the Nasdaq Nordic and Nasdaq Baltic exchanges and companies on the alternative markets of Nasdaq First North at period end.
- (8) Total contract value of orders signed during the period.
Represents total contract value of signed orders that are yet to be recognized as revenue. Market technology
- (9) deferred revenue, as discussed in Note 8, "Deferred Revenue," to the consolidated financial statements, represents consideration received that is yet to be recognized as revenue for these signed orders. Total order value for the years ended December 31, 2017 and 2016 was restated as a result of the adoption of Topic 606.

* * * * *

Financial Summary

The following table summarizes our financial performance for the year ended December 31, 2018 when compared with the same period in 2017 and for the year ended December 31, 2017 when compared with the same period in 2016. The comparability of our results of operations between reported periods is impacted by the divestiture of the Public Relations Solutions and Digital Media Services businesses in April 2018 and the acquisition of eVestment in October 2017. See Note 3, "Acquisitions and Divestiture," to the consolidated financial statements for further discussion of these transactions. For a detailed discussion of our results of operations, see "Segment Operating Results" below. In addition, on January 1, 2018, we adopted Topic 606 using the full retrospective method which required restatement of 2017 and 2016 financial statements.

	Year Ended December 31,			Percentage Change		
	2018	2017	2016	2018 vs. 2017 vs.		
				2017	2016	
	(in millions, except per share amounts)					
Revenues less transaction-based expenses	\$2,526	\$2,411	\$2,276	4.8	% 5.9	%
Operating expenses	1,498	1,420	1,440	5.5	% (1.4))%
Operating income	1,028	991	836	3.7	% 18.5	%
Interest expense	(150)	(143)	(135)	4.9	% 5.9	%
Gain on sale of investment security	118	—	—	N/M	—	%
Net gain on divestiture of businesses	33	—	—	N/M	—	%
Asset impairment charge	—	—	(578)	—	% (100.0))%
Income before income taxes	1,064	872	133	22.0	% 555.6	%
Income tax provision	606	143	27	323.8	% 429.6	%
Net income attributable to Nasdaq	\$458	\$729	\$106	(37.2)	% 587.7	%
Diluted earnings per share	\$2.73	\$4.30	\$0.63	(36.5)	% 582.5	%
Cash dividends declared per common share	\$1.70	\$1.46	\$1.21	16.4	% 20.7	%

N/M - Not meaningful.

In countries with currencies other than the U.S. dollar, revenues and expenses are translated using monthly average exchange rates. Impacts on our revenues less transaction-based expenses and operating income associated with

fluctuations in foreign currency are discussed in more detail under “Item 7A. Quantitative and Qualitative Disclosures about Market Risk.”

Segment Operating Results

The following table shows our revenues by segment, transaction-based expenses for our Market Services segment and total revenues less transaction-based expenses:

	Year Ended December 31,			Percentage Change	
	2018	2017	2016	2018 vs. 2017	2017 vs. 2016
	(in millions)				
Market Services	\$2,709	\$2,418	\$2,255	12.0 %	7.2 %
Transaction-based expenses	(1,751)	(1,537)	(1,428)	13.9 %	7.6 %
Market Services revenues less transaction-based expenses	958	881	827	8.7 %	6.5 %
Corporate Services	528	501	477	5.4 %	5.0 %
Information Services	714	588	540	21.4 %	8.9 %
Market Technology	270	247	241	9.3 %	2.5 %
Other revenues ⁽¹⁾	56	194	\$191	(71.1)%	1.6 %
Total revenues less transaction-based expenses	\$2,526	\$2,411	\$2,276	4.8 %	5.9 %

Includes the revenues from the Public Relations Solutions and Digital Media Services businesses which were sold ⁽¹⁾ in April 2018. Prior to the sale date, these revenues were included in our Corporate Solutions business. See “2018 Divestiture,” of Note 3, “Acquisitions and Divestiture,” to the consolidated financial statements for further discussion.

The following charts show our Market Services, Corporate Services, Information Services and Market Technology segments as a percentage of our total revenues less transaction-based expenses of \$2,526 million in 2018, \$2,411 million in 2017 and \$2,276 million in 2016:

MARKET SERVICES

The following table shows total revenues, transaction-based expenses, and total revenues less transaction-based expenses from our Market Services segment:

	Year Ended			Percentage		
	December 31,			Change		
	2018	2017	2016	2018 vs.	2017 vs.	2016
	(in millions)					
Market Services Revenues:						
Equity Derivative Trading and Clearing Revenues ⁽¹⁾	\$849	\$752	\$541	12.9 %	39.0 %	
Transaction-based expenses:						
Transaction rebates	(506)	(450)	(288)	12.4 %	56.3 %	
Brokerage, clearance and exchange fees ⁽¹⁾	(44)	(43)	(25)	2.3 %	72.0 %	
Equity derivative trading and clearing revenues less transaction-based expenses	299	259	228	15.4 %	13.6 %	
Cash Equity Trading Revenues ⁽²⁾	1,476	1,279	1,349	15.4 %	(5.2)%	
Transaction-based expenses:						
Transaction rebates	(830)	(692)	(785)	19.9 %	(11.8)%	
Brokerage, clearance and exchange fees ⁽²⁾	(361)	(334)	(309)	8.1 %	8.1 %	
Cash equity trading revenues less transaction-based expenses	285	253	255	12.6 %	(0.8)%	
FICC Revenues	92	96	99	(4.2)%	(3.0)%	
Transaction-based expenses:						
Transaction rebates	(8)	(16)	(19)	(50.0)%	(15.8)%	
Brokerage, clearance and exchange fees	(2)	(2)	(2)	— %	— %	
FICC revenues less transaction-based expenses	82	78	78	5.1 %	— %	
Trade Management Services Revenues	292	291	266	0.3 %	9.4 %	
Total Market Services revenues less transaction-based expenses	\$958	\$881	\$827	8.7 %	6.5 %	

Includes Section 31 fees of \$39 million in 2018, \$40 million in 2017, and \$24 million in 2016. Section 31 fees are ⁽¹⁾ recorded as equity derivative trading and clearing revenues with a corresponding amount recorded in transaction-based expenses.

Includes Section 31 fees of \$343 million in 2018, \$319 million in 2017, and \$290 million in 2016. Section 31 fees ⁽²⁾ are recorded as cash equity trading revenues with a corresponding amount recorded in transaction-based expenses.

Equity Derivative Trading and Clearing Revenues

Equity derivative trading and clearing revenues and equity derivative trading and clearing revenues less transaction-based expenses increased in both 2018 compared with 2017 and 2017 compared with 2016.

The increases in 2018 were primarily due to higher U.S. industry trading volumes, partially offset by a decrease in our overall U.S. matched market share executed on Nasdaq's exchanges.

The increases in 2017 were primarily due to the inclusion of a full year of revenues from our acquisition of ISE compared with six months in 2016, higher U.S. industry trading volumes and an increase in our overall matched market share executed on Nasdaq's U.S. exchanges. Further impacting the increase in equity derivative trading revenues was higher Section 31 pass-through fee revenue.

Section 31 fees are recorded as equity derivative trading and clearing revenues with a corresponding amount recorded as transaction-based expenses. In the U.S., we are assessed these fees from the SEC and pass them through to our customers in the form of incremental fees. Pass-through fees can increase or decrease due to rate changes by the SEC,

our percentage of the overall industry volumes processed on our systems, and differences in actual dollar value of shares traded. Since the amount recorded in revenues is equal to the amount recorded as transaction-based expenses, there is no impact on our revenues less transaction-based expenses. Section 31 fees decreased slightly in 2018 compared with 2017 and increased in 2017 compared with 2016. The increase in 2017 was primarily due to the inclusion of a full year of Section 31 fees from our acquisition of ISE compared with six months in 2016. Transaction rebates, in which we credit a portion of the per share execution charge to the market participant, increased in both

2018 compared with 2017 and 2017 compared with 2016. The increase in 2018 was primarily due to higher U.S. industry trading volumes, partially offset by decrease in our overall U.S. matched market share executed on Nasdaq's exchanges. The increase in 2017 was primarily due to the inclusion of a full year of rebates associated with our acquisition of ISE compared with six months in 2016, increases in the U.S. rebate capture rate, higher U.S. industry trading volumes, and an increase in our overall U.S. matched market share.

Brokerage, clearance and exchange fees increased slightly in 2018 compared with 2017. The increase was primarily due to higher routing fees partially offset by lower Section 31 pass-through fees. The increase in 2017 compared with 2016 was primarily due to higher Section 31 pass-through fees, associated with our acquisition of ISE, as discussed above.

Cash Equity Trading Revenues

Cash equity trading revenues and cash equity trading revenues less transaction-based expenses increased in 2018 compared 2017 and decreased in 2017 compared with 2016.

The increases in 2018 were primarily due to higher U.S. and European industry trading volumes and an increase in our overall matched market share executed on Nasdaq's U.S. exchanges. Further impacting the increase in cash equity trading revenues in 2018 was an increase in Section 31 pass-through fee revenue.

Cash equity trading revenues and cash equity trading revenues less transaction-based expenses decreased in 2017 compared with 2016.

The decreases in 2017 were primarily due to:

• lower U.S. industry trading volumes, partially offset by;

• higher European industry trading volumes; and

• an increase in our overall U.S. matched market share and European market share executed on Nasdaq's exchanges.

The decrease in cash equity trading revenues in 2017 was also partially offset by an increase in Section 31 pass-through fee revenue.

Similar to equity derivative trading and clearing, in the U.S. we record Section 31 fees as cash equity trading revenues with a corresponding amount recorded as transaction-based expenses. We are assessed these fees from the SEC and pass them through to our customers in the form of incremental fees. Since the amount recorded as revenues is equal to the amount recorded as transaction-based expenses, there is no impact on our revenues less transaction-based expenses. Section 31 fees increased in both 2018 compared with 2017 and 2017 compared with 2016. The increase in 2018 was primarily due to higher dollar value traded on Nasdaq's exchanges, partially offset by lower average SEC fee rates. The increase in 2017 was primarily due to higher dollar value traded on Nasdaq's exchanges and higher average SEC fee rates.

Transaction rebates increased in 2018 compared with 2017 and decreased in 2017 compared with 2016. For The Nasdaq Stock

Market, Nasdaq PSX and Nasdaq Canada, we credit a portion of the per share execution charge to the market participant that provides the liquidity, and for Nasdaq BX, we credit a portion of the per share execution charge to the market participant that takes the liquidity. The increase in 2018 was primarily due to an increase in our overall U.S. matched market share executed on Nasdaq's exchanges and higher U.S. industry trading volumes, partially offset by a decrease in the U.S. rebate capture rate. The decrease in 2017 was primarily due to lower U.S. industry trading volumes, partially offset by an increase in our matched market share executed on Nasdaq's exchanges.

Brokerage, clearance and exchange fees increased in both 2018 compared with 2017 and 2017 compared with 2016. The increases were primarily due to higher Section 31 pass-through fees, as discussed above.

FICC Revenues

FICC revenues decreased in 2018 compared with the same period in 2017 primarily due to a decline in revenues related to U.S. fixed income products. FICC revenues less transaction-based expenses increased in 2018 compared with 2017 primarily due to higher net revenues at NFX, partially offset by a decline in revenues related to U.S. fixed income products.

FICC revenues decreased in 2017 compared with the same period in 2016 primarily due to volume declines in European commodities products and U.S. fixed income products, partially offset by higher volumes and pricing changes at NFX. FICC revenues less transaction-based expenses were flat in 2017 compared with 2016 as declines in

European commodities products and U.S. fixed income products were offset by higher volumes and pricing changes at NFX.

Trade Management Services Revenues

Trade management services revenues increased slightly in 2018 compared with 2017 primarily due to an increase in co-location revenues, partially offset by a decline in port connectivity revenues. The increase in 2017 compared with 2016 was primarily due to an increase in customer demand for third party connectivity, co-location, and test facilities and the inclusion of a full year of revenues from our acquisition of ISE compared with six months in 2016.

CORPORATE SERVICES

The following table shows revenues from our Corporate Services segment:

	Year Ended			Percentage	
	December 31,			Change	
	2018	2017	2016	2018	2017
				vs.	vs.
				2017	2016
	(in millions)				
Corporate Services:					
Corporate Solutions	\$238	\$234	\$208	1.7%	12.5%
Listing Services	290	267	269	8.6%	(0.7)%
Total Corporate Services	\$528	\$501	\$477	5.4%	5.0%

Corporate Solutions Revenues

Corporate solutions revenues increased in both 2018 compared with 2017 and 2017 compared with 2016. The increase in 2018 was primarily due to an increase in board & leadership revenues and a favorable impact from foreign exchange of \$2 million, partially offset by a decrease in our governance, risk & compliance revenues. The increase in 2017 was primarily due to the inclusion of revenues associated with the acquisition of Boardvantage. See "Acquisition of Boardvantage," of Note 3, "Acquisitions and Divestiture," to the consolidated financial statements for further discussion of the Boardvantage acquisition.

Listing Services Revenues

Listing services revenues increased in 2018 compared with 2017 and decreased in 2017 compared with 2016. The increase in 2018 was primarily from client adoption of our all-inclusive annual listing fee program and an increase in the number and size of IPOs, partially offset by the run-off of fees earned from U.S. listing of additional shares. The decrease in 2017 was primarily due to a decrease in U.S. listing of additional share fees as a result of our all-inclusive annual listing fee program, partially offset by an increase in European listing services revenues due to new company listings.

* * * * *

INFORMATION SERVICES

The following table shows revenues from our Information Services segment:

	Year Ended			Percentage	
	December 31,			Change	
	2018	2017	2016	2018	2017
				vs.	vs.
				2017	2016
	(in millions)				
Information Services:					
Market Data	\$390	\$369	\$354	5.7%	4.2%
Index	206	171	149	20.5%	14.8%
Investment Data & Analytics	118	48	37	145.8%	29.7%
Total Information Services	\$714	\$588	\$540	21.4%	8.9%

Market Data Revenues

Market data revenues increased in both 2018 compared with 2017 and 2017 compared with 2016. The increase in 2018 was primarily due to higher revenues from sales of data subscriptions (notably growth in the Asia Pacific region), an increase in market share in U.S. tape plans and higher revenues from under reported usage. Further impacting the increase in market data revenues was a favorable impact from foreign exchange of \$4 million. The increase in 2017 was primarily due to growth in U.S. equities and European data products subscriptions.

Index Revenues

Index revenues increased in both 2018 compared with 2017 and 2017 compared with 2016. The increases in both 2018 and 2017 were primarily due to higher assets under management in ETPs linked to Nasdaq indexes and higher licensing revenues from futures trading volume related to the Nasdaq 100 Index.

Investment Data & Analytics Revenues

Investment data & analytics revenues increased in both 2018 compared with 2017 and 2017 compared with 2016. The increases in both 2018 and 2017 were primarily due to the inclusion of revenues associated with the acquisition of eVestment.

MARKET TECHNOLOGY

The following table shows revenues from our Market Technology segment:

Year Ended			Percentage	
December 31,			Change	
2018	2017	2016	2018 vs. 2017	2017 vs. 2016
(in millions)				
Market Technology	\$270	\$247	\$241	9.3% 2.5%

Market Technology Revenues

Market technology revenues increased in both 2018 compared with 2017 and 2017 compared with 2016. The increase in 2018 was primarily due to an increase in delivery and support revenues and higher software as a service revenues, partially offset by a decrease in change request and advisory revenues and an unfavorable impact from foreign exchange of \$2 million. The increase in 2017 was primarily due to higher change request revenues and an increase in revenues from software as a service.

OTHER REVENUES

Other revenues include the revenues from the Public Relations Solutions and Digital Media Services businesses which were sold in April 2018. Prior to the sale date, these revenues were included in our Corporate Solutions business. See “2018 Divestiture,” of Note 3, “Acquisitions and Divestiture,” to the consolidated financial statements for further discussion.

Expenses

Operating Expenses

The following table shows our operating expenses:

	Year Ended December 31,			Percentage Change	
	2018	2017	2016	2018 vs. 2017	2017 vs. 2016
(in millions)					
Compensation and benefits	\$712	\$670	\$665	6.3%	0.8%
Professional and contract services	144	153	153	(5.9)%	—%
Computer operations and data communications	127	125	111	1.6%	12.6%
Occupancy	95	94	86	1.1%	9.3%
General, administrative and other	120	82	73	46.3%	12.3%
Marketing and advertising	37	31	30	19.4%	3.3%
Depreciation and amortization	210	188	170	11.7%	10.6%
Regulatory	32	33	35	(3.0)%	(5.7)%
Merger and strategic initiatives	21	44	76	(52.3)%	(42.1)%
Restructuring charges	—	—	41	—%	(100.0)%
Total operating expenses	\$1,498	\$1,420	\$1,440	5.5%	(1.4)%

The increase in compensation and benefits expense in 2018 was primarily due to overall higher compensation costs resulting from our acquisition of eVestment and higher compensation expense reflecting higher performance incentives, partially offset by lower compensation costs due to the sale of the Public Relations Solutions and Digital Media Services businesses. The increase in compensation and benefits expense in 2017 was primarily due to overall higher compensation costs resulting from our 2017 and 2016 acquisitions and an unfavorable impact from foreign exchange of \$2 million, partially offset by lower compensation expense reflecting lower performance incentives. Also impacting the increase in compensation expense in 2017 was accelerated expense recorded in 2016 for

equity awards previously granted due to the retirement of the company's former CEO.

Headcount decreased to 4,099 employees as of December 31, 2018 from 4,734 as of December 31, 2017 primarily due to the sale of the Public Relations Solutions and Digital Media Services businesses, partially offset by our 2018 acquisitions.

Professional and contract services expense decreased in 2018 primarily due to the sale of the Public Relations Solutions and Digital Media Services businesses, partially offset by additional expense associated with our 2017 acquisitions and litigation costs.

Computer operations and data communications expense increased in 2018 primarily due to higher market data feed costs

due to higher volumes as well as higher software maintenance costs, and additional costs associated with our 2017 acquisitions, partially offset by lower costs resulting from the sale of the Public Relations Solutions and Digital Media Services businesses. The increase in 2017 was due to higher hardware and license costs associated with our 2017 and 2016 acquisitions.

Occupancy expense increased in 2018 primarily due to additional facility and rent costs resulting from expansion of our new world headquarters, partially offset by lower costs from the sale of the Public Relations Solutions and Digital Media Services businesses. The increase in 2017 was associated with our 2017 and 2016 acquisitions.

The increase in general, administrative and other expense in 2018 was primarily due to charges associated with the clearing default and lower regulatory fine collections. See “Nasdaq Commodities Clearing Default,” of Note 15, “Clearing Operations,” for further discussion of the capital relief program and default. The increase in 2017 was primarily due to a pre-tax charge of \$10 million in the second quarter of 2017 which primarily included a make-whole redemption price premium paid on the early extinguishment of previously outstanding debt and lower regulatory fine collections.

Marketing and advertising expense increased in both 2018 compared with 2017 and 2017 compared with 2016 primarily

due to an increase in advertising spend relating to our Listing Services and Information Services businesses.

Depreciation and amortization expense increased in both 2018 compared with 2017 and 2017 compared with 2016 primarily due to additional amortization expense associated with acquired intangible assets. The increase in 2018 was associated with our 2017 acquisition and in the increase in 2017 was associated with our 2017 and 2016 acquisitions.

The increase in 2018 was also associated with software assets placed in service.

Merger and strategic initiatives expense decreased in both 2018 compared with 2017 and 2017 compared with 2016.

We have pursued various strategic initiatives and completed a divestiture and a number of acquisitions in recent years which have resulted in expenses which would not have otherwise been incurred. These expenses generally include integration costs, as well as legal, due diligence and other third party transaction costs and will vary based on the size and frequency of the activities described above.

See Note 18, “Restructuring Charges,” to the consolidated financial statements for a discussion of our restructuring charges recorded during 2016.

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Non-operating Income and Expenses

The following table shows our non-operating income and expenses:

	Year Ended			Percentage Change		
	December 31,			2018 vs.	2017 vs.	
	2018	2017	2016	2017	2016	
	(in millions)					
Interest income	\$10	\$7	\$5	42.9	% 40.0	%
Interest expense	(150)	(143)	(135)	4.9	% 5.9	%
Net interest expense	(140)	(136)	(130)	2.9	% 4.6	%
Gain on sale of investment security	118	—	—	N/M	—	%
Net gain on divestiture of businesses	33	—	—	N/M	—	%
Asset impairment charge	—	—	(578)	—	% (100.0)	%
Other investment income	7	2	3	250.0	% (33.3)	%
Net income from unconsolidated investees	18	15	2	20.0	% 650.0	%
Total non-operating income (expenses)	\$36	\$(119)	\$(703)	(130.3)	% (83.1)	%

N/M - Not meaningful.

Interest Income

Interest income increased in both 2018 compared with 2017 and 2017 compared with 2016 primarily due to an increase in prevailing market rates.

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Interest Expense

The following table shows our interest expense:

	Year Ended			Percentage	
	December 31,			Change	
	2018	2017	2016	2018 vs. 2017	2017 vs. 2016
	(in millions)				
Interest expense on debt	\$140	\$135	\$129	3.7 %	4.7 %
Accretion of debt issuance costs and debt discount	7	6	5	16.7%	20.0 %
Other bank and investment-related fees	3	2	1	50.0%	100.0%
Interest expense	\$150	\$143	\$135	4.9 %	5.9 %

Interest expense increased in both 2018 and 2017 primarily due to higher interest rates on floating rate debt and debt issuances related to our acquisitions. See Note 9, "Debt Obligations," to the consolidated financial statements for further discussion of our debt obligations.

Gain on Sale of Investment Security

In December 2018, we recorded a pre-tax gain of \$118 million (\$93 million after tax) on the sale of an investment security. See "Equity Securities," of Note 6, "Investments," to the consolidated financial statements for further discussion.

Net Gain on Divestiture of Businesses

In April 2018, we sold our Public Relations Solutions and Digital Media Services businesses. See "2018 Divestiture," of Note 3, "Acquisitions and Divestiture," to the consolidated financial statements for further discussion.

Asset Impairment Charge

The asset impairment charge in 2016 relates to a pre-tax, non-cash intangible asset impairment charge related to the full write-off of a trade name from an acquired business due to a continued decline in the operating performance of the business during 2016 and a rebranding of our fixed income business under a single brand called Nasdaq Fixed Income.

Other Investment Income

Other investment income in 2018 primarily related to dividend income received on an equity security.

Net Income from Unconsolidated Investees

Net income from unconsolidated investees in both 2018 and 2017 primarily relates to income recognized from our equity method investment in OCC. See "Equity Method Investments," of Note 6, "Investments," to the consolidated financial statements for further discussion of our equity method investments.

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Tax Matters

The following table shows our income tax provision and effective tax rate:

	Year Ended December			Percentage	
	31,			Change	
	2018	2017	2016	2018 vs. 2017	2017 vs. 2016
	(\$ in millions)				
Income tax provision	\$606	\$143	\$27	323.8%	429.6%
Effective tax rate	57.0 %	16.4 %	20.3%		

The majority of the increase in our effective tax rate in 2018 compared to 2017 and the decrease in our effective tax rate in 2017 compared to 2016 was the result of the final and provisional impacts from the Tax Cuts and Jobs Act which was enacted on December 22, 2017. For further discussion of the impacts of the tax act and other tax matters, see Note 17, "Income Taxes," to the consolidated financial statements.

The effective tax rate may vary from period to period depending on, among other factors, the geographic and business mix of earnings and losses. These same and other factors, including history of pre-tax earnings and losses, are taken into account in assessing the ability to realize deferred tax assets.

Non-GAAP Financial Measures

In addition to disclosing results determined in accordance with U.S. GAAP, we also have provided non-GAAP net income attributable to Nasdaq and non-GAAP diluted earnings per share. Management uses this non-GAAP information internally, along with U.S. GAAP information, in evaluating our performance and in making financial and operational decisions. We believe our presentation of these measures provides investors with greater transparency and supplemental data relating to our financial condition and results of operations. In addition, we believe the presentation of these measures is useful to investors for period-to-period comparisons of our ongoing operating performance.

These measures are not in accordance with, or an alternative to, U.S. GAAP, and may be different from non-GAAP measures used by other companies. Investors should not rely on any single financial measure when evaluating our business. We recommend investors review the U.S. GAAP financial measures included in this Annual Report on Form 10-K, including our consolidated financial statements and the notes thereto. When viewed in conjunction with our U.S. GAAP results and the accompanying reconciliation, we believe these non-GAAP measures provide greater transparency and a more complete understanding of factors affecting our business than U.S. GAAP measures alone. We understand that analysts and investors regularly rely on non-GAAP financial measures, such as non-GAAP net income attributable to Nasdaq and non-GAAP diluted earnings per share, to assess operating performance. We use non-GAAP net income attributable to Nasdaq and non-GAAP diluted earnings per share because they highlight trends more clearly in our business that may not otherwise be apparent when relying solely on U.S. GAAP financial measures, since these measures eliminate from our results specific financial items that have less bearing on our ongoing operating performance. Non-GAAP net income attributable to Nasdaq for the periods presented below is calculated by adjusting for the following items:

Amortization expense of acquired intangible assets: We amortize intangible assets acquired in connection with various acquisitions. Intangible asset amortization expense can vary from period to period due to episodic acquisitions completed, rather than from our ongoing business operations. As such, if intangible asset amortization is included in performance measures, it is more difficult to assess the day-to-day operating performance of the businesses, the relative operating performance of the businesses between periods, and the earnings power of Nasdaq. Performance measures excluding intangible asset amortization therefore provide investors with a more useful representation of our businesses' ongoing activity in each period.

Merger and strategic initiatives expense: We have pursued various strategic initiatives and completed a divestiture and a number of acquisitions in recent years which have resulted in expenses which would not have otherwise been incurred. These expenses generally include integration costs, as well as legal, due diligence and other third party transaction costs. The frequency and the amount of such expenses vary significantly based on the size, timing and complexity of the transaction. Accordingly, we exclude these costs for purposes of calculating non-GAAP measures which provide a more meaningful analysis of Nasdaq's ongoing operating performance or comparisons in Nasdaq's performance between periods.

Clearing Default: For the year ended December 31, 2018, we recorded \$31 million in expense related to the clearing default of a Nasdaq Clearing commodities member that occurred in September 2018. We recorded an \$8 million loss in September 2018 relating to this default. In December 2018, we recorded a \$23 million charge as a result of initiating a capital relief program. These charges are recorded in general, administrative and o

ther expense in our Consolidated Statements of Income. See "Nasdaq Commodities Clearing Default," of Note 15, "Clearing Operations," for further discussion of the default. We have excluded these charges as we believe they are non-recurring, as there has never been a loss due to member default in our clearinghouse, and they should be excluded when evaluating the ongoing operating performance of Nasdaq. Any expenses associated with the enhancement of processes and procedures relating to our clearing business will not be excluded from our GAAP results.

Other significant items: We have excluded certain other charges or gains, including certain tax items, that are the result of other non-comparable events to measure operating performance. We believe the exclusion of such amounts allows management and investors to better understand the ongoing financial results of Nasdaq.

For the year ended December 31, 2018, other significant items primarily included:

- gain on sale of investment security which represents our pre-tax gain of \$118 million on the sale of our 5.0% ownership interest in LCH;

- net gain on divestiture of businesses which represents our pre-tax net gain of \$33 million on the sale of the Public Relations Solutions and Digital Media Services businesses;

- other items:

- charges related to uncertain positions pertaining to sales and use tax and VAT which are recorded in general, administrative and other expense in our Consolidated Statements of Income; and

- certain litigation costs which are recorded in professional and contract services expense in our Consolidated Statements of Income.

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For the year ended December 31, 2017, other significant items primarily included:

• loss on extinguishment of debt of \$10 million which is recorded in general, administrative and other expense in our Consolidated Statements of Income; and

• wind down costs associated with an equity method investment that was previously written off which are recorded in net income from unconsolidated investees in our Consolidated Statements of Income.

For the year ended December 31, 2016, other significant items primarily included:

• restructuring charges of \$41 million which were associated with our 2015 restructuring plan;

• an asset impairment charge of \$578 million related to the full write-off of a trade name from an acquired business;

executive compensation of \$12 million which represents accelerated expense for equity awards previously granted due to the retirement of the company's former CEO which is recorded in compensation and benefits expense in our Consolidated Statements of Income;

a regulatory matter that resulted in a regulatory fine of \$6 million received by our Nordic exchanges and clearinghouse which is recorded in regulatory expense in our Consolidated Statements of Income;

other items:

the release of a sublease loss reserve due to the early exit of a facility which is recorded in occupancy expense in our Consolidated Statements of Income; and

the impact of the write-off of an equity method investment, partially offset by a gain resulting from the sale of a percentage of a separate equity method investment which is recorded in net income from unconsolidated investees in our Consolidated Statements of Income.

Significant tax items: The non-GAAP adjustment to the income tax provision included the tax impact of each non-GAAP adjustment and:

for the year ended December 31, 2018, a net \$7 million increase to tax expense due to a remeasurement of unrecognized tax benefits (excluding the reversal of certain Swedish tax benefits discussed below) and the impact of state tax rate changes;

for the year ended December 31, 2017, a \$12 million decrease to tax expense due to a remeasurement of unrecognized tax benefits; and

for the year ended December 31, 2016, a tax expense of \$27 million due to an unfavorable tax ruling received during the second quarter of 2016, the impact of which is related to prior periods.

Additional adjustments included the following items:

The impact of newly enacted U.S. tax legislation is related to the Tax Cuts and Jobs Act which was enacted on December 22, 2017.

For the year ended December 31, 2018, we recorded an increase to tax expense of \$290 million and a reduction to deferred tax assets related to foreign currency translation as a result of the finalization of the provisional estimate related to this act.

For the year ended December 31, 2017, we recorded a decrease to tax expense of \$89 million, primarily related to the remeasurement of our net U.S. deferred tax liability at the lower U.S. federal corporate income tax rate which reflected the provisional impact associated with the enactment of this act.

The reversal of certain Swedish tax benefits. See Note 17, "Income Taxes," to the consolidated financial statements for further discussion.

Excess tax benefits related to employee share-based compensation of \$9 million for the year ended December 31, 2018 and \$40 million for the year ended December 31, 2017, were recorded as a result of the adoption of accounting guidance on January 1, 2017. This guidance requires all income tax effects of share-based awards to be recognized as income tax expense or benefit in the income statement when the awards vest or are settled on a prospective basis, as opposed to stockholders' equity where it was previously recorded, and will be a recurring item going forward. This item is subject to volatility and will vary based on the timing of the vesting of employee share-based compensation arrangements and fluctuation in our stock price.

We believe the exclusion of such amounts allows management and investors to better understand the financial results of Nasdaq.

The following table represents reconciliations between U.S. GAAP net income attributable to Nasdaq and diluted earnings per share and non-GAAP net income attributable to Nasdaq and diluted earnings per share:

	Year Ended December 31, 2018		Year Ended December 31, 2017		Year Ended December 31, 2016	
	Net Income	Diluted Earnings Per Share	Net Income	Diluted Earnings Per Share	Net Income	Diluted Earnings Per Share
(in millions, except share and per share amounts)						
U.S. GAAP net income attributable to Nasdaq and diluted earnings per share	\$458	\$ 2.73	\$729	\$ 4.30	\$106	\$ 0.63
Non-GAAP adjustments:						
Amortization expense of acquired intangible assets	109	0.65	92	0.54	82	0.49
Merger and strategic initiatives expense	21	0.13	44	0.26	76	0.45
Clearing default	31	0.18	—	—	—	—
Gain on sale of investment security	(118)	(0.69)	—	—	—	—
Net gain on divestiture of businesses	(33)	(0.20)	—	—	—	—
Extinguishment of debt	—	—	10	0.06	—	—
Restructuring charges	—	—	—	—	41	0.24
Asset impairment charge	—	—	—	—	578	3.42
Executive compensation	—	—	—	—	12	0.07
Regulatory matter	—	—	—	—	6	0.04
Other	17	0.10	5	0.02	5	0.03
Adjustment to the income tax provision to reflect non-GAAP adjustments and other tax items	4	0.02	(70)	(0.40)	(287)	(1.70)
Impact of newly enacted U.S. tax legislation	290	1.73	(89)	(0.52)	—	—
Reversal of certain Swedish tax benefits	41	0.24	—	—	—	—
Excess tax benefits related to employee share-based compensation	(9)	(0.05)	(40)	(0.24)	—	—
Total non-GAAP adjustments, net of tax	353	2.11	(48)	(0.28)	513	3.04
Non-GAAP net income attributable to Nasdaq and diluted earnings per share	\$811	\$ 4.84	\$681	\$ 4.02	\$619	\$ 3.67
Weighted-average common shares outstanding for diluted earnings per share		167,691,299		169,585,031		168,800,997

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Liquidity and Capital Resources

Historically, we have funded our operating activities and met our commitments through cash generated by operations, augmented by the periodic issuance of our common stock and debt. See Note 9, “Debt Obligations,” to the consolidated financial statements for further discussion. Currently, our cost and availability of funding remain healthy.

As part of the purchase price consideration of a prior acquisition, Nasdaq has contingent future obligations to issue 992,247 shares of Nasdaq common stock. See “Non-Cash Contingent Consideration,” of Note 19, “Commitments, Contingencies and Guarantees,” to the consolidated financial statements for further discussion.

In April 2017, we entered into the 2017 Credit Facility which replaced a former credit facility. We also entered into a commercial paper program which enables us to borrow efficiently at reasonable short-term interest rates and is supported by our 2017 Credit Facility. See “Commercial Paper Program,” and “2017 Credit Facility,” of Note 9, “Debt Obligations,” to the consolidated financial statements for further discussion.

As of December 31, 2018, no amounts were outstanding on the 2017 Credit Facility. The \$4 million balance represents unamortized debt issuance costs. Of the \$1 billion that is available for borrowing, \$277 million provides liquidity support for the commercial paper program and for a letter of

credit. As such, as of December 31, 2018, the total remaining amount available under the 2017 Credit Facility was \$723 million.

In the near term, we expect that our operations and the availability under our revolving credit commitment and commercial paper program will provide sufficient cash to fund our operating expenses, capital expenditures, debt repayments, any share repurchases, and any dividends.

The value of various assets and liabilities, including cash and cash equivalents, receivables, accounts payable and accrued expenses, and commercial paper can fluctuate from month to month. Working capital (calculated as current assets less current liabilities) was \$(200) million as of December 31, 2018, compared with \$276 million as of December 31, 2017, a decrease of \$476 million. Current asset balance changes increased working capital by \$860 million, with increases in default funds and margin deposits, cash and cash equivalents, financial investments, at fair value, receivables, net and restricted cash, partially offset by a decrease in other current assets. Current liability balance changes decreased working capital by \$1,336 million, due to increases in default funds and margin deposits, short-term debt, other current liabilities, deferred revenue, accrued personnel costs, and accounts payable and accrued expenses, partially offset by a decrease in Section 31 fees payable to the SEC.

Principal factors that could affect the availability of our internally-generated funds include:

- deterioration of our revenues in any of our business segments;
- changes in regulatory and working capital requirements; and
- an increase in our expenses.

Principal factors that could affect our ability to obtain cash from external sources include:

- operating covenants contained in our credit facilities that limit our total borrowing capacity;
- increases in interest rates under our credit facilities;
- credit rating downgrades, which could limit our access to additional debt;
- a decrease in the market price of our common stock; and
- volatility or disruption in the public debt and equity markets.

The following sections discuss the effects of changes in our financial assets, debt obligations, clearing and broker-dealer net capital requirements, and cash flows on our liquidity and capital resources.

Financial Assets

The following table summarizes our financial assets:

	December 31,	
	2018	2017
	(in millions)	
Cash and cash equivalents	\$ 545	\$ 377
Restricted cash	41	22
Financial investments, at fair value	268	235
Total financial assets	\$ 854	\$ 634

Cash and Cash Equivalents and Restricted Cash

Cash and cash equivalents includes all non-restricted cash in banks and highly liquid investments with original maturities of 90 days or less at the time of purchase. 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. As of December 31, 2018, our cash and cash equivalents of \$545 million were primarily invested in bank deposits, money market funds and commercial paper. In the long-term, we may use both internally generated funds and external sources to satisfy our debt obligations and other long-term liabilities. Cash and cash equivalents as of December 31, 2018 increased \$168 million from December 31, 2017, primarily due to:

- net cash provided by operating activities;
- proceeds from divestiture of businesses, net;
- proceeds received from the sale of an investment security, partially offset by;
- repurchases of our common stock;
- cash dividends paid on our common stock;
- repayments made on commercial paper, net;

repayments of long-term debt;
purchases of property and equipment;
cash paid for acquisitions, net of cash and cash equivalents acquired and other investment activities;
net purchases of securities; and
net payments related to employee stock activity.

See “Cash Flow Analysis” below for further discussion.

Restricted cash is restricted from withdrawal due to a contractual or regulatory requirements or is not available for general use. Restricted cash was \$41 million as of December 31, 2018 and \$22 million as of December 31, 2017, an increase of \$19 million. The increase primarily relates to an increase in cash pledged as collateral and an increase in regulatory capital requirements. Restricted cash is classified as restricted cash in the Consolidated Balance Sheets.

Repatriation of Cash

Our cash and cash equivalents held outside of the U.S. in various foreign subsidiaries totaled \$367 million as of December 31, 2018 and \$137 million as of December 31, 2017. The remaining

balance held in the U.S. totaled \$178 million as of December 31, 2018 and \$240 million as of December 31, 2017. Unremitted earnings of subsidiaries outside of the U.S. are used to finance our international operations and are considered to be indefinitely reinvested.

Share Repurchase Program

See “Share Repurchase Program,” of Note 12, “Nasdaq Stockholders’ Equity,” to the consolidated financial statements for further discussion of our share repurchase program.

Cash Dividends on Common Stock

The following table shows quarterly cash dividends paid per common share on our outstanding common stock:

	2018	2017
First quarter	\$0.38	\$0.32
Second quarter	0.44	0.38
Third quarter	0.44	0.38
Fourth quarter	0.44	0.38
Total	\$1.70	\$1.46

See “Cash Dividends on Common Stock,” of Note 12, “Nasdaq Stockholders’ Equity,” to the consolidated financial statements

for further discussion of the dividends.

Financial Investments, at Fair Value

Our financial investments, at fair value totaled \$268 million as of December 31, 2018 and \$235 million as of December 31, 2017 and are primarily comprised of trading securities, mainly highly rated European government debt securities. Of these securities, \$166 million as of December 31, 2018 and \$160 million as of December 31, 2017 are assets primarily utilized to meet regulatory capital requirements, mainly for our clearing operations at Nasdaq Clearing. See Note 6, “Investments,” to the consolidated financial statements for further discussion of our trading investment securities.

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Debt Obligations

The following table summarizes our debt obligations by contractual maturity:

	Maturity Date	December 31, 2018	December 31, 2017
(in millions)			
Short-term debt:			
Commercial paper	Weighted-average maturity of 33 days	\$275	\$ 480
Senior unsecured floating rate notes ⁽¹⁾	March 2019	500	498
\$400 million senior unsecured term loan facility ⁽²⁾	November 2019	100	100
Total short-term debt		875	1,078
Long-term debt:			
5.55% senior unsecured notes	January 2020	599	599
3.875% senior unsecured notes	June 2021	686	716
\$1 billion revolving credit commitment	April 2022	(4) 110
1.75% senior unsecured notes	May 2023	682	712
4.25% senior unsecured notes	June 2024	497	496
3.85% senior unsecured notes	June 2026	496	496
Total long-term debt		2,956	3,129
Total debt obligations		\$3,831	\$ 4,207

⁽¹⁾ Balance was reclassified to short-term debt as of March 31, 2018.

⁽²⁾ Balance was reclassified to short-term debt as of December 31, 2018.

In addition to the \$1 billion revolving credit commitment, we also have other credit facilities primarily related to our Nasdaq Clearing operations in order to provide further liquidity. Other credit facilities, which are available in multiple

currencies, totaled \$220 million as of December 31, 2018 and \$187 million as of December 31, 2017, in available liquidity, none of which was utilized.

As of December 31, 2018, we were in compliance with the covenants of all of our debt obligations. See Note 9, "Debt Obligations," to the consolidated financial statements for further discussion of our debt obligations.
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Regulatory Capital Requirements

Clearing Operations Regulatory Capital Requirements

We are required to maintain minimum levels of regulatory capital for the clearing operations of Nasdaq Clearing. The level of regulatory capital required to be maintained is dependent upon many factors, including market conditions and creditworthiness of the counterparty. As of December 31, 2018, our required regulatory capital of \$121 million is primarily comprised of highly rated European government debt securities that are included in financial investments, at fair value in the Consolidated Balance Sheets.

Broker-Dealer Net Capital Requirements

Our broker-dealer subsidiaries, Nasdaq Execution Services, Execution Access, NPM Securities, SMTX, and Nasdaq Capital Markets Advisory, are subject to regulatory requirements intended to ensure their general financial soundness and liquidity. These requirements obligate these subsidiaries to comply with minimum net capital requirements. The required minimum net capital is included in restricted cash in the Consolidated Balance Sheets. The following table summarizes the net capital requirements for our broker-dealer subsidiaries as of December 31, 2018:

Broker-Dealer Subsidiaries	Total Net Capital (in millions)	Required Minimum Net Capital	Excess Capital
Nasdaq Execution Services	\$16.3	\$ 0.3	\$ 16.0
Execution Access	47.1	0.3	46.8
NPM Securities	0.6	0.3	0.3
SMTX	4.0	0.3	3.7
Nasdaq Capital Markets Advisory	0.5	0.3	0.2

Nordic and Baltic Exchange Regulatory Capital Requirements

The entities that operate trading venues in the Nordic and Baltic countries are each subject to local regulations and are required to maintain regulatory capital intended to ensure their general financial soundness and liquidity. As of December 31, 2018, our required regulatory capital of \$34 million is primarily invested in European mortgage bonds that are included in financial investments, at fair value and restricted cash in the Consolidated Balance Sheets.

Other Capital Requirements

We operate several other businesses which are subject to local regulation and are required to maintain certain levels of regulatory capital. As of December 31, 2018, other required regulatory capital was \$17 million and was primarily included in restricted cash and financial investments, at fair value in the Consolidated Balance Sheets.

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Cash Flow Analysis

The following table summarizes the changes in cash flows:

	Year Ended December 31,			Percentage Change	
	2018	2017	2016	2018 vs. 2017	2017 vs. 2016
Net cash provided by (used in):	(in millions)				
Operating activities	\$1,028	\$909	\$776	13.1 %	17.1 %
Investing activities	196	(890)	(1,657)	(122.0)%	(46.3)%
Financing activities	(1,027)	(53)	948	1,837.7%	(105.6)%

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Effect of exchange rate changes on cash and cash equivalents and restricted cash	(10)	15	(6)	(166.7)%	(350.0)%
Net increase in cash and cash equivalents and restricted cash	187	(19)	61	(1,084.2)%	(131.1)%		
Cash and cash equivalents and restricted cash at beginning of period	399	418	357	(4.5)%	17.1	%	
Cash and cash equivalents and restricted cash at end of period	\$586	\$399	\$418	46.9	%	(4.5)%	

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Net Cash Provided by Operating Activities

Net cash provided by operating activities increased \$119 million in 2018 compared with 2017 and increased \$133 million in 2017 compared with 2016. The increase in 2018 was primarily due to higher operating income due to growth in our equity derivative trading and clearing, cash equity trading, market data, index and listing services businesses, and growth related to a full year of eVestment activity, these increases were partially offset by an increase in estimated tax payments, a payment to increase the funded status of our U.S. defined-benefit pension plans and higher Section 31 fee payments. The increase in 2017 was primarily due to higher net income, mainly due to the inclusion of a full year of cash flows from our 2016 acquisitions, partially offset by higher compensation payments driven by our 2016 acquisitions.

Net Cash Provided by (Used in) Investing Activities

Net cash provided by investing activities increased \$1,086 million in 2018 compared with 2017. The increase was primarily due to a decrease in cash flows used for acquisitions of businesses, net of cash and cash equivalents acquired, an increase in proceeds from divestiture of businesses, net and an increase in proceeds from the sale of an investment security.

Net cash used in investing activities decreased \$767 million in 2017 compared with 2016. The decrease was primarily due to a decrease in cash flows used for acquisitions of businesses, net of cash and cash equivalents acquired.

Net Cash Provided by (Used in) Financing Activities

Net cash used in financing activities increased \$974 million in 2018 compared with 2017. The increase was primarily due to an increase in repayments of commercial paper, a decrease in proceeds from long-term debt issuances, and an increase in repurchases of common stock and dividends paid, partially offset by a decrease in repayments of long-term debt.

Net cash used in financing activities increased \$1,001 million in 2018 compared with 2017. The increase was primarily due to a decrease in proceeds from long-term debt issuances and an increase in repurchases of common stock and dividends paid, partially offset by an increase in proceeds from commercial paper and a decrease in repayments of long-term debt.

See Note 3, "Acquisitions and Divestiture," to the consolidated financial statements for further discussion of our divestiture and acquisitions.

See "Equity Securities," of Note 6, "Investments," to the consolidated financial statements for further discussion of the sale of an investment security and consideration received under a market technology agreement.

See Note 9, "Debt Obligations," to the consolidated financial statements for further discussion of our debt obligations.

See "Share Repurchase Program," and "Cash Dividends on Common Stock," of Note 12, "Nasdaq Stockholders' Equity," to the consolidated financial statements for further discussion of our share repurchase program and cash dividends paid on our common stock.

Contractual Obligations and Contingent Commitments

Nasdaq has contractual obligations to make future payments under debt obligations by contract maturity, minimum rental commitments under non-cancelable operating leases, net and other obligations. The following table shows these contractual obligations as of December 31, 2018:

Contractual Obligations	Payments Due by Period				
	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
	(in millions)				
Debt obligations by contract maturity ⁽¹⁾	\$4,311	\$996	\$1,463	\$793	\$1,059
Minimum rental commitments under non-cancelable operating leases, net ⁽²⁾	637	75	131	86	345
Purchase obligations ⁽³⁾	21	11	10	—	—
Other obligations ⁽⁴⁾	12	12	—	—	—
Total	\$4,981	\$1,094	\$1,604	\$879	\$1,404

Our debt obligations include both principal and interest obligations. As of December 31, 2018, an interest rate of 4.04% was used to compute the amount of the contractual obligations for interest on the 2016 Credit Facility, 3.72% was used to compute the amount of the contractual obligations for interest on the 2017 Credit Facility and 3.21% was used to compute the amount of the contractual obligations for interest on the 2019 Notes. All other debt obligations were primarily calculated on a 360-day basis at the contractual fixed rate multiplied by the aggregate principal amount as of December 31, 2018. See Note 9, “Debt Obligations,” to the consolidated financial statements for further discussion.

We lease some of our office space under non-cancelable operating leases with third parties and sublease office space to third parties. Some of our leases contain renewal options and escalation clauses based on increases in property taxes and building operating costs.

Purchase obligations primarily represent minimum outstanding obligations due under software license agreements.

Other obligations primarily consist of potential future escrow agreement payments related to prior acquisitions.

Acquisition of Cinnober

For further discussion of our acquisition of Cinnober, see “Acquisition of Cinnober,” of Note 3, “Acquisitions and Divestiture,” to the consolidated financial statements.

Other Commitment

We have a 40.0% ownership in OCC. Under the OCC's capital plan, the OCC shareholders have committed to contribute up to \$200 million in equity capital if certain capital thresholds are breached, including up to \$80 million to be contributed by Nasdaq. See “Equity Method Investments,” of Note 6, “Investments,” to the consolidated financial statements for further discussion of our equity method investment in OCC.

Offer for Oslo Børs VPS

For further discussion of our offer for Oslo Børs VPS, see “Offer for Oslo Børs VPS,” of Note 21, “Subsequent Events,” to the consolidated financial statements.

Non-Cash Contingent Consideration

See “Non-Cash Contingent Consideration,” of Note 19, “Commitments, Contingencies and Guarantees,” to the consolidated financial statements for further discussion.

Off-Balance Sheet Arrangements

For discussion of off-balance sheet arrangements see:

Note 15, “Clearing Operations,” to the consolidated financial statements for further discussion of our non-cash default fund contributions and margin deposits received for clearing operations; and

Note 19, “Commitments, Contingencies and Guarantees,” to the consolidated financial statements for further discussion of:

Guarantees issued and credit facilities available;

Lease commitments;

Other guarantees;
Non-cash contingent consideration;
Escrow agreements;
Routing brokerage activities;
Acquisition of Cinnober;
Other commitment;
Offer for Oslo Børs VPS;
Legal and regulatory matters; and
Tax audits.

Quantitative and Qualitative Disclosures About Market Risk

Market risk represents the potential for losses that may result from changes in the market value of a financial instrument due to changes in market conditions. As a result of our operating, investing and financing activities, we are exposed to market risks such as interest rate risk and foreign currency exchange rate risk. We are also exposed to credit risk as a result of our normal business activities.

We have implemented policies and procedures to measure, manage, monitor and report risk exposures, which are reviewed regularly by management and the board of directors. We identify risk exposures and monitor and manage such risks on a daily basis.

We perform sensitivity analyses to determine the effects of market risk exposures. We may use derivative instruments solely to hedge financial risks related to our financial positions or risks that are incurred during the normal course of business. We do not use derivative instruments for speculative purposes.

Interest Rate Risk

We are subject to the risk of fluctuating interest rates in the normal course of business. Our exposure to market risk for changes in interest rates relates primarily to our financial investments and debt obligations which are discussed below.

Financial Investments

As of December 31, 2018, our investment portfolio was primarily comprised of trading securities, mainly highly rated European government debt securities, which pay a fixed rate of interest. These securities are subject to interest rate risk and will decrease in value if market interest rates increase. If market interest rates were to increase immediately and uniformly by 100 basis points from levels as of December 31, 2018, the fair value of this portfolio would have declined by \$4 million.

Debt Obligations

As of December 31, 2018, substantially all of our debt obligations are fixed-rate obligations. While changes in interest rates will have no impact on the interest we pay on fixed-rate obligations, we are exposed to changes in interest rates as a result of the issuance of our 2019 Notes, borrowings under our 2017 Credit Facility and 2016 Credit Facility, and amounts outstanding from the sale of commercial paper under our commercial paper program, all of which have variable interest rates. As of December 31, 2018, we had principal amounts outstanding of \$500 million on the 2019 Notes, \$100 million under the 2016 Credit Facility, and \$276 million of commercial paper. A hypothetical 100 basis points increase in interest rates on our outstanding 2019 Notes, the 2016 Credit Facility and our outstanding commercial paper would increase annual interest expense by approximately \$9 million based on borrowings as of December 31, 2018.

Foreign Currency Exchange Rate Risk

As a leading global exchange group, we are subject to foreign currency transaction risk. Our primary exposure to foreign currency denominated revenues less transaction-based expenses and operating income for the years ended December 31, 2018 and 2017 are presented in the following table:

	Euro	Swedish Krona	Other Foreign Currencies	U.S. Dollar	Total
	(in millions, except currency rate)				
Year Ended December 31, 2018					
Average foreign currency rate to the U.S. dollar	1.1800	0.1150	#	N/A	N/A
Percentage of revenues less transaction-based expenses	8.9 %	7.3 %	5.2 %	78.6%	100.0%
Percentage of operating income	11.3 %	0.1 %	(7.0)%	95.6%	100.0%
Impact of a 10% adverse currency fluctuation on revenues less transaction-based expenses	\$(23)	\$(18)	\$(13)	\$ —	\$(54)
Impact of a 10% adverse currency fluctuation on operating income	\$(12)	\$—	\$(7)	\$ —	\$(19)
	(in millions, except currency rate)				
Year Ended December 31, 2017					
Average foreign currency rate to the U.S. dollar	1.1273	0.1170	#	N/A	N/A
Percentage of revenues less transaction-based expenses	9.7 %	8.2 %	6.0 %	76.1%	100.0%
Percentage of operating income	15.4 %	2.5 %	(4.9)%	87.0%	100.0%
Impact of a 10% adverse currency fluctuation on revenues less transaction-based expenses	\$(24)	\$(20)	\$(14)	\$ —	\$(58)
Impact of a 10% adverse currency fluctuation on operating income	\$(15)	\$(2)	\$(5)	\$ —	\$(22)

#Represents multiple foreign currency rates.

N/ANot applicable.

* * * * *

Our investments in foreign subsidiaries are exposed to volatility in currency exchange rates through translation of the foreign subsidiaries' net assets or equity to U.S. dollars. Substantially all of our foreign subsidiaries operate in functional currencies other than the U.S. dollar. Fluctuations in currency exchange rates may create volatility in our results of operations as we are required to translate the balance sheets and operational results of these foreign currency denominated subsidiaries into U.S. dollars for consolidated reporting. The translation of foreign subsidiaries' non-U.S. dollar balance sheets into U.S. dollars for consolidated reporting results in a cumulative translation adjustment which is recorded in accumulated other comprehensive loss within stockholders' equity in the Consolidated Balance Sheets.

Our primary exposure to net assets in foreign currencies as of December 31, 2018 is presented in the following table:

	Net Assets	Impact of a 10% Adverse Currency Fluctuation (in millions)
Swedish Krona ⁽¹⁾	\$3,477	\$(348)
Norwegian Krone	176	(18)
Canadian Dollar	120	(12)

British Pound	145	(14)
Euro	89	(9)
Australian Dollar	107	(11)

⁽¹⁾ Includes goodwill of \$2,466 million and intangible assets, net of \$580 million.

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Credit Risk

Credit risk is the potential loss due to the default or deterioration in credit quality of customers or counterparties. We are exposed to credit risk from third parties, including customers, counterparties and clearing agents. These parties may default on their obligations to us due to bankruptcy, lack of liquidity, operational failure or other reasons. We limit our exposure to credit risk by evaluating the counterparties with which we make investments and execute agreements. The financial investment portfolio objective is to invest in securities to preserve principal while maximizing yields, without significantly increasing risk. Credit risk associated with investments is minimized substantially by ensuring that these financial assets are placed with governments which have investment grade ratings, well-capitalized financial institutions and other creditworthy counterparties.

Our subsidiary, Nasdaq Execution Services, may be exposed to credit risk, due to the default of trading counterparties, in connection with the routing services it provides for our trading customers. System trades in cash equities routed to other market centers for members of our cash equity exchanges are routed by Nasdaq Execution Services for clearing to the NSCC. In this function, Nasdaq Execution Services is to be neutral by the end of the trading day, but may be exposed to intraday risk if a trade extends beyond the trading day and into the next day, thereby leaving Nasdaq Execution Services susceptible to counterparty risk in the period between accepting the trade and routing it to the clearinghouse. In this interim period, Nasdaq Execution Services is not novating like a clearing broker but instead is subject to the short-term risk of counterparty failure before the clearinghouse enters the transaction. Once the clearinghouse officially accepts the trade for novation, Nasdaq Execution Services is legally removed from trade execution risk. However, Nasdaq has membership obligations to NSCC independent of Nasdaq Execution Services' arrangements.

Pursuant to the rules of the NSCC and Nasdaq Execution Services' clearing agreement, Nasdaq Execution Services is liable for any losses incurred due to a counterparty or a clearing agent's failure to satisfy its contractual obligations, either by making payment or delivering securities. Adverse movements in the prices of securities that are subject to these transactions can increase our credit risk. However, we believe that the risk of material loss is limited, as Nasdaq Execution Services' customers are not permitted to trade on margin and NSCC rules limit counterparty risk on self-cleared transactions by establishing credit limits and capital deposit requirements for all brokers that clear with NSCC. Historically, Nasdaq Execution Services has never incurred a liability due to a customer's failure to satisfy its contractual obligations as counterparty to a system trade. Credit difficulties or insolvency, or the perceived possibility of credit difficulties or insolvency, of one or more larger or visible market participants could also result in market-wide credit difficulties or other market disruptions.

Execution Access is an introducing broker which operates the trading platform for our Fixed Income business to trade in U.S. Treasury securities. Execution Access has a clearing

arrangement with Industrial and Commercial Bank of China Financial Services LLC, or ICBC. As of December 31, 2018, we have contributed \$15 million of clearing deposits to ICBC in connection with this clearing arrangement. These deposits are recorded in other current assets in our Consolidated Balance Sheets. Some of the trading activity in Execution Access is cleared by ICBC through the Fixed Income Clearing Corporation, with ICBC acting as agent. Execution Access assumes the counterparty risk of clients that do not clear through the Fixed Income Clearing Corporation. Counterparty risk of clients exists for Execution Access between the trade date and settlement date of the individual transactions, which is at least one business day (or more, if specified by the U.S. Treasury issuance calendar). Counterparties that do not clear through the Fixed Income Clearing Corporation are subject to a credit due diligence process and may be required to post collateral, provide principal letters, or provide other forms of credit enhancement to Execution Access for the purpose of mitigating counterparty risk. Daily position trading limits are also enforced for such counterparties.

We have credit risk related to transaction and subscription-based revenues that are billed to customers on a monthly or quarterly basis, in arrears. Our potential exposure to credit losses on these transactions is represented by the receivable balances in our Consolidated Balance Sheets. We review and evaluate changes in the status of our counterparties' creditworthiness. Credit losses such as those described above could adversely affect our consolidated financial position and results of operations.

We also are exposed to credit risk through our clearing operations with Nasdaq Clearing. See Note 15, "Clearing Operations," to the consolidated financial statements for further discussion. Our clearinghouse holds material amounts of clearing member cash deposits which are held or invested primarily to provide security of capital while minimizing credit, market and liquidity risks. While we seek to achieve a reasonable rate of return, we are primarily concerned with preservation of capital and managing the risks associated with these deposits. As the clearinghouse may pass on interest revenues (minus costs) to the members, this could include negative or reduced yield due to market conditions. The following is a summary of the risks associated with these deposits and how these risks are mitigated.

Credit Risk. When the clearinghouse has the ability to hold cash collateral at a central bank, the clearinghouse utilizes its access to the central bank system to minimize credit risk exposures. When funds are not held at a central bank, we seek to substantially mitigate credit risk by ensuring that investments are primarily placed in highly rated government and supranational debt instruments.

Liquidity Risk. Liquidity risk is the risk a clearinghouse may not be able to meet its payment obligations in the right currency, in the right place and the right time. To mitigate this risk, the clearinghouse monitors liquidity requirements closely and maintains funds and assets in a manner which minimizes the risk of loss or delay in the access by the clearinghouse to such funds and assets. For example,

holding funds with a central bank where possible or investing in highly liquid government or supranational debt instruments serves to reduce liquidity risks.

Interest Rate Risk. Interest rate risk is the risk that interest rates rise causing the value of purchased securities to decline. If we were required to sell securities prior to maturity, and interest rates had risen, the sale of the securities might be made at a loss relative to the latest market price. Our clearinghouse seeks to manage this risk by making short term investments of members' cash deposits. In addition, the clearinghouse investment guidelines allow for direct purchases or repurchase agreements of high quality sovereign debt (for example, European government and U.S. Treasury securities), central bank certificates and supranational debt instruments with short dated maturities.

Security Issuer Risk. Security issuer risk is the risk that an issuer of a security defaults on its payment when the security matures. This risk is mitigated by limiting allowable investments and collateral under reverse repurchase agreements to high quality sovereign, government agency or supranational debt instruments.

Critical Accounting Policies and Estimates

The preparation of financial statements and related disclosures in conformity with U.S. GAAP requires management to make judgments, assumptions, and estimates that affect the amounts reported in the consolidated financial statements and accompanying notes. Note 2, "Summary of Significant Accounting Policies," to the consolidated financial statements describes the significant accounting policies and methods used in the preparation of the consolidated financial statements. The accounting policies described below are significantly affected by critical accounting estimates. Such accounting policies require significant judgments, assumptions, and estimates used in the preparation of the consolidated financial statements, and actual results could differ materially from the amounts reported based on these policies.

Revenue Recognition

Corporate Services Revenues

Listing Services Revenues

Listing services revenues primarily include annual renewal fees and initial listing fees. Annual renewal fees do not require any judgments or assumptions by management as these amounts are recognized ratably over the following 12-month period. However, the initial listing fee is allocated to multiple performance obligations including initial and subsequent listing services and corporate solutions services (when a company qualifies to receive these services under the applicable Nasdaq rule), as well as a customer's material right to renew the option to list on our exchanges. In performing this allocation, the standalone selling price of the performance obligations is based on the initial and annual listing fees and the standalone selling price of the corporate solutions services is based on its market value. All listing fees are billed

upfront and the identified performance obligations are satisfied over time since the customer receives and consumes the benefit as Nasdaq provides the listing service. The amount of revenue related to the corporate solutions services performance obligation is recognized ratably over a two-year period, which is based on contract terms, with the remaining revenue recognized ratably over six years which is based on our historical listing experience and projected future listing duration.

Market Technology Revenues

We enter into long-term contracts with customers to develop customized technology solutions, license the right to use software and provide support and other services to our customers which results in these contracts containing multiple performance obligations. We allocate the contract transaction price to each performance obligation using our best estimate of the standalone selling price of each distinct good or service in the contract. In instances where standalone selling price is not directly observable, such as when we do not sell the product or service separately, we determine the standalone selling price predominately through an expected cost plus a margin approach.

We generally recognize revenue over time as our customers simultaneously receive and consume the benefits provided by our performance because our customer controls the asset for which we are creating, our performance does not create an asset with alternative use, and we have a right to payment for performance completed to date. For these services, we recognize revenue over time using costs incurred to date relative to total estimated costs at completion to measure progress toward satisfying our performance obligation. Incurred costs represent work performed, which corresponds with, and thereby depicts, the transfer of control to the customer.

Accounting for our long-term contracts requires judgment relative to assessing risks and their impact on the estimate of revenues and costs. Our estimates are impacted by factors such as the potential for schedule and technical issues, productivity, and the complexity of work performed. When adjustments in estimated total contract costs are required, any changes in the estimated revenues from prior estimates are recognized in the current period for the effect of such change. If estimates of total costs to be incurred on a contract exceed estimates of total revenues, a provision for the entire estimated loss on the contract is recorded in the period in which the loss is determined.

For further discussion related to recognition of these fees, see “Revenue From Contracts with Customers - Listing Services,” and “Revenue From Contracts with Customers - Market Technology,” of Note 2, “Summary of Significant Accounting Policies,” to the consolidated financial statements for further discussion.

Goodwill and Related Impairment

Goodwill represents the excess of purchase price over the value assigned to the net assets, including identifiable intangible assets, of a business acquired. Goodwill is allocated to our reporting units based on the assignment of the fair values of

each reporting unit of the acquired company. We test goodwill for impairment at the reporting unit level annually, or in interim periods if certain events occur indicating that the carrying amount may be impaired, such as changes in the business climate, poor indicators of operating performance or the sale or disposition of a significant portion of a reporting unit. For purposes of performing our goodwill impairment test, our five reporting units are the Market Services segment, the two businesses comprising the Corporate Services segment: Corporate Solutions and Listing Services, the Information Services segment, and the Market Technology segment. We test for impairment during the fourth quarter of our fiscal year using an October 1 measurement date. When testing goodwill for impairment, we have the option of first performing a qualitative assessment to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount as the basis to determine if it is necessary to perform a quantitative goodwill impairment test. In performing a qualitative assessment, we consider the extent to which unfavorable events or circumstances identified, such as changes in economic conditions, industry and market conditions or company specific events, could affect the comparison of the reporting unit's fair value with its carrying amount. If we choose not to complete a qualitative assessment for a given reporting unit, or if the initial assessment indicates that it is more likely than not that the carrying amount of a reporting unit exceeds its estimated fair value, a quantitative test is required.

When assessing goodwill for impairment, our decision to perform a qualitative impairment assessment for a reporting unit in a given year is influenced by a number of factors, including but not limited to, the size of the reporting unit's goodwill, the significance of the excess of the reporting unit's estimated fair value over its carrying amount at the last quantitative assessment date, and the amount of time in between quantitative fair value assessments.

The quantitative goodwill impairment test consists of two steps performed at the reporting unit level.

The first step compares the estimated fair value of each reporting unit to its corresponding carrying amount, including goodwill. The fair value of each reporting unit is estimated using a combination of discounted cash flow valuation, which incorporates assumptions regarding future growth rates, terminal values, and discount rates, as well as guideline public company valuations, incorporating relevant trading multiples of comparable companies and other factors. The estimates and assumptions used consider historical performance and are consistent with the assumptions used in determining future profit plans for each reporting unit, which are approved by our board of directors. If the reporting unit's estimated fair value exceeds its estimated carrying amount, goodwill is not impaired.

If the first step results in the carrying amount exceeding the fair value of the reporting unit, then a second step must be completed in order to determine the amount of goodwill impairment that should be recorded, if any. In the second

step, the implied fair value of the reporting unit's goodwill is determined by allocating the reporting unit's fair value to all of its assets and liabilities other than goodwill in a manner similar to a purchase price allocation. The implied fair value of the goodwill that results from the application of this second step is then compared to the carrying amount of the goodwill and an impairment charge is recorded for any difference.

The following table presents the balances of goodwill for our reportable segments at the time of our 2018 annual impairment test:

	October
	1, 2018
	(in
	millions)
Market Services	\$ 3,435
Corporate Services	503
Information Services	2,283
Market Technology	148
	\$ 6,369

In 2018, we performed a qualitative goodwill impairment test for all reporting units, as the excesses of their fair values over their respective carrying amounts at the time of the quantitative test in 2017 were significant. In conducting the qualitative assessment, we evaluated the performance of each of these reporting units since the last quantitative test, as well as future financial projections to determine if there were any changes in the key inputs used to determine the fair values of each reporting unit. We also considered the qualitative factors in FASB ASC Topic 350,

“Intangibles–Goodwill and Other,” as well as other relevant events and circumstances. Based on the results of the qualitative assessment for each reporting unit, we concluded based on a predominance of positive indicators and the weight of such indicators that the fair values of our reporting units are more likely than not greater than their respective carrying amounts and as a result, quantitative analyses were not needed. No goodwill impairment was recorded in 2018, 2017 and 2016.

Although we believe our estimates of fair value are reasonable, the determination of certain valuation inputs is subject to management’s judgment. Changes in these inputs could materially affect the results of our impairment review. If our forecasts of cash flows or other key inputs are negatively revised in the future, the estimated fair value of each reporting unit would be adversely impacted, potentially leading to an impairment in the future that could materially affect our operating results.

Subsequent to our annual impairment test, no indications of impairment were identified.

Indefinite-Lived Intangible Assets and Related Impairment

Intangible assets deemed to have indefinite useful lives, primarily exchange and clearing registrations, are not amortized but instead are tested for impairment at least annually and more frequently whenever events or changes in circumstances indicate that the fair value of the asset may be less than its carrying amount. Similar to goodwill impairment testing, we

test for impairment of indefinite-lived intangible assets during the fourth quarter of our fiscal year using an October 1 measurement date and may first perform a qualitative assessment, considering similar factors as discussed above in the goodwill impairment discussion, to determine if it is more likely than not that the fair value of the indefinite-lived intangible asset is less than its carrying amount. If we elect to perform or are required to perform a quantitative assessment, the test consists of a comparison of the fair value of the indefinite-lived intangible asset to its carrying amount as of the impairment testing date. If the carrying amount of the indefinite-lived intangible asset exceeds its fair value, an impairment charge is recorded for the difference. The fair value of indefinite-lived intangible assets is primarily determined on the basis of estimated discounted value, using the Greenfield Approach for exchange and clearing registrations and licenses and the relief from royalty approach or excess earnings approach for trade names, both of which incorporate assumptions regarding future revenue projections and discount rates. During our annual indefinite-lived intangible asset impairment test during the fourth quarter of 2018, we performed a qualitative test as the excess fair value of each individual indefinite-lived intangible asset over its respective carrying amount at the time of the quantitative test in 2017 was significant. Based on the results of the qualitative assessment, we concluded based on a predominance of positive indicators and the weight of such indicators that the fair values of our indefinite-lived intangible assets are more likely than not greater than their respective carrying amounts and as a result, quantitative analyses were not needed. There were no indefinite-lived intangible asset impairment charges in 2018 and 2017. Subsequent to our annual indefinite-lived impairment test, no indications of impairment were identified.

In 2016, we recorded a pre-tax, non-cash indefinite-lived intangible asset impairment charge of \$578 million to write off the full value of a trade name from an acquired business due to a continued decline in the operating performance of the business during 2016 and a rebranding of our fixed income business under a single brand called Nasdaq Fixed Income. This charge is recorded in asset impairment charge in the Consolidated Statements of Income for 2016. There were no other impairments of indefinite-lived intangible assets for the year ended December 31, 2016.

Other Long-Lived Assets and Related Impairment

We review our other long-lived assets, such as finite-lived intangible assets, equity method investments and equity securities, as well as property and equipment for potential impairment when there is evidence that events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. The carrying amount of an asset is not recoverable if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset. Fair value of finite-lived intangible assets and property and equipment is based on various valuation techniques. We evaluate our equity method investments and equity securities for other-than-temporary declines in value by considering a variety of factors such as the earnings capacity of the investment

and the fair value of the investment compared to its carrying amount. In addition, for investments where the market value is readily determinable, we consider the underlying stock price as an additional factor. Any required impairment loss is measured as the amount by which the carrying amount of the asset exceeds its fair value and is recorded as a reduction in the carrying amount of the related asset and a charge to operating results.

In 2016, we recorded a pre-tax, non-cash impairment charge of \$7 million to write off the full value of an equity method investment since the fair value of the investment was less than the carrying value and management considered the decline in value to be other-than-temporary. This charge is partially offset by a gain resulting from the sale of a percentage of a separate equity method investment and is recorded in net income from unconsolidated investees in the Consolidated Statements of Income for 2016. No other impairments of equity method investments or equity securities were recorded in 2018, 2017 or 2016.

We recorded pre-tax, non-cash property and equipment asset impairment charges of \$9 million in 2017 and \$8 million in 2016. The impairment charge in 2017 primarily related to the write-off of capitalized software and hardware equipment associated with our 2017 and 2016 acquisitions and is included in merger and strategic initiatives expense in the Consolidated Statements of Income for 2017. The asset impairment charge in 2016 primarily related to fixed assets and capitalized software that were retired and is included in restructuring charges in the Consolidated Statements of Income for 2016. There were no other impairments of property and equipment recorded in 2018, 2017 or 2016.

Income Taxes

Estimates and judgments are required in the calculation of certain tax liabilities and in the determination of the recoverability of certain deferred tax assets, which arise from net operating loss carryforwards, tax credit carryforwards and temporary differences between the tax and financial statement recognition of revenue and expense. Our deferred tax assets are reduced by a valuation allowance if it is more likely than not that some portion or all of the recorded deferred tax assets will not be realized in future periods. Management is required to determine whether a tax position is more likely than not to be sustained upon examination, including resolution of any related appeals or litigation processes, based on the technical merits of the position. Once it is determined that a position meets the recognition thresholds, the position is measured to determine the amount of benefit to be recognized in the consolidated financial statements.

In assessing the need for a valuation allowance, we consider all available evidence including past operating results, the existence of cumulative losses in the most recent fiscal years, estimates of future taxable income and the feasibility of tax planning strategies. In the event that we change our determination as to the amount of deferred tax assets that can be realized, we will adjust our valuation allowance with a corresponding impact to the provision for income taxes in the period in which such determination is made.

In addition, the calculation of our tax liabilities involves uncertainties in the application of tax regulations in the U.S. and other tax jurisdictions. We recognize potential liabilities for anticipated tax audit issues in such jurisdictions based on our estimate of whether, and the extent to which, additional taxes and interest may be due. While we believe that our tax liabilities reflect the probable outcome of identified tax uncertainties, it is reasonably possible that the ultimate resolution of any tax matter may be greater or less than the amount accrued. If events occur and the payment of these amounts ultimately proves unnecessary, the reversal of the liabilities would result in tax benefits being recognized in the period when we determine the liabilities are no longer necessary. If our estimate of tax liabilities proves to be less than the ultimate assessment, a further charge to expense would result.

The Tax Cuts and Jobs Act was enacted on December 22, 2017. This act contained several key provisions, including a reduction of the U.S. corporate income tax rate from 35% to 21%. It also imposed a transition tax on unremitted aggregate accumulated earnings of non-U.S. subsidiaries, which did not impact us and the act also created a new requirement to provide U.S. tax on foreign earnings, global intangible low-taxed income, or GILTI, which was immaterial for 2018. In December 2017, the SEC staff issued Staff Accounting Bulletin No. 118, "Income Tax Accounting Implications of the Tax Cuts and Jobs Act," or SAB 118, which allowed us to record provisional amounts during a measurement period not to extend beyond one year of the enactment date. During the fourth quarter of 2018, we finalized the effects of the new legislation. For further discussion of the impact of the Tax Cuts and Jobs Act on our financial statements, see "Tax Cuts and Jobs Act," of Note 17, "Income Taxes," to the consolidated financial statements.

Recent Accounting Pronouncements

See "Recent Accounting Pronouncements," of Note 2, "Summary of Significant Accounting Policies," to the consolidated financial statements for further discussion of recently adopted and recently issued accounting pronouncements that are applicable to Nasdaq.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Information about quantitative and qualitative disclosures about market risk is incorporated herein by reference from "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations - Quantitative and Qualitative Disclosures About Market Risk."

Item 8. Financial Statements and Supplementary Data.

Nasdaq's consolidated financial statements, including Consolidated Balance Sheets as of December 31, 2018 and 2017, Consolidated Statements of Income for the years ended December 31, 2018, 2017 and 2016, Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018, 2017 and 2016, Consolidated Statements of Changes in Equity for the years ended December 31, 2018, 2017 and 2016, Consolidated Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016 and notes to our consolidated financial statements, together with a report thereon of Ernst & Young LLP, dated February 22, 2019, are attached hereto as pages F-1 through F-51 and incorporated by reference herein.

Summarized Quarterly Financial Data (Unaudited)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	2018	2018	2018	2018
	(in millions, except per share amounts)			
Total revenues	\$1,151	\$1,027	\$964	\$1,136
Transaction-based expenses	(485)	(412)	(364)	(491)
Revenues less transaction-based expenses	666	615	600	645
Total operating expenses	393	346	354	404
Operating income	273	269	246	241
Net income (loss) attributable to Nasdaq	\$177	\$162	\$163	\$(44)
Basic earnings (loss) per share	\$1.06	\$0.98	\$0.99	\$(0.27)
Diluted earnings (loss) per share	\$1.05	\$0.97	\$0.97	\$(0.27)
Cash dividends declared per common share	\$0.82	\$—	\$0.44	\$0.44

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	2017	2017	2017	2017
	(in millions, except per share amounts)			
Total revenues	\$969	\$994	\$965	\$1,019
Transaction-based expenses	(388)	(398)	(362)	(389)
Revenues less transaction-based expenses	581	596	603	630
Total operating expenses	335	354	341	390
Operating income	246	242	262	240
Net income attributable to Nasdaq	\$168	\$146	\$170	\$246
Basic earnings per share	\$1.01	\$0.88	\$1.02	\$1.47
Diluted earnings per share	\$0.99	\$0.87	\$1.00	\$1.45
Cash dividends declared per common share	\$0.32	\$0.38	\$0.38	\$0.38

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

(a) Disclosure controls and procedures. Nasdaq's management, with the participation of Nasdaq's President and Chief Executive Officer, and Executive Vice President, Accounting and Corporate Strategy and Chief Financial Officer, has evaluated the effectiveness of Nasdaq's disclosure controls and procedures (as defined in Rule 13a-15(e) and Rule 15d-15(e) under the Exchange Act) as of the end of the period covered by this report. Based upon that evaluation, Nasdaq's President and Chief Executive Officer and Executive Vice President, Accounting and Corporate Strategy and Chief Financial Officer, have concluded that, as of the end of such period, Nasdaq's disclosure controls and procedures are effective.

(b) Internal control over financial reporting. There have been no changes in Nasdaq's internal control over financial reporting (as defined in Rule 13a-15(f) and Rule 15d-15(f) under the Exchange Act) that occurred during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, Nasdaq's internal control over financial reporting.

Management's Report on Internal Control Over Financial Reporting

Management is responsible for the preparation and integrity of the consolidated financial statements appearing in the reports that we file with the SEC. The consolidated financial statements were prepared in conformity with U.S. generally accepted accounting principles and include amounts based on management's estimates and judgments. Management is also responsible for establishing and maintaining adequate internal control over Nasdaq's financial reporting. Although there are inherent limitations in the effectiveness of any system of internal control over financial reporting, we maintain a system of internal control that is designed to provide reasonable assurance as to the fair and reliable preparation and presentation of the consolidated financial statements, as well as to safeguard assets from unauthorized use or disposition that could have a material effect on the financial statements.

Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) (2013 framework). This evaluation included review of the documentation of controls, evaluation of the design effectiveness of controls, testing of the operating effectiveness of controls and a conclusion on this evaluation. Based on its assessment, our management believes that, as of December 31, 2018, our internal control over financial reporting is effective.

Ernst & Young LLP, an independent registered public accounting firm, has issued an attestation report on Nasdaq's internal control over financial reporting, which is included herein.

Report of Independent Registered Public Accounting Firm
To the Shareholders and the Board of Directors of Nasdaq, Inc.

Opinion on Internal Control over Financial Reporting

We have audited Nasdaq, Inc.'s internal control over financial reporting as of December 31, 2018, 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, Nasdaq, Inc. (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, 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 the Company as of December 31, 2018 and 2017, and the related consolidated statements of income, comprehensive income (loss), changes in equity and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and our report dated February 22, 2019 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 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
New York, New York
February 22, 2019

Item 9B. Other Information

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Information about Nasdaq's directors, as required by Item 401 of Regulation S-K, is incorporated by reference from the discussion under the caption "Board of Directors-Proposal I: Election of Directors" in Nasdaq's Proxy Statement. Information about Nasdaq's executive officers, as required by Item 401 of Regulation S-K, is incorporated by reference from the discussion under the caption "Other Items-Executive Officers" in the Proxy Statement. Information about Section 16 reports, as required by Item 405 of Regulation S-K, is incorporated by reference from the discussion under the caption "Other Items-Section 16(a) Beneficial Ownership Reporting Compliance" in the Proxy Statement. Information about Nasdaq's code of ethics, as required by Item 406 of Regulation S-K, is incorporated by reference from the discussion under the caption "Corporate Governance" in the Proxy Statement. Information about Nasdaq's nomination procedures, audit committee and audit committee financial experts, as required by Items 407(c)(3), 407(d)(4) and 407(d)(5) of Regulation S-K, is incorporated by reference from the discussions under the headings "Board of Directors-Proposal I: Election of Directors" and "Board of Directors-Board Committees" in the Proxy Statement.

Item 11. Executive Compensation

Information about Nasdaq's director and executive compensation, as required by Items 402, 407(e)(4) and 407(e)(5) of Regulation S-K, is incorporated by reference from the discussions under the headings "Board of Directors-Director Compensation" and "Named Executive Officer Compensation" in the Proxy Statement.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

Information about security ownership of certain beneficial owners and management, as required by Item 403 of Regulation S-K, is incorporated by reference from the discussion under the heading "Other Items-Security Ownership of Certain Beneficial Owners and Management" in the Proxy Statement.

Equity Compensation Plan Information

Nasdaq's Equity Plan provides for the issuance of our equity securities to our officers and other employees, directors and consultants. In addition, most employees of Nasdaq and its subsidiaries are eligible to participate in the ESPP, at 85.0% of the fair market value of our common stock on the price calculation date. The Equity Plan and the ESPP have been approved previously by our stockholders. The following table sets forth information regarding outstanding options and shares reserved for future issuance under all of Nasdaq's compensation plans as of December 31, 2018.

Plan Category	Number of shares to be issued upon exercise of outstanding options, warrants and rights ^(a)	Weighted-average exercise price of outstanding options, warrants and rights ^(b)	Number of shares remaining available for future issuance under equity compensation plans (excluding shares reflected in column(a))(c)	
Equity compensation plans approved by stockholders	447,716	\$ 49.19	12,870,957	(2)
Equity compensation plans not approved by stockholders	—	—	—	
Total	447,716	\$ 49.19	12,870,957	(2)

The amounts in this column include only the number of shares to be issued upon exercise of outstanding options, (1) warrants and rights. As of December 31, 2018, we also had 2,735,356 shares to be issued upon vesting of outstanding restricted stock and PSUs.

(2) This amount includes 10,986,965 shares of common stock that may be awarded pursuant to the Equity Plan and 1,883,992 shares of common stock that may be issued pursuant to the ESPP.

Item 13. Certain Relationships and Related Transactions, and Director Independence

Information about certain relationships and related transactions, as required by Item 404 of Regulation S-K, is incorporated herein by reference from the discussion under the heading “Other Items-Certain Relationships and Related Transactions” in the Proxy Statement. Information about director independence, as required by Item 407(a) of Regulation S-K, is incorporated herein by reference from the discussion under the heading “Board of Directors-Proposal I: Election of Directors” in the Proxy Statement.

Item 14. Principal Accountant Fees and Services

Information about principal accountant fees and services, as required by Item 9(e) of Schedule 14A, is incorporated herein by reference from the discussion under the heading “Audit Committee Matters-Annual Evaluation and 2019 Selection of Independent Auditors” in the Proxy Statement.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(a)(1) Financial Statements

See “Index to Consolidated Financial Statements.”

(a)(2) Financial Statement Schedules

All schedules are omitted because they are not applicable or the required information is included in the consolidated financial statements or notes.

(a)(3) Exhibits

Exhibit Index

Exhibit

Number

2.1 Purchase Agreement, dated as of April 1, 2013, among Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.), BGC Partners, Inc., BGC Holdings, L.P., BGC Partners, L.P., and, solely for purposes of certain sections thereof, Cantor Fitzgerald, L.P. (incorporated herein by reference to Exhibit 2.1 to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2013 filed on August 8, 2013).

2.2 Agreement and Plan of Merger, dated as of September 4, 2017, by and among eVestment, Inc., Nasdaq, Inc., Echo Holding Company and Insight Venture Partners, LLC (solely in its capacity as representative for eVestment’s securityholders) (incorporated herein by reference to Exhibit 2.1 to the Current Report on Form 8-K filed on September 8, 2017).†

3.1 Amended and Restated Certificate of Incorporation of Nasdaq (incorporated herein by reference to Exhibit 3.1 to the Current Report on Form 8-K filed on January 28, 2014).

3.1.1 Certificate of Elimination of Nasdaq’s Series A Convertible Preferred Stock (incorporated herein by reference to Exhibit 3.1.1 to the Current Report on Form 8-K filed on January 28, 2014).

3.1.2 Certificate of Amendment of Nasdaq’s Amended and Restated Certificate of Incorporation (incorporated herein by reference to Exhibit 3.1 to the Current Report on Form 8-K filed on November 19, 2014).

3.1.3 Certificate of Amendment of Nasdaq’s Amended and Restated Certificate of Incorporation (incorporated herein by reference to Exhibit 3.1 to the Current Report on Form 8-K filed on September 8, 2015).

3.2 Nasdaq’s By-Laws (incorporated herein by reference to Exhibit 3.2 to the Current Report on Form 8-K filed on November 21, 2016).

4.1 Form of Common Stock certificate (incorporated herein by reference to Exhibit 4.1 to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2015 filed on November 4, 2015).

4.2 Stockholders’ Agreement, dated as of February 27, 2008, between Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.) and Borse Dubai Limited (incorporated herein by reference to Exhibit 10.2 to the Current Report on Form 8-K filed on March 3, 2008).

4.2.1 First Amendment to Stockholders’ Agreement, dated as of February 19, 2009, between Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.) and Borse Dubai Limited (incorporated herein by reference to Exhibit 4.10.1 to the Annual Report on Form 10-K for the year ended December 31, 2008 filed on February 27,

2009).

4.3 Registration Rights Agreement, dated as of February 27, 2008, among Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.), Borse Dubai Limited and Borse Dubai Nasdaq Share Trust (incorporated herein by reference to Exhibit 10.3 to the Current Report on Form 8-K filed on March 3, 2008).

4.3.1 First Amendment to Registration Rights Agreement, dated as of February 19, 2009, among Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.), Borse Dubai Limited and Borse Dubai Nasdaq Share Trust (incorporated herein by reference to Exhibit 4.11.1 to the Annual Report on Form 10-K for the year ended December 31, 2008 filed on February 27, 2009).

4.4 Indenture, dated as of January 15, 2010, between Nasdaq (f/k/a The NASDAQ OMX Group, Inc.) and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to Exhibit 4.1 to the Current Report on Form 8-K filed on January 19, 2010).

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4.5 First Supplemental Indenture, dated as of January 15, 2010, among Nasdaq (f/k/a The NASDAQ OMX Group, Inc.) and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to Exhibit 4.2 to the Current Report on Form 8-K filed on January 19, 2010).

4.6 Second Supplemental Indenture, dated as of December 21, 2010, among Nasdaq (f/k/a The NASDAQ OMX Group, Inc.) and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to Exhibit 4.1 to the Current Report on Form 8-K filed on December 21, 2010).

4.7 Stockholders' Agreement, dated as of December 16, 2010, between Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.) and Investor AB (incorporated herein by reference to Exhibit 4.12 to the Annual Report on Form 10-K for the year ended December 31, 2010 filed on February 24, 2011).

4.8 Indenture, dated as of June 7, 2013, between Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.) and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to Exhibit 4.1 to the Current Report on Form 8-K filed on June 10, 2013).

4.9 First Supplemental Indenture, dated as of June 7, 2013, among Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.), Wells Fargo Bank, National Association, as Trustee, Deutsche Bank AG, London Branch, as paying agent, and Deutsche Bank Luxembourg S.A., as registrar and transfer agent (incorporated herein by reference to Exhibit 4.2 to the Current Report on Form 8-K filed on June 10, 2013).

4.10 Second Supplemental Indenture, dated as of May 29, 2014, among Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.) and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to Exhibit 4.1 to the Current Report on Form 8-K filed on May 30, 2014).

4.11 Third Supplemental Indenture, dated as of May 20, 2016, among Nasdaq, Inc., Wells Fargo Bank, National Association, as Trustee, and HSBC Bank USA, National Association, as paying agent and as registrar and transfer agent (incorporated herein by reference to the Current Report on Form 8-K filed on May 23, 2016).

4.12 Fourth Supplemental Indenture, dated as of June 7, 2016, among Nasdaq, Inc. and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to the Current Report on Form 8-K filed on June 7, 2016).

4.13 Fifth Supplemental Indenture, dated as of September 22, 2017, among Nasdaq, Inc. and Wells Fargo Bank, National Association, as Trustee (incorporated herein by reference to Exhibit 4.1 to the Current Report on Form 8-K filed on September 22, 2017).

4.14 Registration Rights Agreement, dated as of June 28, 2013, by and among Nasdaq, Inc. (f/k/a The NASDAQ OMX Group, Inc.), BGC Partners, Inc., BGC Holdings, L.P. and BGC Partners, L.P. (incorporated herein by reference to Exhibit 10.1 to the Current Report on Form 8-K filed on July 1, 2013).

10.1 Amended and Restated Board Compensation Policy, effective on April 24, 2018 (incorporated herein by reference to Exhibit 10.1 to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 filed on August 1, 2018).*

10.2 Nasdaq Executive Corporate Incentive Plan, effective as of January 1, 2015 (incorporated herein by reference to Exhibit 10.1 to the Current Report on Form 8-K filed on May 11, 2015).*

10.3 Form of Nasdaq Non-Qualified Stock Option Award Certificate (incorporated herein by reference to Exhibit 10.3 to the Annual Report on Form 10-K for the year ended December 31, 2010 filed on February 24, 2011).*

- 10.4 Form of Nasdaq Restricted Stock Unit Award Certificate (employees) (incorporated herein by reference to Exhibit 10.2 to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 filed on August 1, 2018).*
- 10.5 Form of Nasdaq Restricted Stock Unit Award Certificate (directors) (incorporated herein by reference to Exhibit 10.3 to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 filed on August 1, 2018).*
- 10.6 Form of Nasdaq One-Year Performance Share Unit Agreement (incorporated herein by reference to Exhibit 10.4 to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 filed on August 1, 2018).*
- 10.7 Form of Nasdaq Three-Year Performance Share Unit Agreement (incorporated herein by reference to Exhibit 10.5 to the Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 filed on August 1, 2018).*
- 10.8 Form of Nasdaq Continuing Obligations Agreement (incorporated herein by reference to Exhibit 10.1 to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2017 filed on May 10, 2017).*
- 10.9 Amended and Restated Supplemental Executive Retirement Plan, dated as of December 17, 2008 (incorporated herein by reference to Exhibit 10.6 to the Annual Report on Form 10-K for the year ended December 31, 2008 filed on February 27, 2009).*

- 10.9.1 Amendment No. 1 to Amended and Restated Supplemental Executive Retirement Plan, effective as of December 31, 2008 (incorporated herein by reference to Exhibit 10.6.1 to the Annual Report on Form 10-K for the year ended December 31, 2008 filed on February 27, 2009).*
- 10.10 Nasdaq Supplemental Employer Retirement Contribution Plan, dated as of December 17, 2008 (incorporated herein by reference to Exhibit 10.7 to the Annual Report on Form 10-K for the year ended December 31, 2008 filed on February 27, 2009).*
- 10.11 Employment Agreement between Nasdaq and Adena Friedman, made and entered into on November 14, 2016 and effective as of January 1, 2017 (incorporated herein by reference to Exhibit 10.10 to the Annual Report on Form 10-K for the year ended December 31, 2016 filed on March 1, 2017).*
- 10.12 Nonqualified Stock Option Award Certificate to Adena T. Friedman from Nasdaq, Inc. in connection with grant made on January 3, 2017 (incorporated herein by reference to Exhibit 10.1 to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2017 filed on November 7, 2017).*
- 10.13 Employment Offer Letter, dated as of May 10, 2016, between Nasdaq, Inc. and Michael Ptasznik (incorporated herein by reference to Exhibit 10.2 to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2017 filed on May 10, 2017).*
- 10.14 Employment Agreement between Nasdaq and Edward Knight, effective as of July 29, 2018 (incorporated herein by reference to Exhibit 10.1 to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2018 filed on November 6, 2018).*
- 10.15 Employment Agreement between Nasdaq and Bradley J. Peterson, dated August 1, 2016 (incorporated herein by reference to Exhibit 10.1 to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2016 filed on November 8, 2016).*
- 10.16 Nasdaq Change in Control Severance Plan for Executive Vice Presidents and Senior Vice Presidents, effective November 26, 2013 (incorporated herein by reference to Exhibit 10.1 to the Current Report on Form 8-K filed on November 29, 2013).*
- 10.17 Credit Agreement, dated as of April 25, 2017, among Nasdaq, Inc., the various lenders from time to time party thereto, Bank of America, N.A., as administrative agent and an issuing bank, and the other financial institutions party thereto (incorporated herein by reference to Exhibit 10.1 to the Current Report on Form 8-K filed on April 26, 2017).
- 10.18 Credit Agreement, dated March 17, 2016, among Nasdaq, Inc., the various lenders party thereto and Bank of America, N.A., as Administrative Agent (incorporated herein by reference to the Current Report on Form 8-K filed on March 22, 2016).
- 10.18.1 Amendment No. 1 to Credit Agreement, dated as of April 25, 2017, among Nasdaq, Inc., the lenders party thereto and Bank of America, N.A., as administrative agent (incorporated herein by reference to Exhibit 10.2 to the Current Report on Form 8-K filed on April 26, 2017).

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Form of Commercial Paper Dealer Agreement between Nasdaq, Inc., as Issuer, and the Dealer party thereto (incorporated herein by reference to Exhibit 10.3 to the Current Report on Form 8-K filed on April 26, 2017).

<u>11</u>	Statement regarding computation of per share earnings (incorporated herein by reference from Note 13 to the consolidated financial statements under Part II, Item 8 of this Form 10-K).
<u>21.1</u>	List of all subsidiaries.
<u>23.1</u>	Consent of Ernst & Young LLP.
<u>24.1</u>	Powers of Attorney.
<u>31.1</u>	Certification of President and Chief Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (“Sarbanes-Oxley”).
<u>31.2</u>	Certification of Executive Vice President, Accounting and Corporate Strategy and Chief Financial Officer pursuant to Section 302 of Sarbanes-Oxley.
<u>32.1</u>	Certifications Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of Sarbanes-Oxley.
101.INS	XBRL Instance Document.**
101.SCH	XBRL Taxonomy Extension Schema.
101.CAL	XBRL Taxonomy Extension Calculation Linkbase.

101.DEF Taxonomy Extension Definition Linkbase.

101.LAB XBRL Taxonomy Extension Label Linkbase.

101.PRE XBRL Taxonomy Extension Presentation Linkbase.

*Management contract or compensatory plan or arrangement.

The following materials from the Nasdaq, Inc. Annual Report on Form 10-K for the year ended December 31, 2018, formatted in XBRL (eXtensible Business Reporting Language): (i) Consolidated Balance Sheets as of December 31, 2018 and December 31, 2017; (ii) Consolidated Statements of Income for the years ended

**December 31, 2018, 2017 and 2016; (iii) Consolidated Statements of Comprehensive Income (Loss) for the years ended December 31, 2018, 2017 and 2016; (iv) Consolidated Statements of Changes in Equity for the years ended December 31, 2018, 2017 and 2016; (v) Consolidated Statements of Cash Flows for the years December 31, 2018, 2017 and 2016; and (vi) notes to consolidated financial statements.

Schedules have been omitted pursuant to Item 601(b)(2) of Regulation S-K. Nasdaq hereby undertakes to furnish supplementally copies of any of the omitted schedules upon request by the SEC.

(b)Exhibits:

See Item 15(a)(3) above.

(c)Financial Statement Schedules:

All schedules are omitted because they are not applicable or the required information is included in the consolidated financial statements or notes.

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, on February 22, 2019.

Nasdaq, Inc.
(Registrant)

By: /s/ Adena
T.
Friedman
Name: Adena T.
Friedman
President
Title: and Chief
Executive
Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities indicated as of February 22, 2019.

Name	Title
/s/ Adena T. Friedman Adena T. Friedman	President and Chief Executive Officer and Director (Principal Executive Officer)
/s/ Michael Ptasznik Michael Ptasznik	Executive Vice President, Accounting and Corporate Strategy and Chief Financial Officer (Principal Financial Officer)
/s/ Ann M. Dennison Ann M. Dennison	Senior Vice President and Controller (Principal Accounting Officer)
* Michael R. Splinter	Chairman of the Board
* Melissa M. Arnoldi	Director
* Charlene T. Begley	Director
* Steven D. Black	Director
* Essa Kazim	Director
* Thomas A. Kloet	Director
* John D. Rainey	Director

* Director
Lars R. Wedenborn

* Pursuant to Power of Attorney

By: /s/ Edward S. Knight
Edward S. Knight
Attorney-in-Fact

Nasdaq, Inc.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

The following consolidated financial statements of Nasdaq, Inc. and its subsidiaries are presented herein on the page indicated:

<u>Report of Independent Registered Public Accounting Firm</u>	F- <u>2</u>
<u>Consolidated Balance Sheets</u>	F- <u>3</u>
<u>Consolidated Statements of Income</u>	F- <u>4</u>
<u>Consolidated Statements of Comprehensive Income (Loss)</u>	F- <u>5</u>
<u>Consolidated Statements of Changes in Equity</u>	F- <u>6</u>
<u>Consolidated Statements of Cash Flows</u>	F- <u>7</u>
<u>Notes to Consolidated Financial Statements</u>	F- <u>8</u>

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Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of Nasdaq, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Nasdaq, Inc. (the Company) as of December 31, 2018 and 2017, the related consolidated statements of income, comprehensive income (loss), changes in equity and cash flows for each of the three years in the period ended December 31, 2018 and the related notes (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, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, 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, 2018, 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 22, 2019 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB. We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 1986.

New York, New York
February 22, 2019

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Nasdaq, Inc.

Consolidated Balance Sheets

(in millions, except share and par value amounts)

	December 31, 2018	December 31, 2017
Assets		
Current assets:		
Cash and cash equivalents	\$ 545	\$ 377
Restricted cash	41	22
Financial investments, at fair value	268	235
Receivables, net	384	356
Default funds and margin deposits	4,742	3,988
Other current assets	390	532
Total current assets	6,370	5,510
Property and equipment, net	376	400
Goodwill	6,363	6,586
Intangible assets, net	2,300	2,468
Other non-current assets	291	390
Total assets	\$ 15,700	\$ 15,354
Liabilities		
Current liabilities:		
Accounts payable and accrued expenses	\$ 198	\$ 177
Section 31 fees payable to SEC	109	128
Accrued personnel costs	199	170
Deferred revenue	194	161
Other current liabilities	253	130
Default funds and margin deposits	4,742	3,988
Short-term debt	875	480
Total current liabilities	6,570	5,234
Long-term debt	2,956	3,727
Deferred tax liabilities, net	501	225
Non-current deferred revenue	87	126
Other non-current liabilities	137	162
Total liabilities	10,251	9,474
Commitments and contingencies		
Equity		
Nasdaq stockholders' equity:		
Common stock, \$0.01 par value, 300,000,000 shares authorized, shares issued: 170,709,425 at December 31, 2018 and 172,373,432 at December 31, 2017; shares outstanding: 165,165,104 at December 31, 2018 and 167,441,030 at December 31, 2017	2	2
Additional paid-in capital	2,716	3,024
Common stock in treasury, at cost: 5,544,321 shares at December 31, 2018 and 4,932,402 shares at December 31, 2017	(297) (247
Accumulated other comprehensive loss	(1,530) (862
Retained earnings	4,558	3,963
Total Nasdaq stockholders' equity	5,449	5,880
Total liabilities and equity	\$ 15,700	\$ 15,354

See accompanying notes to consolidated financial statements.

Nasdaq, Inc.
 Consolidated Statements of Income
 (in millions, except per share amounts)

	Years Ended December		
	31,	2017	2016
	2018		
Revenues:			
Market Services	\$2,709	\$2,418	\$2,255
Corporate Services	528	501	477
Information Services	714	588	540
Market Technology	270	247	241
Other revenues	56	194	191
Total revenues	4,277	3,948	3,704
Transaction-based expenses:			
Transaction rebates	(1,344)	(1,158)	(1,092)
Brokerage, clearance and exchange fees	(407)	(379)	(336)
Revenues less transaction-based expenses	2,526	2,411	2,276
Operating expenses:			
Compensation and benefits	712	670	665
Professional and contract services	144	153	153
Computer operations and data communications	127	125	111
Occupancy	95	94	86
General, administrative and other	120	82	73
Marketing and advertising	37	31	30
Depreciation and amortization	210	188	170
Regulatory	32	33	35
Merger and strategic initiatives	21	44	76
Restructuring charges	—	—	41
Total operating expenses	1,498	1,420	1,440
Operating income	1,028	991	836
Interest income	10	7	5
Interest expense	(150)	(143)	(135)
Gain on sale of investment security	118	—	—
Net gain on divestiture of businesses	33	—	—
Asset impairment charge	—	—	(578)
Other investment income	7	2	3
Net income from unconsolidated investees	18	15	2
Income before income taxes	1,064	872	133
Income tax provision	606	143	27
Net income attributable to Nasdaq	\$458	\$729	\$106
Per share information:			
Basic earnings per share	\$2.77	\$4.38	\$0.64
Diluted earnings per share	\$2.73	\$4.30	\$0.63
Cash dividends declared per common share	\$1.70	\$1.46	\$1.21

See accompanying notes to consolidated financial statements.

Nasdaq, Inc.

Consolidated Statements of Comprehensive Income (Loss)

(in millions)

	Years Ended		
	December 31,		
	2018	2017	2016
Net income	\$458	\$729	\$106
Other comprehensive income (loss):			
Foreign currency translation gains (losses)	(240)	214	(183)
Income tax benefit (expense)	(11)	(96)	68
Foreign currency translation, net	(251)	118	(115)
Employee benefit plan adjustment gains (losses)	9	(2)	—
Employee benefit plan income tax (benefit) expense	(9)	1	—
Employee benefit plan, net	—	(1)	—
Total other comprehensive income (loss), net of tax ⁽¹⁾	(251)	117	(115)
Comprehensive income (loss) attributable to Nasdaq	\$207	\$846	\$(9)

⁽¹⁾ Excludes a reclassification impact of Tax Reform of \$417 million. See “Tax Cuts and Jobs Act,” of Note 17, “Income Taxes,” for further discussion.

See accompanying notes to consolidated financial statements.

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Nasdaq, Inc.

Consolidated Statements of Changes in Equity

(in millions, except share amounts)

	Number of Common Shares Outstanding	Common Stock at Par Value	Additional Paid-in Capital	Common Stock In Treasury, at Cost	Accumulated Other Comprehensive Loss	Retained Earnings	Total Equity
Balance at December 31, 2015	164,324,270	\$ 2	\$ 3,011	\$(111)	\$ (864)	\$ 3,571	\$ 5,609
Net income	—	—	—	—	—	106	106
Other comprehensive loss	—	—	—	—	(115)	—	(115)
Cash dividends declared per common share	—	—	—	—	—	(200)	(200)
Share repurchase program	(1,547,778)	—	(100)	—	—	—	(100)
Share-based compensation	2,361,699	—	86	—	—	—	86
Stock option exercises, net	1,219,820	—	41	—	—	—	41
Other issuances of common stock, net	(770,790)	—	66	(65)	—	—	1
Issuance of Nasdaq common stock related to a prior acquisition	992,247	—	—	—	—	—	—
Balance at December 31, 2016	166,579,468	\$ 2	\$ 3,104	\$(176)	\$ (979)	\$ 3,477	\$ 5,428
Net income	—	—	—	—	—	729	729
Other comprehensive income	—	—	—	—	117	—	117
Cash dividends declared per common share	—	—	—	—	—	(243)	(243)
Share repurchase program	(2,843,519)	—	(203)	—	—	—	(203)
Share-based compensation	2,384,821	—	70	—	—	—	70
Stock option exercises, net	1,102,830	—	24	—	—	—	24
Other issuances of common stock, net	(774,817)	—	29	(71)	—	—	(42)
Issuance of Nasdaq common stock related to a prior acquisition	992,247	—	—	—	—	—	—
Balance at December 31, 2017	167,441,030	\$ 2	\$ 3,024	\$(247)	\$ (862)	\$ 3,963	\$ 5,880
Net income	—	—	—	—	—	458	458
Other comprehensive loss, excluding reclassification impact of Tax Reform ⁽¹⁾	—	—	—	—	(251)	—	(251)
Reclassification impact of Tax Reform ⁽¹⁾	—	—	—	—	(417)	417	—
Cash dividends declared per common share	—	—	—	—	—	(280)	(280)
Share repurchase program	(4,508,426)	—	(394)	—	—	—	(394)
Share-based compensation	1,528,293	—	69	—	—	—	69
Stock option exercises, net	118,094	—	3	—	—	—	3
Other issuances of common stock, net	(406,134)	—	14	(50)	—	—	(36)
Issuance of Nasdaq common stock related to a prior acquisition	992,247	—	—	—	—	—	—
Balance at December 31, 2018	165,165,104	\$ 2	\$ 2,716	\$(297)	\$ (1,530)	\$ 4,558	\$ 5,449

⁽¹⁾ See “Tax Cuts and Jobs Act,” of Note 17, “Income Taxes,” for further discussion.

See accompanying notes to consolidated financial statements.

Nasdaq, Inc.
Consolidated Statements of Cash Flows
(in millions)

	Year Ended December 31,		
	2018	2017	2016
Cash flows from operating activities:			
Net income	\$458	\$729	\$106
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	210	188	170
Share-based compensation	69	70	86
Deferred income taxes	301	7	(137)
Reversal of certain Swedish tax benefits	41	—	—
Net gain on divestiture of businesses	(33)	—	—
Gain on sale of investment security	(118)	—	—
Asset impairment charge	—	—	578
Net income from unconsolidated investees	(18)	(15)	(2)
Other reconciling items included in net income	15	25	17
Net change in operating assets and liabilities, net of effects of divestiture and acquisitions:			
Receivables, net	(35)	11	73
Other assets	(40)	(30)	(52)
Accounts payable and accrued expenses	33	(12)	5
Section 31 fees payable to SEC	(19)	20	5
Accrued personnel costs	37	(41)	27
Deferred revenue	7	(29)	(75)
Other liabilities	120	(14)	(25)
Net cash provided by operating activities	1,028	909	776
Cash flows from investing activities:			
Purchases of securities	(421)	(392)	(468)
Proceeds from sales and redemptions of securities	374	424	411
Proceeds from divestiture of businesses, net	286	—	—
Proceeds from sale of investment security	169	—	—
Acquisition of businesses, net of cash and cash equivalents acquired and other investment activities	(101)	(778)	(1,466)
Purchases of property and equipment	(111)	(144)	(134)
Net cash provided by (used in) investing activities	196	(890)	(1,657)
Cash flows from financing activities:			
Proceeds from (repayments of) commercial paper, net	(205)	480	—
Repayments of long-term debt	(115)	(708)	(1,156)
Payment of debt extinguishment cost	—	(9)	—
Proceeds from long-term debt issuances, net of debt issuance costs	—	648	2,456
Repurchases of common stock	(394)	(203)	(100)
Dividends paid	(280)	(243)	(200)
Proceeds received from employee stock activity	17	53	54
Payments related to employee shares withheld for taxes	(50)	(71)	(65)
Proceeds of customer funds	—	—	(38)
Other financing activities	—	—	(3)
Net cash (used in) provided by financing activities	(1,027)	(53)	948
Effect of exchange rate changes on cash and cash equivalents and restricted cash	(10)	15	(6)
Net increase (decrease) in cash and cash equivalents and restricted cash	187	(19)	61

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Cash and cash equivalents and restricted cash at beginning of period	399	418	357
Cash and cash equivalents and restricted cash at end of period	\$586	\$399	\$418
Supplemental Disclosure Cash Flow Information			
Cash paid for:			
Interest	\$148	\$129	\$119
Income taxes, net of refund	\$221	\$154	\$191

See accompanying notes to consolidated financial statements.

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Nasdaq, Inc.

Notes to Consolidated Financial Statements

1. Organization and Nature of Operations

Nasdaq, Inc. is a leading provider of trading, clearing, marketplace technology, regulatory, securities listing, information and public and private company services. Our global offerings are diverse and include trading and clearing across multiple asset classes, trade management services, market data products, financial indexes, investment data and analytics, capital formation solutions, corporate solutions, and market technology products and services. Our technology powers markets across the globe, supporting equity derivative trading, clearing and settlement, cash equity trading, fixed income trading, trading surveillance and many other functions.

We manage, operate and provide our products and services in four business segments: Market Services, Corporate Services, Information Services and Market Technology.

Market Services

Our Market Services segment includes our Equity Derivative Trading and Clearing, Cash Equity Trading, FICC and Trade Management Services businesses. We operate multiple exchanges and other marketplace facilities across several asset classes, including derivatives, commodities, cash equity, debt, structured products and ETPs. In addition, in some countries where we operate exchanges, we also provide broker services, clearing, settlement and central depository services. Our transaction-based platforms provide market participants with the ability to access, process, display and integrate orders and quotes. The platforms allow the routing and execution of buy and sell orders as well as the reporting of transactions, providing fee-based revenues.

In the U.S., we operate six electronic options exchanges and three cash equity exchanges. The Nasdaq Stock Market, the largest of our cash equities exchanges, is the largest single venue of liquidity for trading U.S.-listed cash equities. We also operate an electronic platform for trading of U.S. Treasuries and NFX, a U.S. based designated contract market which lists cash-settled energy derivatives based on key energy benchmarks including oil, natural gas and U.S. power. In addition, we also operate a Canadian exchange for the trading of Canadian-listed securities.

In Europe, we operate exchanges in Stockholm (Sweden), Copenhagen (Denmark), Helsinki (Finland), and Reykjavik (Iceland), as well as the clearing operations of Nasdaq Clearing, as Nasdaq Nordic. We also operate exchanges in Tallinn (Estonia), Riga (Latvia) and Vilnius (Lithuania) as Nasdaq Baltic. Collectively, Nasdaq Nordic and Nasdaq Baltic offer trading in cash equities, depository receipts, warrants, convertibles, rights, fund units and ETFs, as well as trading and clearing of derivatives and clearing of resale and repurchase agreements.

Nasdaq Commodities is the brand name for Nasdaq's European commodity-related products and services. Nasdaq

Commodities' offerings include derivatives in oil, power, natural gas and carbon emission markets, seafood, electricity certificates and clearing services. These products are listed on two of Nasdaq's derivatives exchanges, Nasdaq Oslo ASA and NFX.

Through our Trade Management Services business, we provide market participants with a wide variety of alternatives for connecting to and accessing our markets via a number of different protocols used for quoting, order entry, trade reporting, and connectivity to various data feeds. We also provide data center services, including co-location to market participants, whereby we offer firms cabinet space and power to house their own servers and other equipment within our data centers. Our broker services operations offer technology and customized securities administration solutions to financial participants in the Nordic market.

Corporate Services

Our Corporate Services segment includes our Corporate Solutions and Listing Services businesses.

Our Corporate Solutions business serves corporate clients, including companies listed on our exchanges and private companies. We help organizations enhance their ability to understand and expand their global shareholder base, and improve corporate governance through our suite of advanced technology, analytics, and consultative services. In April 2018, we sold our Public Relations Solutions and Digital Media Services businesses. See "2018 Divestiture," of Note 3, "Acquisitions and Divestiture," for further discussion. As of December 31, 2018, our Corporate Solutions business included our investor relations intelligence, board & leadership and our governance, risk & compliance products and services.

For segment reporting purposes, we have included the revenues and expenses of the Public Relations Solutions and Digital Media Services businesses in corporate items, which were part of the Corporate Solutions business, within our Corporate Services segment, prior to the date of sale. See Note 20, "Business Segments," for further discussion. In early 2018, we realigned our businesses to better serve the needs of our corporate clients. As a result, beginning in the second quarter of 2018, our B Wise internal audit, regulatory compliance management, and operational risk management software solutions are now offered as part of governance, risk & compliance products and services within our Corporate Solutions business. B Wise was previously part of our Market Technology segment. As of December 31, 2018, B Wise has been classified as held for sale. See Note 5, "Assets and Liabilities Held for Sale," for further discussion. In February 2019, we entered into an agreement to sell B Wise. See "Agreement to Sell B Wise," of Note 21, "Subsequent Events," for further discussion. Our Listing Services business includes our U.S. and European Listing Services businesses. We operate a variety of listing

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platforms around the world to provide multiple global capital raising solutions for private and public companies. Our main listing markets are The Nasdaq Stock Market and the Nasdaq Nordic and Nasdaq Baltic exchanges. Through Nasdaq First North, our Nordic and Baltic operations also offer alternative marketplaces for smaller companies and growth companies. Our Listing Services business also includes NPM, which provides liquidity solutions for private companies and private funds.

In December 2018, we launched a Corporate Bond exchange for the listing and trading of corporate bonds. The new exchange operates pursuant to The Nasdaq Stock Market exchange license and is powered by the Nasdaq Financial Framework, similar to the Nasdaq Fixed Income platform. Surveillance is conducted by the Nasdaq regulatory team, assisted by our SMARTS surveillance solution.

As of December 31, 2018, there were 3,058 total listings on The Nasdaq Stock Market, including 392 ETPs. The combined market capitalization was approximately \$11.1 trillion. In Europe, the Nasdaq Nordic and Nasdaq Baltic exchanges, together with Nasdaq First North, were home to 1,019 listed companies with a combined market capitalization of approximately \$1.3 trillion.

Information Services

Beginning in the second quarter of 2018, our Information Services segment was recategorized into the following businesses:

• Market Data;

• Index; and

• Investment Data & Analytics.

Prior to the second quarter, our Information Services segment was comprised of our Data Products and our Index Licensing and Services businesses.

Our Market Data business sells and distributes historical and real-time quote and trade information to the sell-side, the buy-side, retail online brokers, proprietary trading shops, other venues, internet portals and data distributors. Our market data products enhance transparency of market activity within our exchanges and provide critical information to professional and non-professional investors globally.

Our Index business develops and licenses Nasdaq-branded indexes, associated derivatives, and financial products and also provides custom calculation services for third-party clients. As of December 31, 2018, we had 365 ETPs licensed to Nasdaq's indexes which had \$172 billion in assets under management.

Our Investment Data & Analytics business is a leading content and analytics cloud-based solutions provider used by asset managers, investment consultants and asset owners to help facilitate better investment decisions. Additionally, the Nasdaq Fund Network gathers and distributes daily net asset values from over 35,000 funds and other investment vehicles across North America.

Market Technology

Our Market Technology segment is a leading global technology solutions provider and partner to exchanges, clearing organizations, central securities depositories, regulators, banks, brokers, buy-side firms and corporate businesses. Our Market Technology business is the sales channel for our complete global offering to other marketplaces.

Market Technology provides technology solutions for trading, clearing, settlement, surveillance and information dissemination to markets with wide-ranging requirements, from the leading markets in the U.S., Europe and Asia to emerging markets in the Middle East, Latin America, and Africa. Our marketplace solutions can handle a wide array of assets, including cash equities, equity derivatives, currencies, various interest-bearing securities, commodities and energy products, and are currently powering more than 100 marketplaces in 50 countries. Market Technology also provides market surveillance services to broker-dealer firms worldwide, as well as risk management solutions.

As discussed above under "Corporate Services," as of the second quarter of 2018, our BWISE business, which was previously part of our Market Technology segment, is now offered as part of our Corporate Solutions business.

2. Summary of Significant Accounting Policies

Basis of Presentation and Principles of Consolidation

The consolidated financial statements are prepared in accordance with U.S. GAAP and include the accounts of Nasdaq, its wholly-owned subsidiaries and other entities in which Nasdaq has a controlling financial interest. When we do not have a controlling interest in an entity but exercise significant influence over the entity's operating and

financial policies, such investment is accounted for under the equity method of accounting. We recognize our share of earnings or losses of an equity method investee based on our ownership percentage. See “Equity Method Investments,” of Note 6, “Investments,” for further discussion of our equity method investments.

The accompanying consolidated financial statements reflect all adjustments which are, in the opinion of management, necessary for a fair statement of the results. These adjustments are of a normal recurring nature. All significant intercompany accounts and transactions have been eliminated in consolidation.

Certain prior year amounts have been reclassified to conform to the current year presentation. On January 1, 2018, we adopted Topic 606 using the full retrospective method which required restatement of 2017 and 2016 financial statements.

Use of Estimates

The preparation of consolidated financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts and the disclosure of contingent amounts in the consolidated

financial statements and accompanying notes. Actual results could differ from those estimates.

Foreign Currency

Foreign denominated assets and liabilities are remeasured into the functional currency at exchange rates in effect at the balance sheet date and recorded through the income statement. Gains or losses resulting from foreign currency transactions are remeasured using the rates on the dates on which those elements are recognized during the period, and are included in general, administrative and other expense in the Consolidated Statements of Income.

Translation gains or losses resulting from translating our subsidiaries' financial statements from the local functional currency to the reporting currency, net of tax, are included in accumulated other comprehensive loss within stockholders' equity in the Consolidated Balance Sheets. Assets and liabilities are translated at the balance sheet date while revenues and expenses are translated at the date the transaction occurs or at an applicable average rate.

Cash and Cash Equivalents

Cash and cash equivalents include all non-restricted cash in banks and highly liquid investments with original maturities of 90 days or less at the time of purchase. Such equivalent investments included in cash and cash equivalents in the Consolidated Balance Sheets were \$198 million as of December 31, 2018 and \$183 million as of December 31, 2017. Cash equivalents are carried at cost plus accrued interest, which approximates fair value due to the short maturities of these investments.

Restricted Cash

Current restricted cash, which was \$41 million as of December 31, 2018 and \$22 million as of December 31, 2017, is restricted from withdrawal due to a contractual or regulatory requirement or not available for general use and is classified as restricted cash in the Consolidated Balance Sheets. As of December 31, 2018 and 2017, current restricted cash primarily includes restricted cash held for our trading and clearing businesses.

Receivables, net

Our receivables are concentrated with our member firms, market data distributors, listed companies, corporate solutions and market technology customers. Receivables are shown net of a reserve for uncollectible accounts. The reserve for bad debts is maintained at a level that management believes to be sufficient to absorb estimated losses in the accounts receivable portfolio. The reserve is increased by the provision for bad debts which is charged against operating results and decreased by the amount of charge-offs, net of recoveries. The provision for bad debts is included in general, administrative and other expense in the Consolidated Statements of Income. The amount charged against operating results is based on several factors including, but not limited to, the length of time a receivable is past due and our historical experience with the particular customer. In circumstances where a specific customer's inability to meet its

financial obligations is known (i.e., bankruptcy filings), we record a specific provision for bad debts against amounts due to reduce the receivable to the amount we reasonably believe will be collected. Accounts receivable are written-off against the reserve for bad debts when collection efforts cease. Due to changing economic, business and market conditions, we review the reserve for bad debts monthly and make changes to the reserve through the provision for bad debts as appropriate. If circumstances change (i.e., higher than expected defaults or an unexpected material adverse change in a major customer's ability to pay), our estimates of recoverability could be reduced by a material amount. The total reserve netted against receivables in the Consolidated Balance Sheets was \$13 million as of December 31, 2018, \$9 million as of December 31, 2017 and \$13 million as of December 31, 2016. The changes in the balance between periods was immaterial.

Investments

Purchases and sales of investment securities are recognized on settlement date.

Financial investments, at fair value

Financial investments, at fair value are primarily comprised of highly rated European government debt securities bought principally to meet regulatory capital requirements mainly for our clearing operations at Nasdaq Clearing. These investments are classified as trading securities as they are generally sold in the near term. Changes in fair value of trading securities are included in other investment income. Debt securities that are classified as available-for-sale investment securities are primarily comprised of commercial paper and are carried at fair value with unrealized gains and losses, net of tax, reported in accumulated other comprehensive loss within stockholders' equity in the

Consolidated Balance Sheets. Realized gains and losses on these securities are included in earnings upon disposition of the securities using the specific identification method. In addition, realized losses are recognized when management determines that a decline in value is other than temporary, which requires judgment regarding the amount and timing of recovery. For financial investments that are classified as available-for-sale securities, we also consider the extent to which cost exceeds fair value, the duration of that difference, management's judgment about the issuer's current and prospective financial condition, as well as our intent and ability to hold the security until recovery of the unrealized losses.

Fair value of both trading and available-for-sale investment securities is generally obtained from third party pricing sources. When available, quoted market prices are used to determine fair value. If quoted market prices are not available, fair values are estimated using pricing models with observable market inputs. The inputs to the valuation models vary by the type of security being priced but are typically benchmark yields, reported trades, broker-dealer quotes, and prices of similar assets. Pricing models generally do not entail material subjectivity because the methodologies employed use inputs observed from active markets. See "Fair Value Measurements," below for further discussion of fair value measures.

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Equity Securities

Our investments in equity securities are included in other non-current assets in the Consolidated Balance Sheets, as we intend to hold these investments for more than one year. On January 1, 2018, we adopted ASU 2016-01 which requires that investments in equity securities (excluding equity method investments) be measured at fair value with changes in fair value recognized in net income. Equity securities are no longer classified as trading or available-for-sale.

We elected the measurement alternative for equity securities which were historically accounted for under the cost method of accounting. Since these equity securities do not have readily determinable fair values, they are measured at cost, less any impairment, plus or minus changes resulting from observable price changes in orderly transactions for the identical or a similar investment of the same issuer. We assess relevant transactions that occur on or before the balance sheet date to identify observable price changes, and we regularly monitor these investments to evaluate whether there is an indication that the investment is impaired, based on the implied value of recent company financings, public market prices of comparable companies, and general market conditions. If a qualitative assessment indicates that the security is impaired, Nasdaq will estimate the fair value of the security, and if the fair value is less than the carrying amount of the security, recognize an impairment loss in net income equal to the difference between the carrying amount and fair value. There was no impact on our consolidated financial statements as a result of this change. For the years ended December 31, 2018, 2017 and 2016, no impairment charges were recorded on our equity securities and there were no upward or downward adjustments recorded.

Equity Method Investments

In general, the equity method of accounting is used when we own 20% to 50% of the outstanding voting stock of a company or when we are able to exercise significant influence over the operating and financial policies of a company. We have certain investments in which we have determined that we have significant influence and as such account for the investments under the equity method of accounting. We record our pro-rata share of earnings or losses each period and record any dividends as a reduction in the investment balance. We evaluate our equity method investments for other-than-temporary declines in value by considering a variety of factors such as the earnings capacity of the investment and the fair value of the investment compared to its carrying amount. In addition, for investments where the market value is readily determinable, we consider the underlying stock price. If the estimated fair value of the investment is less than the carrying amount and management considers the decline in value to be other than temporary, the excess of the carrying amount over the estimated fair value is recognized in the financial statements as an impairment. In 2016, we recorded a pre-tax, non-cash impairment charge of \$7 million to write off the full value of an equity method investment since the fair value of the investment was less than the carrying value and management considered the decline in value to be other-than-temporary. This charge is partially offset by a gain resulting from the sale of a percentage of a separate equity

method investment and is recorded in net income from unconsolidated investees in the Consolidated Statements of Income for 2016. No other impairments of equity method investments were recorded in 2018, 2017 or 2016.

Default Funds and Margin Deposits

Nasdaq Clearing members' cash contributions are included in default funds and margin deposits in the Consolidated Balance Sheets as both a current asset and a current liability. These balances may fluctuate over time due to changes in the amount of deposits required and whether members choose to provide cash or non-cash contributions. Non-cash contributions include highly rated government debt securities that must meet specific criteria approved by Nasdaq Clearing. Non-cash contributions are pledged assets that are not recorded in the Consolidated Balance Sheets as Nasdaq Clearing does not take legal ownership of these assets and the risks and rewards remain with the clearing members.

Derivative Financial Instruments and Hedging Activities

Non-Designated Derivatives

We use foreign exchange forward contracts to manage foreign currency exposure of intercompany loans, accounts receivable, accounts payable and other balance sheet items. These contracts are not designated as hedges for financial reporting purposes. The change in fair value of these contracts is recognized in general, administrative and other expense in the Consolidated Statements of Income and offsets the foreign currency exposure.

As of December 31, 2018 and 2017, the fair value amounts of our derivative instruments were immaterial.

Net Investment Hedges

Net assets of our foreign subsidiaries are exposed to volatility in foreign currency exchange rates. We may utilize net investment hedges to offset the translation adjustment arising from re-measuring our investment in foreign subsidiaries.

Our 2021 and 2023 Notes have been designated as a hedge of our net investment in certain foreign subsidiaries to mitigate the foreign exchange risk associated with certain investments in these subsidiaries. Any increase or decrease related to the remeasurement of the 2021 and 2023 Notes into U.S. dollars is recorded in accumulated other comprehensive loss within stockholders' equity in the Consolidated Balance Sheets. See "3.875% Senior Unsecured Notes," and "1.75% Senior Unsecured Notes," of Note 9, "Debt Obligations," for further discussion.

Property and Equipment, net

Property and equipment, including leasehold improvements, are carried at cost less accumulated depreciation and amortization. Depreciation and amortization are recognized

using the straight-line method over the estimated useful lives of the related assets, which range from 10 to 40 years for buildings and improvements, 2 to 5 years for data processing equipment, and 5 to 10 years for furniture and equipment.

We develop systems solutions for both internal and external use. Certain costs incurred in connection with developing or obtaining internal use software are capitalized. In addition, certain costs of computer software to be sold, leased, or otherwise marketed as a separate product or as part of a product or process are capitalized beginning when a product's technological feasibility has been established and ending when a product is available for general release.

Technological feasibility is established upon completion of a detailed program design or, in its absence, completion. Prior to reaching technological feasibility, all costs are charged to expense. Unamortized capitalized costs are included in data processing equipment and software, within property and equipment, net in the Consolidated Balance Sheets. Capitalized software costs are amortized on a straight-line basis over the estimated useful lives of the software, generally 3 to 5 years. Amortization of these costs is included in depreciation and amortization expense in the Consolidated Statements of Income.

Leasehold improvements are amortized using the straight-line method over the shorter of their estimated useful lives or the remaining term of the related lease.

See Note 7, "Property and Equipment, net," for further discussion.

Goodwill and Indefinite-Lived Intangible Assets

Goodwill represents the excess of purchase price over the value assigned to the net assets, including identifiable intangible assets, of a business acquired. Goodwill is assessed for impairment annually in the fourth quarter of our fiscal year using an October 1 measurement date, or more frequently if conditions exist that indicate that the asset may be impaired, such as changes in the business climate, poor indicators of operating performance or the sale or disposition of a significant portion of a reporting unit. When testing goodwill for impairment, we have the option of first performing a qualitative assessment to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount as the basis to determine if it is necessary to perform a quantitative goodwill impairment test. In performing a qualitative assessment, we consider the extent to which unfavorable events or circumstances identified, such as changes in economic conditions, industry and market conditions or company specific events, could affect the comparison of the reporting unit's fair value with its carrying amount. If we choose not to complete a qualitative assessment for a given reporting unit, or if the initial assessment indicates that it is more likely than not that the carrying amount of a reporting unit exceeds its estimated fair value, a quantitative test is required.

When assessing goodwill for impairment, our decision to perform a qualitative impairment assessment for a reporting unit in a given year is influenced by a number of factors, including but not limited to, the size of the reporting unit's

goodwill, the significance of the excess of the reporting unit's estimated fair value over its carrying amount at the last quantitative assessment date, and the amount of time in between quantitative fair value assessments.

The quantitative goodwill test consists of two steps:

The first step compares the fair value of each reporting unit with its carrying amount, including goodwill. If the reporting unit's fair value exceeds its carrying amount, goodwill is not impaired.

If the fair value of a reporting unit is less than its carrying amount, the second step of the goodwill test is performed to measure the amount of impairment, if any. An impairment is equal to the excess of the carrying amount of goodwill over its fair value.

We also evaluate indefinite-lived intangible assets for impairment annually in the fourth quarter of our fiscal year using an October 1 measurement date, or more frequently whenever events or changes in circumstances indicate that the fair value of the asset may be less than its carrying amount. Such evaluation includes determining the fair value of the asset and comparing the fair value of the asset with its carrying amount. If the fair value of the indefinite-lived intangible asset is less than its carrying amount, an impairment charge is recognized in an amount equal to the difference.

For indefinite-lived intangible assets impairment testing, we also have the option to first perform a qualitative assessment to determine whether it is more likely than not that the fair value of an indefinite-lived intangible asset is less than the carrying amount. If, after assessing the totality of events or circumstances, we determine that it is more

likely than not that the fair value of an indefinite-lived intangible asset is less than its carrying amount, then we must perform additional testing of the asset. Otherwise, we conclude that no impairment is indicated and further testing is not performed.

There was no impairment of goodwill for the years ended December 31, 2018, 2017 and 2016 and there were no indefinite-lived intangible asset impairment charges in 2018 and 2017. In 2016, we recorded a pre-tax, non-cash indefinite-lived intangible asset impairment charge of \$578 million to write off the full value of a trade name from an acquired business due to a continued decline in the operating performance of the business during 2016 and a rebranding of our fixed income business under a single brand called Nasdaq Fixed Income. This charge is recorded in asset impairment charge in the Consolidated Statements of Income for 2016. There were no other impairments of indefinite-lived intangible assets for the year ended December 31, 2016. Disruptions to our business and events, such as economic weakness or unexpected significant declines in the operating results of any of our reporting units or businesses, may result in goodwill or indefinite-lived intangible asset impairment charges in the future.

Valuation of Other Long-Lived Assets

We review our other long-lived assets, such as finite-lived intangible assets and property and equipment, for potential

impairment when there is evidence that events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. The carrying amount of an asset is not recoverable if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset. Fair value of finite-lived intangible assets and property and equipment is based on various valuation techniques. Any required impairment loss is measured as the amount by which the carrying amount of the asset exceeds its fair value and is recorded as a reduction in the carrying amount of the related asset and a charge to operating results. We recorded pre-tax, non-cash property and equipment asset impairment charges of \$9 million in 2017 and \$8 million in 2016. The impairment charge in 2017 primarily related to the write-off of capitalized software and hardware equipment associated with our 2017 and 2016 acquisitions and is included in merger and strategic initiatives expense in the Consolidated Statements of Income for 2017. The asset impairment charge in 2016 primarily related to fixed assets and capitalized software that were retired and is included in restructuring charges in the Consolidated Statements of Income for 2016. There were no other impairments of property and equipment recorded in 2018, 2017 or 2016.

Revenue Recognition and Transaction-Based Expenses

Revenue From Contracts With Customers

On January 1, 2018, we adopted Topic 606 using the full retrospective method. The adoption of Topic 606 impacted the revenue and expense recognition for our Market Technology business and revenue recognition for our Listing Services business. However, the adoption of Topic 606 did not have a material impact on our consolidated financial statements at the time of adoption or in any prior reporting periods. There was no impact to revenue and expense recognition for our other businesses.

As of January 1, 2016, as a result of the adoption of Topic 606, the impact to retained earnings was immaterial. The following tables present the adjustments to reflect the adoption of Topic 606 on our Consolidated Statements of Income for the years ended December 31, 2017 and 2016 and our Consolidated Balance Sheets as of December 31, 2017 and 2016:

Adjustments to Reflect Adoption of Topic 606

	Year Ended December 31, 2017 2016 (in millions)	
Revenues less transaction-based expenses:		
Market Services	\$—	\$—
Corporate Services	(3)	(3)
Information Services	—	—
Market Technology	(14)	2
Total revenues less transaction-based expenses	\$(17)	\$(1)
Total operating expenses ⁽¹⁾	\$(9)	\$2
Income before income taxes	\$(8)	\$(3)
Income tax provision	(3)	(1)
Net income attributable to Nasdaq	\$(5)	\$(2)
Diluted earnings per share	\$(0.03)	\$(0.01)

⁽¹⁾ Adjustment to reflect the adoption of Topic 606 for the year ended December 31, 2017 and 2016 primarily pertain to our Market Technology business.

Adjustments to Reflect Adoption of Topic 606

	December 31, 2017	December 31, 2016
	(in millions)	

Assets:

Other current assets	\$ (19)	\$ (15)
Other non-current assets	(38)	(46)
Deferred tax assets	2	(1)
Total assets	\$ (55)	\$ (62)

Liabilities:

Deferred revenue	\$ (28)	\$ (24)
Non-current deferred revenue	(20)	(36)
Total liabilities	(48)	(60)

Nasdaq stockholders' equity:

Retained earnings	\$ (7)	\$ (2)
Total Nasdaq stockholders' equity	(7)	(2)

Total liabilities and equity \$ (55) \$ (62)

Additional disclosures required by Topic 606 are provided below.

Contract Balances

Substantially all of our revenues are considered to be revenues from contracts with customers. The related accounts receivable balances are recorded in our Consolidated Balance Sheets as receivables which is net of allowance for doubtful accounts of \$13 million as of December 31, 2018 and \$9 million as of December 31, 2017. The changes in the balance between periods were immaterial. We do not have obligations for warranties, returns or refunds to customers.

For the majority of our contracts with customers, except for our market technology and listings services contracts, our performance obligations are short-term in nature and there is no significant variable consideration.

We do not have revenues recognized from performance obligations that were satisfied in prior periods. We have elected not to provide disclosures about transaction price allocated to unsatisfied performance obligations if contract durations are less than one year. For contract durations that are one-year or greater, we do not have a material portion of transaction price allocated to unsatisfied performance obligations that are not included in deferred revenue other than for our market technology contracts which are discussed below under "Market Technology." Deferred revenue primarily represents our contract liabilities related to our fees for annual and initial listings, market technology, corporate solutions and information services contracts. Deferred revenue is the only significant contract asset or liability impacted by our adoption of Topic 606. See Note 8, "Deferred Revenue," for our discussion on deferred revenue balances, activity, and expected timing of recognition. See "Revenue Recognition" below for further descriptions of our revenue contracts.

Sales commissions earned by our sales force are considered incremental and recoverable costs of obtaining a contract with a customer. These costs are deferred and amortized on a straight-line basis over the period of benefit that we have determined to be the contract term or estimated service periods. Sales commissions for renewal contracts are deferred and amortized on a straight-line basis over the related contractual renewal period. Amortization expense is included in compensation and benefits expense in the Consolidated Statements of Income. The balance of deferred costs and related amortization expense are not material to our consolidated financial statements. We elected the practical expedient of recognizing sales commissions as an expense when incurred if contract durations are one year or less. We also have elected the practical expedient of excluding sales taxes from transaction prices.

Certain judgments and estimates were used in the identification and timing of satisfaction of performance obligations and the related allocation of transaction price and are discussed below. We believe that these represent a faithful depiction of the transfer of services to our customers.

Revenue Recognition

Our primary revenue contract classifications are described below. Though we discuss additional revenue details in our "Management's Discussion and Analysis of Financial

Condition and Results of Operations," the categories below best represent those that depict similar economic characteristics of the nature, amount, timing and uncertainty of our revenues and cash flows.

Market Services

Transaction-Based Trading and Clearing

Transaction-based trading and clearing includes equity derivative trading and clearing, cash equity trading and FICC revenues. Nasdaq charges transaction fees for trades executed on our exchanges, as well as on orders that are routed to and executed on other market venues. Nasdaq charges clearing fees for contracts cleared with Nasdaq Clearing.

In the U.S., transaction fees are based on trading volumes for trades executed on our U.S. exchanges and in Europe, transaction fees are based on the volume and value of traded and cleared contracts. In Canada, transaction fees are based on trading volumes for trades executed on our Canadian exchange.

Nasdaq satisfies its performance obligation for trading services upon the execution of a customer trade and clearing services when a contract is cleared, as trading and clearing transactions are substantially complete when they are executed and we have no further obligation to the customer at that time. Transaction-based trading and clearing fees can be variable and are based on trade volume tiered discounts. Transaction revenues, as well as any tiered volume discounts, are calculated and billed monthly in accordance with our published fee schedules. In the U.S., we also pay liquidity payments to customers based on our published fee schedules. We use these payments to improve the liquidity on our markets and therefore recognize those payments as a cost of revenue.

The majority of our FICC trading and clearing customers are charged transaction fees, as discussed above, which are based on the volume and value of traded and cleared contracts. We also enter into annual fixed contracts with customers trading U.S. Treasury securities. The customers are charged an annual fixed fee which is billed per the agreement, on a monthly or quarterly basis. Revenues earned on fixed contracts are recognized over time on a ratable basis over the contract period beginning on the date that our service is made available to the customer since the customer receives and consumes the benefit as Nasdaq provides the service.

For U.S. equity derivative trading, we credit a portion of the per share execution charge to the market participant that provides the liquidity. For U.S. cash equity trading, for Nasdaq and Nasdaq PSX, we credit a portion of the per share execution charge to the market participant that provides the liquidity and for Nasdaq BX, we credit a portion of the per share execution charge to the market participant that takes the liquidity. We record these credits as transaction rebates that are included in transaction-based expense in the Consolidated Statements of Income. These transaction rebates are paid on a monthly basis and the amounts due are included in accounts payable and accrued expenses in the Consolidated Balance Sheets.

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In the U.S., we pay Section 31 fees to the SEC for supervision and regulation of securities markets. We pass these costs along to our customers through our equity derivative trading and clearing fees and our cash equity trading fees. We collect the fees as a pass-through charge from organizations executing eligible trades on our options exchanges and our cash equity platforms and we recognize these amounts in transaction-based expenses when incurred. Section 31 fees received are included in cash and cash equivalents in the Consolidated Balance Sheets at the time of receipt and, as required by law, the amount due to the SEC is remitted semiannually and recorded as Section 31 fees payable to the SEC in the Consolidated Balance Sheets until paid. Since the amount recorded as revenues is equal to the amount recorded as transaction-based expenses, there is no impact on our revenues less transaction-based expenses. As we hold the cash received until payment to the SEC, we earn interest income on the related cash balances. Under our Limitation of Liability Rule and procedures, we may, subject to certain caps, provide compensation for losses directly resulting from the systems' actual failure to correctly process an order, quote, message or other data into our platform. We do not record a liability for any potential claims that may be submitted under the Limitation of Liability Rule unless they meet the provisions required in accordance with U.S. GAAP. As such, losses arising as a result of the rule are accrued and charged to expense only if the loss is probable and estimable.

Trade Management Services

We provide market participants with a wide variety of alternatives for connecting to and accessing our markets for a fee. We also offer market participants co-location services, whereby we charge firms for cabinet space and power to house their own equipment and servers within our data centers. These participants are charged monthly fees for cabinet space, connectivity and support in accordance with our published fee schedules. These fees are recognized on a monthly basis when the performance obligation is met. We also earn revenues from annual and monthly exchange membership and registration fees. Revenues for providing access to our markets, co-location services and monthly exchange membership and registration fees are recognized on a monthly basis as the service is provided. Revenues from annual fees for exchange membership and registration fees are recognized ratably over the following 12-month period since the customer receives and consumes the benefit as Nasdaq provides the service. We also offer broker services to financial participants in the Nordic market primarily providing flexible back-office systems, which allow customers to entirely or partly outsource their company's back-office functions. Revenues from broker services are based on a fixed basic fee for administration or licensing, maintenance and operations, and an incremental fee depending on the number of transactions completed. Broker services revenues are generally billed and recognized monthly.

Corporate Services

Corporate Solutions

As of December 31, 2018, corporate solutions revenues

primarily include subscription and transaction-based income from our investor relations intelligence, board & leadership and governance, risk & compliance products and services. In April 2018, we completed the sale of our Public Relations Solutions and Digital Media Services businesses. See "2018 Divestiture," of Note 3, "Acquisitions and Divestiture," for further discussion. Subscription-based revenues earned are recognized over time on a ratable basis over the contract period beginning on the date that our service is made available to the customer since the customer receives and consumes the benefit as Nasdaq provides the service. Generally, fees are billed quarterly in advance and the contract provides for automatic renewal. As part of the subscription agreements, customers can also be charged usage fees based upon actual usage of the services provided. Revenues from usage fees are recognized at a point in time upon completion of the service.

Listing Services

Listing services revenues primarily include initial listing fees and annual renewal fees. Under Topic 606, the initial listing fee is allocated to multiple performance obligations including initial and subsequent listing services and corporate solutions services (when a company qualifies to receive these services under the applicable Nasdaq rule), as well as a customer's material right to renew the option to list on our exchanges. In performing this allocation, the standalone selling price of the performance obligations is based on the initial and annual listing fees and the standalone selling price of the corporate solutions services is based on its market value. All listing fees are billed upfront and the identified performance obligations are satisfied over time since the customer receives and consumes

the benefit as Nasdaq provides the listing service. Upon adoption of Topic 606, the amount of revenue related to the corporate solutions services performance obligation is recognized ratably over a two-year period, which is based on contract terms, with the remaining revenue recognized ratably over six years which is based on our historical listing experience and projected future listing duration.

In the U.S., annual renewal fees are charged based on the number of outstanding shares of companies listed in the U.S. at the end of the prior year and are recognized ratably over the following 12-month period since the customer receives and consumes the benefit as Nasdaq provides the service. European annual renewal fees, which are received from companies listed on our Nasdaq Nordic and Nasdaq Baltic exchanges and Nasdaq First North, are directly related to the listed companies' market capitalization on a trailing 12-month basis and are recognized ratably over the following 12-month period since the customer receives and consumes the benefit as Nasdaq provides the service.

Information Services

Market Data Products

Market data products revenues are earned from U.S. and European proprietary market data products. In the U.S., we also earn revenues from U.S. shared tape plans.

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We earn revenues primarily based on the number of data subscribers and distributors of our data. Market data products revenues are subscription-based and are recognized on a monthly basis net of amounts due under revenue sharing arrangements with market participants.

For U.S. tape plans, revenues are collected monthly based on published fee schedules and distributed quarterly to the U.S. exchanges based on a formula required by Regulation NMS that takes into account both trading and quoting activity. Revenues are presented on a net basis as we are acting as an agent in this arrangement.

Market Data Products Revenue Sharing

The most significant component of market data products revenues recorded on a net basis is the UTP Plan revenue sharing in the U.S. All indicators of principal versus agent reporting under U.S. GAAP have been considered in analyzing the appropriate presentation of the revenue sharing. However, the following are the primary indicators of net reporting:

We are the administrator for the plan, in addition to being a participant in the plan. In our unique role as administrator, we facilitate the collection and dissemination of revenues on behalf of the plan participants. As a participant, we share in the net distribution of revenues according to the plan on the same terms as all other plan participants.

The operating committee of the plan, which is comprised of representatives from each of the participants, including us solely in our capacity as a plan participant, is responsible for setting the level of fees to be paid by distributors and subscribers and taking action in accordance with the provisions of the plan, subject to SEC approval.

Risk of loss on the revenue is shared equally among plan participants according to the plan.

The exchanges that comprise Nasdaq Nordic and Nasdaq Baltic do not have any market data products revenue sharing agreements.

Index

We develop and license Nasdaq branded indexes, associated derivatives and financial products as part of our Global Index Family. We also provide index data products and custom calculation services for third-party clients. Revenues primarily include license fees from these branded indexes, associated derivatives and financial products in the U.S. and abroad. We primarily have two types of license agreements: transaction-based licenses and asset-based licenses. Transaction-based licenses are generally renewable agreements. Customers are charged based on transaction volume or a minimum contract amount, or both. If a customer is charged based on transaction volume, we recognize revenue when the transaction occurs. If a customer is charged based on a minimum contract amount, we recognize revenue on a pro-rata basis over the licensing term since the customer receives and consumes the benefit as Nasdaq provides the service. Asset-based licenses are also generally renewable agreements. Customers are charged based on a percentage of assets under management for licensed products,

per the agreement, on a monthly or quarterly basis. These revenues are recognized over the term of the license agreement since the customer receives and consumes the benefit as Nasdaq provides the service. Revenue from index data subscriptions are recognized on a monthly basis.

Investment Data & Analytics

Investment data & analytics revenues are earned from investment content and analytics products. We earn revenues primarily based on the number of content and analytics subscribers and distributors.

Subscription agreements are generally annual in term, payable in advance, and provide for automatic renewal.

Subscription-based revenues are recognized over time on a ratable basis over the contract period beginning on the date that our service is made available to the customer since the customer receives and consumes the benefit as Nasdaq provides the service.

Market Technology

Market Technology provides technology solutions for trading, clearing, settlement, surveillance and information dissemination, as well as risk management solutions. Revenues primarily consist of software, license and support revenues, change request and advisory revenues, and software as a service revenues.

In our Market Technology business, we enter into long-term contracts with customers to develop customized technology solutions, license the right to use software, and provide support and other services to our customers. We also enter into agreements to modify the system solutions sold by Nasdaq after delivery has occurred. In addition, we enter into subscription agreements which allow customers to connect to our servers to access our software.

Our long-term contracts with customers to develop customized technology solutions, license the right to use software and provide support and other services to our customers have multiple performance obligations. The performance obligations are generally: 1) software license and installation service and 2) software support. We have determined that the software license and installation service are not distinct as the license and the customized installation service are inputs to produce the combined output, a functional and integrated software system.

For contracts with multiple performance obligations, we allocate the contract transaction price to each performance obligation using our best estimate of the standalone selling price of each distinct good or service in the contract. In instances where standalone selling price is not directly observable, such as when we do not sell the product or service separately, we determine the standalone selling price predominately through an expected cost plus a margin approach. Contract modifications are routine in the performance of our contracts. Contracts are often modified to account for changes in contract specifications or requirements. In most instances, contract modifications are for goods and services that are not

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distinct, and, therefore, are accounted for as part of the existing contract.

For our long-term contracts, payments are generally made throughout the contract life and can be dependent on either reaching certain milestones or paid upfront in advance of the service period depending on the stage of the contract. For subscription agreements, contract payment terms can be quarterly, annually or monthly, in advance. For all other contracts, payment terms vary.

We generally recognize revenue over time as our customers simultaneously receive and consume the benefits provided by our performance because our customer controls the asset for which we are creating, our performance does not create an asset with alternative use, and we have a right to payment for performance completed to date. For these services, we recognize revenue over time using costs incurred to date relative to total estimated costs at completion to measure progress toward satisfying our performance obligation. Incurred costs represent work performed, which corresponds with, and thereby depicts, the transfer of control to the customer. Contract costs generally include labor and direct overhead. For software support and update services, and for subscription agreements which allow customers to connect to our servers to access our

software, we generally recognize revenue ratably over the service period beginning on the date our service is made available to the customer since the customer receives and consumes the benefit consistently over the period as Nasdaq provides the services.

Accounting for our long-term contracts requires judgment relative to assessing risks and their impact on the estimate of revenues and costs. Our estimates are impacted by factors such as the potential for schedule and technical issues, productivity, and the complexity of work performed. When adjustments in estimated total contract costs are required, any changes in the estimated revenues from prior estimates are recognized in the current period for the effect of such change. If estimates of total costs to be incurred on a contract exceed estimates of total revenues, a provision for the entire estimated loss on the contract is recorded in the period in which the loss is determined.

Other Revenues

Other revenues include the revenues from the Public Relations Solutions and Digital Media Services businesses which were sold in April 2018. Prior to the sale date, these revenues were included in our Corporate Solutions business and were primarily transaction-based revenues.

* * * * *

As stated above, for contract durations that are one-year or greater, we do not have a material portion of transaction price allocated to unsatisfied performance obligations that are not included in deferred revenue other than for our market technology contracts. For our market technology contracts, the following table summarizes the amount of the transaction price allocated to performance obligations that are unsatisfied as of December 31, 2018:

	(in millions)
2019	\$ 255
2020	183
2021	94
2022	58
2023	30
2024 and thereafter	75
Total	\$ 695

Market technology deferred revenue, as discussed in Note 8, "Deferred Revenue," to the consolidated financial statements, represents consideration received that is yet to be recognized as revenue for unsatisfied performance obligations.

The following tables summarize the disaggregation of revenue by major product and service and by segment for the years ended December 31, 2018, 2017 and 2016:

	Year Ended December 31, 2018					Consolidated
	Market Services	Corporate Services	Information Services	Market Technology	Other Revenues	
	(in millions)					
Transaction-based trading and clearing, net	\$666	\$ —	\$ —	\$ —	\$ —	\$ 666
Trade management services	292	—	—	—	—	292
Corporate solutions	—	238	—	—	—	238
Listing services	—	290	—	—	—	290
Market data products	—	—	390	—	—	390
Index	—	—	206	—	—	206
Investment data & analytics	—	—	118	—	—	118
Market technology	—	—	—	270	—	270
Other revenues	—	—	—	—	56	56
Revenues less transaction-based expenses	\$958	\$ 528	\$ 714	\$ 270	\$ 56	\$ 2,526
	Year Ended December 31, 2017					
	Market Services	Corporate Services	Information Services	Market Technology	Other Revenues	Consolidated
	(in millions)					
Transaction-based trading and clearing, net	\$590	\$ —	\$ —	\$ —	\$ —	\$ 590
Trade management services	291	—	—	—	—	291
Corporate solutions	—	234	—	—	—	234
Listing services	—	267	—	—	—	267
Market data products	—	—	369	—	—	369
Index	—	—	171	—	—	171
Investment data & analytics	—	—	48	—	—	48
Market technology	—	—	—	247	—	247
Other revenues	—	—	—	—	194	194
Revenues less transaction-based expenses	\$881	\$ 501	\$ 588	\$ 247	\$ 194	\$ 2,411
	Year Ended December 31, 2016					
	Market Services	Corporate Services	Information Services	Market Technology	Other Revenues	Consolidated
	(in millions)					
Transaction-based trading and clearing, net	\$561	\$ —	\$ —	\$ —	\$ —	\$ 561
Trade management services	266	—	—	—	—	266
Corporate solutions	—	208	—	—	—	208
Listing services	—	269	—	—	—	269
Market data products	—	—	354	—	—	354
Index	—	—	149	—	—	149
Investment data & analytics	—	—	37	—	—	37
Market technology	—	—	—	241	—	241
Other revenues	—	—	—	—	191	191
Revenues less transaction-based expenses	\$827	\$ 477	\$ 540	\$ 241	\$ 191	\$ 2,276

For the year ended December 31, 2018, approximately 63.6% of Market Services revenues were recognized at a point in time and 36.4% were recognized over time. For the year ended December 31, 2017, approximately 62.7% of Market Services revenues were recognized at a point in time and 37.3% were recognized over time. For the year ended December 31, 2016, approximately 63.4% of Market Services revenues were recognized at a point in time and 36.6% were recognized over time. Substantially all revenues from the Corporate Services, Information Services and Market Technology segments were recognized over time for the years ended December 31, 2018, 2017 and 2016.

* * * * *

Earnings Per Share

We present both basic and diluted earnings per share. Basic earnings per share is computed by dividing net income attributable to Nasdaq by the weighted-average number of common shares outstanding for the period. Diluted earnings per share is computed by dividing net income attributable to Nasdaq by the weighted-average number of common shares and common share equivalents outstanding during the period and reflects the assumed conversion of all dilutive securities, which primarily consist of employee stock options, restricted stock, and PSUs. Common share equivalents are excluded from the computation in periods for which they have an anti-dilutive effect. Stock options for which the exercise price exceeds the average market price over the period are anti-dilutive and, accordingly, are excluded from the calculation. PSUs, which are considered contingently issuable, are included in the computation of dilutive earnings per share on a weighted average basis when management determines the related performance criteria are met. See Note 13, "Earnings Per Share," for further discussion.

Pension and Post-Retirement Benefits

Pension and other post-retirement benefit plan information for financial reporting purposes is developed using actuarial valuations. We assess our pension and other post-retirement benefit plan assumptions on a regular basis. In evaluating these assumptions, we consider many factors, including evaluation of the discount rate, expected rate of return on plan assets, mortality rate, healthcare cost trend rate, retirement age assumption, our historical assumptions compared with actual results and analysis of current market conditions and asset allocations. See Note 10, "Retirement Plans," for further discussion.

Discount rates used for pension and other post-retirement benefit plan calculations are evaluated annually and modified to reflect the prevailing market rates at the measurement date of a high-quality fixed-income debt instrument portfolio that would provide the future cash flows needed to pay the benefits included in the benefit obligations as they come due. Actuarial assumptions are based upon management's best estimates and judgment.

The expected rate of return on plan assets for our U.S. pension plans represents our long-term assessment of return expectations which may change based on significant shifts in economic and financial market conditions. The long-term rate of return on plan assets is derived from return assumptions based on targeted allocations for various asset classes. While we consider the pension plans' recent performance and other economic growth and inflation factors, which are supported by long-term historical data, the return expectations for the

targeted asset categories represent a long-term prospective return.

Share-Based Compensation

Nasdaq uses the fair value method of accounting for share-based awards. Share-based awards, or equity awards, include stock options, restricted stock, and PSUs. The fair value of stock options are estimated using the Black-Scholes option-pricing model. The fair value of restricted stock awards and PSUs, other than PSUs granted with market conditions, is determined based on the grant date closing stock price less the present value of future cash dividends. We estimate the fair value of PSUs granted with market conditions using a Monte Carlo simulation model at the date of grant.

We generally recognize compensation expense for equity awards on a straight-line basis over the requisite service period of the award, taking into account an estimated forfeiture rate. Granted but unvested shares are generally forfeited upon termination of employment.

Excess tax benefits or expense related to employee share-based payments, if any, are recognized as income tax benefit or expense in the Consolidated Statements of Income when the awards vest or are settled.

Nasdaq also has an ESPP that allows eligible employees to purchase a limited number of shares of our common stock at six-month intervals, called offering periods, at 85.0% of the lower of the fair market value on the first or the last day

of each offering period. The 15.0% discount given to our employees is included in compensation and benefits expense in the Consolidated Statements of Income.

See Note 11, "Share-Based Compensation," for further discussion of our share-based compensation plans.

Merger and Strategic Initiatives

We incur incremental direct merger and strategic initiative costs relating to various completed and potential acquisitions and other strategic opportunities. These costs include outside advisor fees, deal-related bonuses to certain employees, and other external costs directly related to proposed or closed transactions. We also incur integration costs primarily related to employee termination costs, deal-related bonuses and professional services costs incurred relating to the integrations. As of December 31, 2018, all planned integrations for our 2017 and 2016 acquisitions have been completed. For the years ended December 30, 2018 and December 31, 2017, we also incurred costs related to the divestiture of our Public Relations Solutions and Digital Media Services businesses which primarily included outside advisor fees as well as certain employee termination and lease reserves.

Leases

We expense rent from non-cancellable operating leases, net of sublease income, on a straight line basis, based on future minimum lease payments. The net costs are included in occupancy expense in the Consolidated Statements of Income. See Note 16, "Leases," for further discussion.

In February 2016, the FASB issued ASU 2016-02, "Leases." We adopted this new guidance on January 1, 2019. See "Leases," of "Recent Accounting Pronouncements," below for further discussion.

Fair Value Measurements

Fair value is defined as the price that would be received from selling an asset or paid to transfer a liability, or the exit price, in an orderly transaction between market participants at the measurement date. When determining the fair value measurements for assets and liabilities required or permitted to be either recorded or disclosed at fair value, we consider the principal or most advantageous market in which we would transact, and we also consider assumptions that market participants would use when pricing the asset or liability. Fair value measurement establishes a hierarchy of valuation techniques based on whether the inputs to those valuation techniques are observable or unobservable. Observable inputs reflect market data obtained from independent sources, while unobservable inputs reflect Nasdaq's market assumptions. These two types of inputs create the following fair value hierarchy:

Level 1-Quoted prices for identical instruments in active markets.

Level 2-Quoted prices for similar instruments in active markets; quoted prices for identical or similar instruments in markets that are not active; and model-derived valuations whose inputs are observable or whose significant value drivers are observable.

Level 3-Instruments whose significant value drivers are unobservable.

This hierarchy requires the use of observable market data when available.

See Note 14, "Fair Value of Financial Instruments," for further discussion.

Tax Matters

We use the asset and liability method to determine income taxes on all transactions recorded in the consolidated financial statements. Deferred tax assets (net of valuation allowances) and deferred tax liabilities are presented net by jurisdiction as either a non-current asset or liability in our Consolidated Balance Sheets, as appropriate. Deferred tax assets and liabilities are determined based on differences between the financial statement carrying amounts and the tax basis of existing assets and liabilities (i.e., temporary differences) and are measured at the enacted rates that will be in effect when

these differences are realized. If necessary, a valuation allowance is established to reduce deferred tax assets to the amount that is more likely than not to be realized.

In order to recognize and measure our unrecognized tax benefits, management determines whether a tax position is more likely than not to be sustained upon examination, including resolution of any related appeals or litigation processes, based on the technical merits of the position. Once it is determined that a position meets the recognition thresholds, the position is measured to determine the amount of benefit to be recognized in the consolidated financial statements. Interest and/or penalties related to income tax matters are recognized in income tax expense.

During the fourth quarter of 2018, we finalized the accounting associated with the December 22, 2017 enactment of The Tax Cuts and Jobs Act. For further discussion of the impacts of the tax act and other tax matters, see Note 17, "Income Taxes," to the consolidated financial statements.

Assets Held for Sale

We classify assets or disposal groups as held for sale in the period in which all of the following criteria are met:

- management commits to a plan to sell;
- the asset or disposal group is available for immediate sale in its present condition subject only to terms that are usual and customary for sales of such assets or disposal groups;
- an active program to locate a buyer and other actions required to complete the plan to sell have been initiated;
- the sale is probable within one year;
- the asset or disposal group is being actively marketed for sale at a price that is reasonable in relation to its current fair value; and
- it is unlikely that significant changes to the plan will be made or that the plan will be withdrawn.

Assets and disposal groups classified as held for sale are measured at the lower of their carrying amount or fair value less costs to sell. Any loss resulting from this measurement is recognized in the period in which the held for sale criteria are met. Conversely, gains are not recognized until the date of sale. The fair value of an asset less any costs to sell is assessed each reporting period it remains classified as held for sale, and any change in fair value is reported as an adjustment to the carrying value of the asset, except that increases in fair value are limited to prior decreases recorded. Assets are not depreciated or amortized while they are classified as held for sale. See Note 4, "Assets and Liabilities Held For Sale," for further discussion of our assets held for sale.

Recent Accounting Pronouncements

Accounting Standard	Description	Effective Date	Effect on the Financial Statements or Other Significant Matters
Intangibles - Goodwill and Other - Internal-Use Software In August 2018, the FASB issued ASU 2018-15, "Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract."	This ASU clarifies the accounting for implementation costs of a hosting arrangement and aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). Capitalized implementation costs should be expensed over the term of the hosting arrangement and recognized in the same line item in the statement of income as the hosted service costs. Payments for capitalized implementation costs should be classified in the statement of cash flows in the same manner as payments made for fees associated with the hosting element. Capitalized implementation costs should be presented in the balance sheet in the same line item as a prepayment for the fees of the associated hosting arrangement.	January 1, 2020, with early adoption permitted. We early adopted this standard as of July 1, 2018.	There was no impact to the financial statements as a result of the adoption of this standard, as we are currently accounting for costs incurred in a cloud computing arrangement in accordance with the standard.
Fair Value Measurements In August 2018, the FASB issued ASU 2018-13 "Disclosure Framework—Changes to the Disclosure Requirements for Fair Value Measurement."	This ASU modifies the disclosure requirements on fair value measurements by removing certain disclosure requirements related to the fair value hierarchy, modifying existing disclosure requirements related to measurement uncertainty, and adding new requirements, mainly for Level 3 fair value measurements.	January 1, 2020, with early adoption permitted. We early adopted this standard as of July 1, 2018 on a prospective basis.	There was no impact to the financial statements or our disclosures as a result of the adoption of this standard.

Accounting Standard	Description	Effective Date	Effect on the Financial Statements or Other Significant Matters
Income Statement - Reporting Comprehensive Income	This ASU was issued to address the income tax accounting treatment of the stranded tax effects within other comprehensive income due to the prohibition of backward tracing due to an income tax rate change that was initially recorded in other comprehensive income. This issue came about from the enactment of the Tax Cuts and Jobs Act that changed our income tax rate from 35% to 21%. The ASU changed current accounting whereby an entity may elect to reclassify the stranded tax effect from accumulated other comprehensive income to retained earnings. This ASU simplifies how an entity is required to test goodwill for impairment and removes the second step of the goodwill impairment test, which required a hypothetical purchase price allocation if the fair value of a reporting unit is less than its carrying amount. Goodwill impairment will now be measured using the difference between the carrying amount and the fair value of the reporting unit and the loss recognized should not exceed the total amount of goodwill allocated to that reporting unit. The amendments in this ASU should be applied on a prospective basis.	January 1, 2019, with early adoption permitted. We early adopted this standard as of January 1, 2018.	As a result of the adoption of this standard, we recorded a reclassification of \$417 million related to the Tax Cuts and Jobs Act from accumulated other comprehensive loss to retained earnings within stockholders' equity in the Consolidated Balance Sheets. See "Tax Cuts and Jobs Act," of Note 17, "Income Taxes," for further discussion.
Goodwill		January 1, 2020, with early adoption permitted for interim or annual goodwill impairment tests performed on testing dates after January 1, 2017.	We do not anticipate a material impact on our consolidated financial statements at the time of adoption of this new standard as the carrying amounts of our reporting units have been less than their corresponding fair values in recent years. However, changes in future projections, market conditions and other factors may cause a change in the excess of fair value of our reporting units over their corresponding carrying amounts. We do not anticipate early adoption of this standard.

Accounting Standard	Description	Effective Date	Effect on the Financial Statements or Other Significant Matters
Financial Instruments - Credit Losses In June 2016, the FASB issued ASU 2016-13, "Measurement of Credit Losses on Financial Instruments."	This ASU changes the impairment model for certain financial instruments. The new model is a forward looking expected loss model and will apply to financial assets subject to credit losses and measured at amortized cost and certain off-balance sheet credit exposures. This includes loans, held-to-maturity debt securities, loan commitments, financial guarantees and net investments in leases, as well as trade receivables. For available-for-sale debt securities with unrealized losses, credit losses will be measured in a manner similar to today, except that the losses will be recognized as allowances rather than reductions in the amortized cost of the securities. Under this ASU, at the commencement date, lessees will be required to recognize a lease liability, which is a lessee's obligation to make lease payments arising from a lease, measured on a discounted basis; and a right-of-use asset, which is an asset that represents the lessee's right to use, or control the use of, a specified asset for the lease term. This guidance is not applicable for leases with a term of 12 months or less.	January 1, 2020, with early adoption permitted as of January 1, 2019.	We will adopt this standard on January 1, 2020. We are currently assessing the impact that this standard will have on our consolidated financial statements.
Leases In February 2016, the FASB issued ASU 2016-02, "Leases."	Recognition, measurement and presentation of expenses will depend on classification as a finance or operating lease. The guidance also requires certain quantitative and qualitative disclosures about leasing arrangements. Lessor accounting is largely unchanged. In transition, lessees and lessors are required to recognize and measure leases at the beginning of the earliest period presented using a modified retrospective approach.	January 1, 2019.	See discussion below.

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Leases

We adopted ASU 2016-02 on January 1, 2019. Adoption of the new standard resulted in the recording of a right-of-use asset of \$442 million, a lease liability of \$483 million, as well as the elimination of deferred rent and sublease reserves of \$41 million as of January 1, 2019. The standard did not impact our statements of income and had no impact on our cash flows. Our implementation of this guidance is subject to the same internal controls over financial reporting that we apply to our consolidated financial statements.

Practical Expedients and Accounting Policy Elections

We elected the package of practical expedients permitted under the transition guidance within the standard to not reassess contracts to determine if they contain leases, lease classification and initial direct costs. We also elected the optional transition

method to initially apply the standard at the January 1, 2019 adoption date. As a result, we applied the new lease standard prospectively to leases existing or commencing on or after January 1, 2019. Comparative periods presented will not be restated upon adoption. Similarly, new disclosures under the standard will be made for periods beginning January 1, 2019, and not for prior comparative periods. Prior periods will continue to be reported under guidance in effect prior to January 1, 2019. We made an accounting policy election to treat the lease and non-lease components in a contract as a single performance obligation to the extent that the timing and pattern of transfer are similar for the lease and non-lease components and the lease component qualifies as an operating lease. We also made an accounting policy election not to recognize lease liabilities and right-of-use assets for leases with a term of 12 months or less. We will recognize these lease payments on a straight-line basis over the lease term. We did not elect the practical

expedient related to using hindsight to reevaluate the lease term. Additionally, since our leases do not provide an implicit rate, we used our incremental borrowing rate based on i

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information available at the transition date utilizing the remaining lease term to determine the present value of future payments.

3. Acquisitions and Divestiture

2019 Acquisition

Acquisition of Cinnober

In 2018, we made an all cash recommended public offer to the shareholders and warrant holders of Cinnober, a major Swedish financial technology provider to brokers, exchanges and clearinghouses worldwide. In December 2018, we increased our offer to SEK 87 per share and SEK 121 per warrant, or approximately \$220 million. In January 2019, Nasdaq completed the offer and as of February 2019 controls approximately 99.6% of the total number of shares in Cinnober. Through compulsory acquisition procedures, Nasdaq intends to acquire 100% of the Cinnober shares outstanding. It is not currently known when the proceedings will be completed and when Nasdaq will be able to acquire the Cinnober shares that are the subject of the proceedings. Cinnober is part of our Market Technology segment.

Nasdaq used cash on hand to fund this acquisition.

2018, 2017 and 2016 Acquisitions and 2018 Divestiture

We completed a divestiture in April 2018 and several acquisitions during the years ended December 31, 2018, 2017 and 2016 and included the financial results of such acquisitions in our consolidated financial statements from the respective acquisition dates.

2018 Acquisitions

Acquisition of Quandl

In November 2018, we acquired Quandl, Inc., a leading provider of alternative and core financial data. Quandl is part of our Information Services segment.

Nasdaq used issuances of commercial paper to fund this acquisition.

Acquisition of RedQuarry

In October 2018, we acquired the assets of RedQuarry. RedQuarry is part of our Information Services segment.

2018 Divestiture

In April 2018, we sold our Public Relations Solutions and Digital Media Services businesses which were part of our Corporate Solutions business to West Corporation and recognized a pre-tax net gain on the sale of \$33 million, net of disposal costs (\$14 million after tax), which includes a post-closing working capital adjustment of \$8 million (\$5 million after tax) recorded in September 2018. The total net pre-tax gain is included in net gain on divestiture of businesses in the Consolidated Statements of Income for 2018.

As of December 31, 2017, the assets and liabilities of the above businesses were held for sale. See Note 4, "Assets and Liabilities Held For Sale," for further discussion.

Through a multi-year partnership with West, Nasdaq will continue to provide eligible Nasdaq-listed clients with access to public relations, webcasting and webhosting products and services as part of the terms of the transaction.

As part of the terms of the transaction, we are providing transition services to West, such as technology, finance and facilities related services until mid-2019, and the compensation received for such transition services is being reflected as a reduction to the underlying expenses incurred by Nasdaq to provide such transition services.

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2017 Acquisitions

	Total Net Purchase Consideration Acquired	Total Net Deferred Tax Liability	Acquired Intangible Assets	Goodwill
(in millions)				
eVestment	\$744	\$ (10)	\$ (96)	\$ 405
				\$ 445

The amounts in the table above represent the final allocation of purchase price. The allocation of the purchase price was subject to revision during the measurement period, a period not to exceed 12 months from the acquisition date.

Adjustments to the provisional values, which may include tax and other estimates, during the measurement period are recorded in the reporting period in which the adjustment amounts are determined. In October 2018, we recorded a measurement period adjustment related to our acquisition of eVestment which is discussed below under “Acquisition of eVestment.” The allocation of the purchase price for eVestment was finalized in October 2018.

See “Intangible Assets” below for further discussion of intangible assets acquired in the eVestment acquisition.

Acquisition of eVestment

In October 2017, we acquired eVestment for \$705 million. The aggregate cash consideration of \$744 million, which is net of cash acquired of \$22 million, included \$39 million of estimated tax benefits associated with the transaction. We acquired net liabilities, at fair value, totaling \$10 million and we recorded a net deferred tax liability of \$104 million, which is net of the \$39 million in estimated tax benefits associated with the

transaction. The deferred tax liability recorded of \$143 million relates to differences in the U.S. GAAP and tax basis of our investment in eVestment. In October 2018, we recorded a measurement period adjustment of \$8 million to the estimated fair value of deferred tax assets to reflect a revised assessment following the receipt of new information. The adjustment resulted in an increase to deferred tax assets recorded and a decrease to goodwill. The adjustment did not result in an impact to our Consolidated Statements of Income. eVestment is part of our Information Services segment.

Nasdaq used cash on hand and issuances of commercial paper to fund this acquisition.

Acquisition of Sybenetix

In September 2017, we acquired Sybenetix which is part of our Market Technology segment.

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2016 Acquisitions

	Total Net Purchase Price Considered Acquired (in millions)		Total Net Deferred Tax Liability	Acquired Intangible Assets	Goodwill
ISE	\$ 1,070	\$ 83	\$ (185)	\$ 623	\$ 549
Boardvantage	242	28	(38)	111	141
Marketwired	111	(1)	(5)	31	86
Nasdaq Canada	116	6	(20)	76	54

The amounts in the table above represent the final allocation of purchase price for each acquisition. The allocations of the purchase price were subject to revision during the measurement period, a period not to exceed 12 months from the acquisition date. Adjustments to the provisional values, which may include tax and other estimates, during the measurement period are recorded in the reporting period in which the adjustment amounts are determined. We finalized the allocation of the purchase price for Marketwired and Nasdaq Canada in February 2017. In the second quarter of 2017, we finalized the allocation of the purchase price for Boardvantage and ISE. There were no adjustments to the provisional values during the 12-month measurement period for Nasdaq Canada and ISE. In the second quarter of 2016, we recorded a measurement period adjustment of \$5 million related to our acquisition of Marketwired which is discussed below under “Acquisition of Marketwired.” In the second quarter of 2017, we recorded a measurement period adjustment of \$7 million related to our acquisition of Boardvantage which is discussed below under “Acquisition of Boardvantage.”

See “Intangible Assets” below for further discussion of intangible assets acquired through our 2016 acquisitions.

Acquisition of ISE

In June 2016, we acquired ISE for \$1,070 million. We acquired net assets, at fair value, totaling \$83 million and recorded a net deferred tax liability of \$185 million, comprised of a deferred tax liability of \$266 million and a deferred tax asset of \$81 million, related to differences in the U.S. GAAP and tax basis of our investment in ISE. ISE is part of our Market Services, Information Services and Market Technology segments.

In May 2016, we issued the 2023 Notes and in June 2016, we

issued the 2026 Notes to fund this acquisition. See “1.75% Senior Unsecured Notes,” and “3.85% Senior Unsecured Notes,” of Note 9, “Debt Obligations,” for further discussion.

Acquisition of Boardvantage

In May 2016, we acquired Boardvantage for \$242 million (\$197 million in cash paid plus \$45 million in working capital adjustments, which primarily includes cash acquired). We acquired net assets, at fair value, totaling \$28 million and recorded a net deferred tax liability of \$45 million, comprised of a deferred tax liability of \$46 million and a deferred tax asset of \$1 million, related to differences in the U.S. GAAP and tax basis of our investment in Boardvantage. In the second quarter of 2017, we recorded a measurement period adjustment of \$7 million to the estimated fair value of deferred tax assets to reflect a revised assessment following the receipt of new information.

The adjustment resulted in an increase to deferred tax assets recorded and a decrease to goodwill. The adjustment did not result in an impact to our Consolidated Statements of Income. Boardvantage is part of our Corporate Solutions business within our Corporate Services segment.

Nasdaq borrowed \$197 million under the revolving credit commitment of a previous credit facility to fund this acquisition.

Acquisition of Marketwired

In February 2016, we acquired Marketwired for \$111 million (\$109 million in cash paid plus \$2 million in working capital adjustments). We acquired net liabilities, at fair value, totaling \$1 million and recorded a deferred tax liability of \$10 million related to differences in the U.S. GAAP and tax basis of our investment in Marketwired. In the second quarter of 2016, we recorded a measurement period adjustment of \$5 million to the estimated fair value of deferred tax liabilities to reflect a revised

assessment following the receipt of new information. The adjustment resulted in a decrease to both deferred tax liabilities recorded and goodwill. The adjustment did not result in an impact to our Consolidated Statements of Income. Marketwired was part of our Corporate Solutions business within our Corporate Services segment. Nasdaq borrowed \$109 million under the revolving credit commitment of a previous credit facility to fund this acquisition.

Acquisition of Nasdaq Canada

In February 2016, we acquired Nasdaq Canada for \$116 million

(\$115 million in cash paid plus \$1 million in working capital adjustments). We acquired net assets, at fair value, totaling \$6 million and recorded a deferred tax liability of \$20 million related to differences in the U.S. GAAP and tax basis of our investment in Nasdaq Canada. Nasdaq Canada is part of our Market Services segment and our Data Products business within our Information Services segment.

Nasdaq used cash on hand and borrowed \$55 million under the revolving credit commitment of a previous credit facility to fund this acquisition.

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Intangible Assets

The following table presents the details of significant acquired intangible assets at the date of each acquisition. All acquired

intangible assets with finite lives are amortized using the straight-line method.

	2017	2016			
	eVestment	ISE	Boardvantage	Marketwired	Nasdaq Canada
	(\$ in millions)				
Exchange registrations	\$—	\$467	\$ —	\$ —	\$ —
Discount rate used	—	8.6 %	—	—	—
Estimated average useful life	—	Indefinite	—	—	—
Customer relationships	\$378	\$148	\$ 103	\$ 29	\$ 76
Discount rate used	9.3 %	9.1 %	15.5 %	16.4 %	10.3 %
Estimated average useful life	14	13	14 years	6 years	17
	years	years			years
Trade name	\$13	\$8	\$ 2	\$ 2	\$ —
Discount rate used	9.2 %	8.6 %	15.0 %	15.8 %	—
Estimated average useful life	8	Indefinite	1 year	2 years	—
	years				
Technology	\$14	\$—	\$ 6	\$ —	\$ —
Discount rate used	9.2 %	—	15.5 %	—	—
Estimated average useful life	8	—	5 years	—	—
	years				
Total intangible assets	\$405	\$623	\$ 111	\$ 31	\$ 76

Exchange Registrations

As part of our acquisition of ISE we acquired exchange registrations. The exchange registrations represent licenses that provide ISE with the ability to operate its options exchanges.

Nasdaq views these intangible assets as a perpetual license to operate the exchanges so long as ISE meets its regulatory requirements. Nasdaq selected a variation of the income approach called the Greenfield Approach to value the exchange registrations. The Greenfield Approach refers to a discounted cash flow analysis that assumes the buyer is building the exchange from a start-up business to a normalized level of operations as of the acquisition date. This discounted cash flow model considers the required resources and eventual returns from the build-out of operational exchanges and the acquisition of customers, once the exchange registrations are obtained. The advantage of this

approach is that it reflects the actual expectations that will arise from an investment in the

registrations and it directly values the registrations. The Greenfield Approach relies on assumptions regarding projected revenues, margins, capital expenditures, depreciation, and working capital during the 2 year pre-trade phase, the 10 year ramp-up period, as well as the terminal period.

In developing a discount rate for the exchange registrations, we estimated a weighted-average cost of capital for the overall business and we employed this rate when discounting the cash flows. The resulting discounted cash flows were then tax-effected at the applicable statutory rate.

Customer Relationships

As part of all of our 2017 and 2016 acquisitions, we acquired customer relationships. Customer relationships represent the non-contractual and contractual relationships with customers.

Methodology

For our 2017 and 2016 acquisitions, customer relationships were valued using the income approach, specifically an excess

earnings method. The excess earnings method examines the economic returns contributed by the identified tangible and intangible assets of a company, and then isolates the excess return that is attributable to the intangible asset being valued.

Discount Rate

The discount rates used reflect the amount of risk associated with the hypothetical cash flows for the customer relationships relative to the overall business. In developing a discount rate for the customer relationships, we estimated a weighted-average cost of capital for the overall business and we employed this rate when discounting the cash flows. The resulting discounted cash flows were then tax-effected at the applicable statutory rate.

For our acquisitions of eVestment, Marketwired and Nasdaq Canada, a discounted tax amortization benefit was added to the fair value of the assets under the assumption that the customer relationships would be amortized for tax purposes over a period of 15 years.

Estimated Useful Life

We estimate the useful life based on the historical behavior of the customers and a parallel analysis of the customers using the excess earnings method.

Trade Names

As part of our acquisitions of eVestment and ISE, we acquired trade names. These trade names are recognized in the industry and carry a reputation for quality. As such, the reputation and positive recognition embodied in these trade names are a valuable asset to Nasdaq.

Methodology

The eVestment and ISE trade names were valued using the income approach, specifically the relief-from-royalty method, or RFRM. The RFRM is used to estimate the cost savings that accrue to the owner of an intangible asset who would otherwise have to pay royalties or license fees on revenues earned through the use of the asset. The royalty rate is applied to the projected revenue over the expected remaining life of the intangible asset to estimate royalty savings. The net after-tax royalty savings are calculated for each year in the remaining economic life of the trade name and discounted to present value.

Discount Rate

The discount rates used reflect the amount of risk associated with the hypothetical cash flows for each trade name relative to the overall business as discussed above in "Customer Relationships."

Estimated Useful Life

We have estimated the useful life of the eVestment trade name to be 8 years and the estimated useful life of the ISE trade name to be indefinite based on the number of years the name has been in service, its popularity within the industry, and our intention

to continue to use it in the branding of products.

Technology

As part of our acquisitions of eVestment and Boardvantage, we acquired developed technology.

Methodology

The developed technologies were valued using the income approach, specifically the RFRM as discussed above in "Trade Names."

Discount Rate

The discount rates used reflect the amount of risk associated with the hypothetical cash flows for the developed technology relative to the overall business as discussed above in "Customer Relationships."

Estimated Useful Life

We have estimated the useful life of the eVestment technology to be 8 years and the estimated useful life of the Boardvantage technology to be 5 years.

Pro Forma Results and Acquisition-related Costs

The consolidated financial statements for the years ended December 31, 2018, 2017 and 2016 include the financial results of the above 2018, 2017 and 2016 acquisitions from the date of each acquisition. Pro forma financial results have not been presented since these acquisitions both individually and in the aggregate were not material to our financial results.

Acquisition-related costs for the transactions described above were expensed as incurred and are included in merger and strategic initiatives expense in the Consolidated Statements of Income.

4. Assets and Liabilities Held For Sale

As of December 31, 2018, our B Wise business was recorded as held for sale and as of December 31, 2017, our Public Relations Solutions and Digital Media Services businesses were recorded as held for sale.

2018 Assets and Liabilities Held For Sale

As part of Nasdaq's renewed corporate strategy to embrace our leading technology, information analytics and market strengths, in December 2018, we decided to sell B Wise, our internal audit, regulatory compliance management, and operational risk management software that comprises our governance, risk and compliance product offering. B Wise is part of our Corporate Solutions business within our Corporate Services segment.

We determined that we met all of the criteria to classify the assets and liabilities of B Wise as held for sale as of December 31, 2018. The disposal of B Wise did not represent a strategic shift that would have a major effect on our operations and financial results and is, therefore, not classified as discontinued operations. No impairment charge was recorded for the year ended December 31, 2018 as the carrying amount of the net assets was less than the fair value less costs to sell. Fair value was determined based upon the anticipated sales price of these products and services based on current market conditions and

assumptions made by management, which may differ from actual results and may result in an impairment if market conditions deteriorate.

In February 2019, we entered into an agreement to sell BWISE. Based on the sales price in the agreement, no impairment charge was recorded. See “Agreement to Sell BWISE,” of Note 21, “Subsequent Events,” for further discussion.

2017 Assets and Liabilities Held For Sale

As of December 31, 2017, the Public Relations Solutions and Digital Media Services businesses were classified as held for sale. The disposal of these businesses did not represent a strategic shift that would have had a major effect on our operations and financial results and were, therefore, not classified as discontinued operations.

In April 2018, we sold these businesses. See “2018 Divestiture,” of Note 3, “Acquisitions and Divestiture,” for further discussion. Based on the sales price in the agreement, no impairment charge was recorded at the time of the sale as the carrying amount of the net assets was less than the sales price in the agreement less costs to sell.

Major Classes of Assets and Liabilities Held For Sale

The carrying amounts of the major classes of assets and liabilities that were classified as held for sale at December 31, 2018 and 2017 were as follows:

	December 31, 2018	December 31, 2017
	(in millions)	
Receivables, net	\$13	\$ 27
Property and equipment, net	10	21
Goodwill ⁽¹⁾	47	202
Intangible assets, net ⁽²⁾	16	38
Other assets	3	9
Total assets held for sale ⁽³⁾	\$89	\$ 297
Deferred tax liabilities	\$4	\$ 16
Deferred revenue	12	2
Other current liabilities	4	27
Total liabilities held for sale ⁽⁴⁾	\$20	\$ 45

(1) The assignment of goodwill was based on the relative fair value of the disposal group and the portion of the remaining reporting unit.

(2) Primarily represents customer relationships.

(3) Included in other current assets in the Consolidated Balance Sheets as of December 31, 2018 and 2017.

(4) Included in other current liabilities in the Consolidated Balance Sheets as of December 31, 2018 and 2017.

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5. Goodwill and Acquired Intangible Assets

Goodwill

The following table presents the changes in goodwill by business segment during the year ended December 31, 2018:

	Market Services	Corporate Services	Information Services	Market Technology	Total
	(in millions)				
Balance at December 31, 2017	\$3,546	\$ 490	\$ 2,362	\$ 188	\$6,586
Goodwill acquired	—	—	56	—	56
Measurement period adjustment	—	—	(8)	(8)
Reclassification of goodwill ⁽¹⁾	—	29	—	(29) —
Goodwill reclassified to held for sale ⁽²⁾	—	(47)	—	(47)
Foreign currency translation adjustment	(116)	(17)	(77)
	(14)	(14)	(224)

Balance at December 31, 2018	\$3,430	\$ 455	\$ 2,333	\$ 145	\$6,363
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(1) Concurrent with the realignment of our BWISE internal audit, regulatory compliance management, and operational risk management software solutions from our Market Technology segment to our Corporate Services segment, goodwill was reassigned to the Corporate Services segment using a relative fair value approach.

(2) See Note 5, "Assets and Liabilities Held for Sale," for further discussion.

The goodwill acquired for Information Services shown above relates to our acquisitions of Quandl and RedQuarry. See "2018 Acquisitions," of Note 3, "Acquisitions and Divestiture," for further discussion.

In October 2018, we recorded a measurement period adjustment of \$8 million to the estimated fair value of deferred tax assets related to our acquisition of eVestment. See "Acquisition of eVestment," of Note 3, "Acquisitions and Divestiture," for further discussion of the adjustment.

As of December 31, 2018, the amount of goodwill that is expected to be deductible for tax purposes in future periods is \$807 million.

Goodwill represents the excess of purchase price over the value assigned to the net assets, including identifiable intangible assets, of a business acquired. Goodwill is allocated to our reporting units based on the assignment of the fair values of each reporting unit of the acquired company. We test goodwill for impairment at the reporting unit level annually, or in interim

periods if certain events occur indicating that the carrying amount may be impaired, such as changes in the business climate, poor indicators of operating performance or the sale or disposition of a significant portion of a reporting unit. There was no impairment of goodwill for the years ended

December 31, 2018, 2017 and 2016; however, events such as extended economic weakness or unexpected significant declines in operating results of a reporting unit may result in goodwill impairment charges in the future.

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Acquired Intangible Assets

The following table presents details of our total acquired intangible assets, both finite- and indefinite-lived:

	December 31, 2018				December 31, 2017			
	Gross Amount (in millions)	Accumulated Amortization	Net Amount	Weighted-Average Useful Life (in Years)	Gross Amount (in millions)	Accumulated Amortization	Net Amount	Weighted-Average Useful Life (in Years)
Finite-Lived Intangible Assets								
Technology	\$54	\$(15)	\$39	9	\$65	\$(22)	\$43	8
Customer relationships ⁽¹⁾	1,532	(456)	1,076	18	1,708	(526)	1,182	18
Other	17	(2)	15	8	17	(4)	13	8
Foreign currency translation adjustment	(149)	64	(85)		(111)	46	(65)	
Total finite-lived intangible assets	\$1,454	\$(409)	\$1,045		\$1,679	\$(506)	\$1,173	
Indefinite-Lived Intangible Assets								
Exchange and clearing registrations	\$1,257	\$—	\$1,257		\$1,257	\$—	\$1,257	
Trade names	122	—	122		129	—	129	
Licenses	52	—	52		52	—	52	
Foreign currency translation adjustment	(176)	—	(176)		(143)	—	(143)	
Total indefinite-lived intangible assets	\$1,255	\$—	\$1,255		\$1,295	\$—	\$1,295	
Total intangible assets	\$2,709	\$(409)	\$2,300		\$2,974	\$(506)	\$2,468	

The decrease in the gross amount and accumulated amortization for customer relationships as of December 31, ⁽¹⁾ 2018 compared with 2017 is primarily due to certain intangible assets that became fully amortized in fourth quarter of 2018.

As a result of our decision to sell B Wise, we reclassified certain intangibles assets to held for sale. The following table presents the gross amount, accumulated amortization and net amount of finite-lived and indefinite-lived intangible assets that have been reclassified as assets held for sale as of December 31, 2018. See Note 5, "Assets and Liabilities Held for Sale," for further discussion.

	Gross Amount (in millions)	Accumulated Amortization	Net Amount
Finite-lived intangible assets reclassified as held for sale - customer relationships	\$ 21	\$ (10)	\$ 11
Indefinite-lived intangible assets reclassified as held for sale - trade name	\$ 5	\$ —	\$ 5
Total intangible assets held for sale	\$ 26	\$ (10)	\$ 16

In February 2019, we entered into an agreement to sell B Wise. See “Agreement to Sell B Wise,” of Note 21, “Subsequent Events,” for further discussion.

In addition, in April 2018, in connection with the sale of the Public Relations Solutions and Digital Media Services businesses, we recorded a \$2 million pre-tax, non-cash write-off related to an indefinite-lived intangible asset trade name.

Amortization expense for acquired finite-lived intangible assets was \$109 million for the year ended December 31, 2018, \$92 million for the year ended December 31, 2017, and \$82 million for the year ended December 31, 2016. Amortization expense increased in 2018 and 2017 primarily due to additional amortization expense associated with acquired intangible assets in 2017. These amounts are included in depreciation and amortization expense in the Consolidated Statements of Income.

The estimated future amortization expense (excluding the impact of foreign currency translation adjustments of \$85 million as of December 31, 2018) of acquired finite-lived intangible assets as of December 31, 2018 is as follows:

	(in millions)
2019	\$ 100
2020	98
2021	97
2022	94
2023	92
2024 and thereafter	649
Total	\$ 1,130

6. Investments

The following table presents the details of our investments:

	December 31,	
	2018	2017
	(in millions)	
Trading securities	\$ 259	\$ 221
Available-for-sale investment securities	9	14
Financial investments, at fair value	\$ 268	\$ 235

Equity method investments	\$ 135	\$ 131
Equity securities	\$ 44	\$ 152

Equity securities	\$ 44	\$ 152
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Financial Investments, at Fair Value

Trading Securities

Trading securities, which are included in financial investments, at fair value in the Consolidated Balance Sheets, are primarily comprised of highly rated European government debt securities, of which \$166 million as of December 31, 2018 and \$160 million as of December 31, 2017, are assets primarily utilized to meet regulatory capital requirements, mainly for our clearing operations at Nasdaq Clearing.

Available-for-Sale Investment Securities

As of December 31, 2018 and 2017, available-for-sale investment securities, which are included in financial

investments, at fair value in the Consolidated Balance Sheets, were primarily comprised of commercial paper. As of December 31, 2018 and 2017, the cumulative unrealized gains and losses on these securities were immaterial.

Equity Method Investments

As of December 31, 2018 and December 31, 2017, our equity method investments primarily included equity interests in OCC and EuroCCP N.V.

The carrying amounts of our equity method investments are included in other non-current assets in the Consolidated Balance Sheets.

Net income recognized from our equity interest in the earnings and losses of these equity method investments was \$18 million for the year ended December 31, 2018, \$15 million for the year ended December 31, 2017, and \$2 million for the year ended December 31, 2016. The change in the year ended December 31, 2018 compared with the same period in 2017 is primarily due to an increase in income recognized from our investments in OCC and EuroCCP N.V. The

change in the year ended December 31, 2017 compared with the same period in 2016 relates to our additional 20.0% ownership interest in OCC, which we acquired in connection with our acquisition of ISE in June 2016, bringing our total ownership interest in OCC to 40.0%, partially offset by the write-off of an equity method investment which was offset by a gain resulting from the sale of a percentage of a separate equity method investment.

Capital Contribution to OCC

In March 2015, OCC implemented a capital plan under which the options exchanges that are OCC's stockholders contributed \$150 million of new equity capital to OCC, committed to make future replenishment capital contributions under certain circumstances, and received commitments regarding future dividend payments and related matters. See "Other Commitments," of Note 19, "Commitments, Contingencies and Guarantees," for further discussion of our commitment to make future replenishment capital contributions. Nasdaq PHLX and ISE each contributed \$30 million of new equity capital under the OCC capital plan. OCC adopted specific policies with respect to fees, customer refunds and stockholder dividends, which envision an annual dividend equal to the portion of OCC's after-tax income that exceeds OCC's capital requirements after payment of refunds to OCC's clearing members (such refunds are generally 50% of the portion of OCC's pre-tax income that exceeds OCC's capital requirements). In 2018, 2017 and 2016, OCC disbursed annual dividends under the capital plan and Nasdaq, via its ownership interests, as the owner of two shares, received \$13 million in 2018, \$10 million in 2017 and \$4 million in 2016.

In February 2016, after the SEC approved the rule change establishing the OCC capital plan, certain industry participants appealed that approval in the U.S. Court of Appeals. In August 2017, the Court of Appeals remanded the case to the SEC. In February 2019, on remand from the Court of Appeals, the SEC disapproved the OCC rule change that established the capital plan. In its decision, the SEC noted that it will consider any

requests for exemptive or other relief that OCC might seek while OCC considers its alternatives to ensure compliance with relevant regulations. OCC has not publicly announced its plans in light of the order. As a result of the SEC decision, OCC may return capital to us or adopt new policies, which may impact us. We are unable to predict the outcome or exact timing of resolution of this matter.

Equity Securities

The carrying amounts of our equity securities are included in other non-current assets in the Consolidated Balance Sheets. As of December 31, 2018, our equity securities primarily represent various strategic investments made through our corporate venture program. As of December 31, 2017, our equity securities primarily represented our 5.0% ownership in Borsa Istanbul and our 5.0% ownership interest in LCH.

In December 2018, we sold our 5.0% ownership interest in LCH for \$169 million in cash. As a result of the sale, we recognized a pre-tax gain of \$118 million (\$93 million after tax). The gain is included in gain on sale of investment security in the Consolidated Statements of Income for the year ended December 31, 2018.

The Borsa Istanbul shares, which were issued to us in the first quarter of 2014, were part of the consideration received under a market technology agreement. This investment had a carrying amount of \$75 million which was guaranteed to us via a put option negotiated as part of the market technology agreement. During the second quarter of 2018, we exercised the put option and we expect to receive cash consideration in installments through 2022. In 2018, we received \$45 million in cash. The remaining receivable is recorded in other current assets and other non-current assets in the Consolidated Balance Sheets.

7. Property and Equipment, net

The following table presents our major categories of property and equipment, net:

	Year Ended	
	December	
	31,	
	2018	2017
	(in millions)	
Data processing equipment and software	\$526	\$626
Furniture, equipment and leasehold improvements	274	279
Total property and equipment	800	905
Less: accumulated depreciation and amortization	(424)	(505)
Total property and equipment, net	\$376	\$400

Depreciation and amortization expense for property and equipment was \$101 million for the year ended December 31, 2018, \$96 million for the year ended December 31, 2017 and \$88 million for the year ended December 31, 2016. The increase in depreciation and amortization expense in 2018 and 2017 was primarily due to additional expense associated with assets and software placed in service. These amounts are included in depreciation and amortization expense in the Consolidated Statements of Income.

There were no impairments of property and equipment recorded in 2018. In 2017, we recorded a pre-tax, non-cash property and equipment asset impairment charge of \$9 million primarily related to the write-off of capitalized software and hardware equipment associated with our 2017 and 2016 acquisitions. This charge is included in merger and strategic initiatives expense in the Consolidated Statements of Income for 2017.

As of December 31, 2018 and 2017, we did not own any real estate properties.

8. Deferred Revenue

Deferred revenue represents consideration received that is yet to be recognized as revenue. The changes in our deferred revenue during the year ended December 31, 2018 are reflected in the following table:

Initial Annual Listing Revenues	Market Listings Revenues	Market Technology Revenues	Corporate Solutions and Other Revenues ⁽³⁾	Information Services Revenues	Other ⁽⁴⁾	Total
(in millions)						

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Balance at December 31, 2017	\$64	\$ 3	\$ 109	\$ 37	\$ 40	\$ 34	\$287
Additions	29	236	168	242	169	23	867
Revenue recognized	(25)	(234)	(183)	(242)	(130)	(36)	(850)
Reclassification of deferred revenue ⁽¹⁾	—	—	(11)	11	—	—	—
Deferred revenue reclassified to held for sale ⁽²⁾	—	—	—	(12)	—	—	(12)
Translation adjustment	(2)	(1)	(8)	—	1	(1)	(11)
Balance at December 31, 2018	\$66	\$ 4	\$ 75	\$ 36	\$ 80	\$ 20	\$281

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Concurrent with the realignment of our B Wise internal audit, regulatory compliance management, and operational (1) risk management software solutions from our Market Technology segment to our Corporate Services segment, deferred revenue was reassigned to the Corporate Services segment.

(2) See Note 5, “Assets and Liabilities Held for Sale,” for further discussion.

Other revenues include the revenues from the Public Relations Solutions and Digital Media Services businesses (3) through the date of sale (April 2018). See “2018 Divestiture,” of Note 3, “Acquisitions and Divestiture,” to the consolidated financial statements for further discussion.

The balance as of December 31, 2018 and 2017 primarily includes deferred revenue from listing of additional (4) shares fees which are included in our Listing Services segment. The activity during the period primarily pertains to our Trade Management Services and FICC businesses, which are included in our Market Services segment, for contracts paid monthly or quarterly in advance of the service.

On January 1, 2018, we adopted Topic 606. As a result, a portion of revenues that were previously deferred were recognized either in prior period revenues, through restatement, or as an adjustment to retained earnings upon adoption of the new standard. See “Revenue From Contracts With Customers,” of Note 2, “Summary of Significant Accounting Policies,” for a description of our initial listing, annual listing, market technology, corporate solutions, and information services revenues and the revenue recognition policy for each of these revenue streams.

As of December 31, 2018, we estimate that our deferred revenue will be recognized in the following years:

	Initial Listing Revenues (in millions)	Annual Listings Revenues	Market Technology Revenues	Corporate Solutions Revenues	Information Services Revenues	Other ⁽¹⁾	Total
Fiscal year ended:							
2019	\$23	\$ 4	\$ 47	\$ 33	\$ 77	\$ 10	\$194
2020	20	—	21	3	3	7	54
2021	10	—	7	—	—	2	19
2022	7	—	—	—	—	1	8
2023	5	—	—	—	—	—	5
2024 and thereafter	1	—	—	—	—	—	1
Total	\$66	\$ 4	\$ 75	\$ 36	\$ 80	\$ 20	\$281

(1) Other primarily includes revenues from listing of additional shares fees which are included in our Listing Services business.

The timing of recognition of our deferred market technology revenues is primarily dependent upon the completion of customization and any significant modifications made pursuant to existing market technology contracts. As such, as it relates to market technology revenues, the timing represents our best estimate.

9. Debt Obligations

The following table presents the changes in the carrying amount of our debt obligations during the year ended December 31, 2018:

	December 31, 2017	Additions	Payments, Accretion and Other	December 31, 2018
(in millions)				
Short-term debt:				
Commercial paper	\$480	\$ 4,096	\$ (4,301)	\$ 275
Senior unsecured floating rate notes due March 22, 2019 ⁽¹⁾	498	—	2	500
\$400 million senior unsecured term loan facility due November 25, 2019 (average interest rate of 3.48% for the period January 1, 2018 through December 31, 2018) ⁽²⁾	100	—	—	100
Total short-term debt	1,078	4,096	(4,299)	875
Long-term debt:				
5.55% senior unsecured notes due January 15, 2020	599	—	—	599
3.875% senior unsecured notes due June 7, 2021	716	—	(30)	686
4.25% senior unsecured notes due June 1, 2024	496	—	1	497
1.75% senior unsecured notes due May 19, 2023	712	—	(30)	682
3.85% senior unsecured notes due June 30, 2026	496	—	—	496
\$1 billion revolving credit commitment due April 25, 2022 (average interest rate of 2.74% for the period January 1, 2018 through December 31, 2018)	110	—	(114)	(4)
Total long-term debt	3,129	—	(173)	2,956
Total debt obligations	\$4,207	\$ 4,096	\$ (4,472)	\$ 3,831

⁽¹⁾ Balance was reclassified to short-term debt as of March 31, 2018.

⁽²⁾ Balance was reclassified to short-term debt as of December 31, 2018.

Commercial Paper Program

Our U.S. dollar commercial paper program is supported by our 2017 Credit Facility which provides liquidity support for the repayment of commercial paper issued through the commercial paper program. See “2017 Credit Facility” below for further discussion of our 2017 Credit Facility. The effective interest rate of commercial paper issuances fluctuate as short term interest rates and demand fluctuate. The fluctuation of these rates due to market conditions may impact our interest expense.

As of December 31, 2018, commercial paper notes in the table above reflect the aggregate principal amount, less the unamortized discount which is being accreted through interest expense over the life of the applicable notes. The original maturities of these notes range from 24 days to 67 days and the weighted-average maturity is 33 days. The weighted-average effective interest rate is 3.03% per annum.

Senior Unsecured Notes

Our senior unsecured notes were all issued at a discount. As a result of the discount, the proceeds received from each issuance were less than the aggregate principal amount. As of December 31, 2018, the amounts in the table above reflect the aggregate principal amount, less the unamortized debt discount and the unamortized debt issuance costs which are being accreted through interest expense over the life of the applicable notes. Our senior unsecured notes are general unsecured obligations of ours and rank equally with all of our existing and

future unsubordinated obligations and they are not guaranteed by any of our subsidiaries. The senior unsecured notes were issued under indentures that, among other things, limit our ability to consolidate, merge or sell all or substantially all of our assets, create liens, and enter into sale and leaseback transactions.

With the exception of the 2020 Notes, upon a change of control triggering event (as defined in the various note indentures), the terms require us to repurchase all or part of each holder’s notes for cash equal to 101% of the aggregate

principal amount purchased plus accrued and unpaid interest, if any.

Senior Unsecured Floating Rate Notes

In September 2017, Nasdaq issued the 2019 Notes. The 2019 Notes pay interest quarterly in arrears at a rate equal to the three-month U.S. dollar LIBOR as determined at the beginning of each quarterly period plus 0.39% per annum until March 22, 2019.

As of December 31, 2018, the amount outstanding of \$500 million is due upon maturity at March 22, 2019, which we expect to repay with cash on hand and proceeds from issuances of commercial paper or borrowings from our revolving credit commitment under our 2017 Credit Facility.

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5.55% Senior Unsecured Notes

In January 2010, Nasdaq issued the 2020 Notes. The 2020 Notes pay interest semiannually at a rate of 5.55% per annum until January 15, 2020.

3.875% Senior Unsecured Notes

In June 2013, Nasdaq issued the 2021 Notes. The 2021 Notes pay interest annually at a rate of 3.875% per annum until June 7, 2021 and such rate may vary with Nasdaq's debt rating up to a rate not to exceed 5.875%.

The 2021 Notes have been designated as a hedge of our net investment in certain foreign subsidiaries to mitigate the foreign exchange risk associated with certain investments in these subsidiaries. The decrease in the carrying amount of \$30 million noted in the "Payments, Accretion and Other" column in the table above primarily reflects the translation of the 2021 Notes into U.S. dollars and is recorded in accumulated other comprehensive loss within stockholders' equity in the Consolidated Balance Sheets as of December 31, 2018.

4.25% Senior Unsecured Notes

In May 2014, Nasdaq issued the 2024 Notes. The 2024 Notes pay interest semiannually at a rate of 4.25% per annum until June 1, 2024 and such rate may vary with Nasdaq's debt rating up to a rate not to exceed 6.25%.

1.75% Senior Unsecured Notes

In May 2016, Nasdaq issued the 2023 Notes. The 2023 Notes pay interest annually at a rate of 1.75% per annum until May 19, 2023 and such rate may vary with Nasdaq's debt rating up to a rate not to exceed 3.75%.

The 2023 Notes have been designated as a hedge of our net investment in certain foreign subsidiaries to mitigate the foreign exchange rate risk associated with certain investments in these subsidiaries. The decrease in the carrying amount of \$30 million noted in the "Payments, Accretion and Other" column in the table above reflects the translation of the 2023 Notes into U.S. dollars and is recorded in accumulated other comprehensive loss within stockholders' equity in the Consolidated Balance Sheets as of December 31, 2018.

3.85% Senior Unsecured Notes

In June 2016, Nasdaq issued the 2026 Notes. The 2026 Notes pay interest semiannually at a rate of 3.85% per annum until June 30, 2026 and such rate may vary with Nasdaq's debt rating up to a rate not to exceed 5.85%.

Credit Facilities

As of December 31, 2018, the amounts in the table above reflect the aggregate principal amount, less the unamortized debt issuance costs which are being accreted through interest expense over the life of the applicable credit facility. Nasdaq is permitted to repay borrowings under our credit facilities at any time in whole or in part, without penalty. Our credit facilities contain financial and operating covenants. Financial covenants include a minimum interest expense

coverage ratio and a maximum leverage ratio. Operating covenants include, among other things, limitations on Nasdaq's ability to incur additional indebtedness, grant liens on assets, dispose of assets and pay dividends. Our credit facilities allow us to pay cash dividends on our common stock. The facilities also contain customary affirmative covenants, including access to financial statements, notice of defaults and certain other material events, maintenance of properties and insurance, and events of default, including cross-defaults to our material indebtedness.

2017 Credit Facility

In April 2017, Nasdaq entered into the 2017 Credit Facility. The 2017 Credit Facility consists of a \$1 billion five-year revolving credit facility (with sublimits for non-dollar borrowings, swingline borrowings and letters of credit), which replaced a former credit facility. Nasdaq intends to use funds available under the 2017 Credit Facility for general corporate purposes and to provide liquidity support for the repayment of commercial paper issued through the commercial paper program.

As of December 31, 2018, no amounts were outstanding on the 2017 Credit Facility. The \$4 million balance represents unamortized debt issuance costs. Of the \$1 billion that is available for borrowing, \$277 million provides liquidity support for the commercial paper program and for a letter of credit. As such, as of December 31, 2018, the total remaining amount available under the 2017 Credit Facility was \$723 million. See "Commercial Paper Program" above for further discussion of our commercial paper program.

Under our 2017 Credit Facility, borrowings under the revolving credit facility and swingline borrowings bear interest on the principal amount outstanding at a variable interest rate based on either the LIBOR or the base rate (as defined

in the credit agreement) (or other applicable rate with respect to non-dollar borrowings), plus an applicable margin that varies with Nasdaq's debt rating. We are charged commitment fees of 0.125% to 0.4%, depending on our credit rating, whether or not amounts have been borrowed. These commitment fees are included in interest expense and were not material for the years ended December 31, 2018, 2017 and 2016.

The 2017 Credit Facility includes an option for Nasdaq to increase the available aggregate amount by up to \$500 million, subject to the consent of the lenders funding the increase and certain other conditions.

2016 Credit Facility

In March 2016, Nasdaq entered into the 2016 Credit Facility. Under our 2016 Credit Facility, borrowings bear interest on the principal amount outstanding at a variable interest rate based on either the LIBOR or the base rate (or other applicable rate with respect to non-dollar borrowings), plus an applicable margin that varies with Nasdaq's debt rating. As of December 31, 2018, the amount outstanding of \$100 million is due upon maturity at November 25, 2019, which we expect to repay with cash on hand and proceeds from issuances

of commercial paper or borrowings from our revolving credit commitment under our 2017 Credit Facility.

Other Credit Facilities

We also have credit facilities related to our Nasdaq Clearing operations in order to provide further liquidity. Credit facilities, which are available in multiple currencies, totaled \$220 million as of December 31, 2018 and \$187 million as of December 31, 2017 in available liquidity, none of which was utilized.

Debt Covenants

As of December 31, 2018, we were in compliance with the covenants of all of our debt obligations.

10. Retirement Plans

Defined Contribution Savings Plan

We sponsor a 401(k) Plan for U.S. employees. Employees are immediately eligible to make contributions to the plan and are also eligible for an employer contribution match at an amount equal to 100.0% of the first 6.0% of eligible employee contributions. Savings plan expense included in compensation and benefits expense in the Consolidated Statements of Income was \$14 million for the year ended December 31, 2018, \$13 million for 2017 and \$11 million for 2016.

Pension and Supplemental Executive Retirement Plans

We maintain non-contributory, defined-benefit pension plans, non-qualified SERPs for certain senior executives and other post-retirement benefit plans for eligible employees in the U.S., collectively referred to as the Nasdaq Benefit Plans. Our pension plans and SERPs are frozen. Future service and salary for all participants do not count toward an accrual of benefits under the pension plans and SERPs. Most employees outside the U.S. are covered by local retirement plans or by applicable social laws. Benefits under social laws are generally expensed in the periods in which the costs are incurred. The total expense for these plans is included in compensation and benefits expense in the Consolidated Statements of Income and was \$22 million in 2018, \$21 million in 2017 and \$23 million in 2016.

Nasdaq recognizes the funded status of the Nasdaq Benefit Plans, measured as the difference between the fair value of the plan assets and the benefit obligation, in the Consolidated Balance Sheets. During the third quarter of 2018, we contributed \$22 million to our U.S. defined-benefit pension plans. This contribution increased the funded status of these plans to approximately 100.0%. The funded status related to the SERP was underfunded by \$28 million as of December 31, 2018. As of December 31, 2017, the funded status related to the Nasdaq Benefit Plans was underfunded by \$60 million and was underfunded by \$59 million as of December 31, 2016. The underfunded liability for the above plans is included in accrued personnel costs and other non-current liabilities in the Consolidated Balance Sheets. The fair value of the plans' assets was \$94 million as of December 31, 2018 and \$79 million as of December 31, 2017 and the benefit obligation was \$122 million as of December 31, 2018 and \$139 million as of December 31, 2017. The plan assets of the Nasdaq Benefit Plans

are invested per target allocations adopted by Nasdaq's Pension and 401(k) Committee and are primarily invested in collective fund investments that have underlying investments in fixed income securities. The collective fund investments are valued at net asset value which is a practical expedient to estimate fair value.

Accumulated Other Comprehensive Loss

As of December 31, 2018, accumulated other comprehensive

loss for the Nasdaq Benefit Plans was \$22 million reflecting an unrecognized net loss of \$28 million, partially offset by an income tax benefit of \$6 million, primarily due to our pension plans.

Estimated Future Benefit Payments

We expect to make the following benefit payments to participants in the next ten fiscal years under the Nasdaq Benefit Plans:

Fiscal Year Ended:	Pension	SERP	Post-retirement	Total
(in millions)				
2019	\$4	\$2	\$—	\$6
2020	5	7	—	12
2021	4	2	—	6
2022	5	2	—	7

2023	5	2	—	7
2024 through 2028	29	10	1	40
	\$52	\$25	\$	1
				\$78

11. Share-Based Compensation

We have a share-based compensation program for employees and non-employee directors. Share-based awards granted under this program include stock options, restricted stock (consisting of restricted stock units), and PSUs. For accounting purposes, we consider PSUs to be a form of restricted stock.

Summary of Share-Based Compensation Expense

The following table shows the total share-based compensation expense resulting from equity awards and the 15.0% discount for the ESPP for the years ended December 31, 2018, 2017 and 2016 in the Consolidated Statements of Income:

	Year Ended December 31, 2018 2017 2016 (in millions)		
Share-based compensation expense before income taxes	\$69	\$70	\$86
Income tax benefit	(19)	(29)	(35)
Share-based compensation expense after income taxes	\$50	\$41	\$51

Common Shares Available Under Our Equity Plan

As of December 31, 2018, we had approximately 11.0 million shares of common stock authorized for future issuance under our Equity Plan.

Restricted Stock

We grant restricted stock to most active employees. The grant date fair value of restricted stock awards is based on the closing stock price at the date of grant less the present value of future cash dividends. Restricted stock awards granted generally vest 25.0% on the second anniversary of the grant date, 25.0% on the third anniversary of the grant date, and 50.0% on the fourth anniversary of the grant date.

Summary of Restricted Stock Activity

The following table summarizes our restricted stock activity for the years ended December 31, 2018, 2017 and 2016:

	Restricted Stock	
	Number of Awards	Weighted-Average Grant Date Fair Value
Unvested balances at December 31, 2015	3,343,738	\$ 35.36
Granted	724,200	\$ 62.91
Vested	(1,238,980)	\$ 27.91
Forfeited	(268,380)	\$ 43.29
Unvested balances at December 31, 2016	2,560,578	\$ 45.92
Granted	737,864	\$ 67.48
Vested	(1,102,823)	\$ 38.56
Forfeited	(207,119)	\$ 52.29
Unvested balances at December 31, 2017	1,988,500	\$ 57.34
Granted	550,544	\$ 81.66
Vested	(702,832)	\$ 48.64
Forfeited	(252,837)	\$ 63.86
Unvested balances at December 31, 2018	1,583,375	\$ 68.62

As of December 31, 2018, \$55 million of total unrecognized compensation cost related to restricted stock is expected to be recognized over a weighted-average period of 1.8 years.

PSUs

PSUs are based on performance measures that impact the amount of shares that each recipient will receive upon vesting. We have two performance-based long-term PSU programs for certain officers, a one-year performance-based program and a three-year cumulative performance-based program that focuses on TSR.

One-Year PSU Program

The grant date fair value of PSUs under the one-year performance-based program is based on the closing stock price at the date of grant less the present value of future cash dividends. Under this program, an eligible employee receives a target grant of PSUs, but may receive from 0.0% to 150.0% of the target amount granted, depending on the achievement of performance measures. These awards vest ratably on an annual basis over a three-year period commencing with the end of the

one-year performance period. Compensation cost is recognized over the performance period and the three-year vesting period based on the probability that such performance measures will be achieved, taking into account an estimated forfeiture rate.

During 2018, certain grants of PSUs with a one-year performance period exceeded the applicable performance parameters. As a result, an additional 51,914 units above target were considered granted in the first quarter of 2019.

Three-Year PSU Program

Under the three-year performance-based program, each eligible individual receives PSUs, subject to market conditions, with a three-year cumulative performance period that vest at the end of the performance period. Compensation cost is recognized over the three-year vesting period, taking into account an estimated forfeiture rate, regardless of whether the market condition is satisfied, provided that the requisite service period has been completed. Performance will be determined by comparing Nasdaq's TSR to two peer groups, each weighted 50.0%. The first peer group consists of exchange companies, and the second peer group consists of all companies in the S&P 500. Nasdaq's

relative performance ranking against each of these groups will determine the final number of shares delivered to each individual under the program. The payout under this program will be between 0.0% and 200.0% of the number of PSUs granted and will be determined by Nasdaq's overall performance against both peer groups. However, if Nasdaq's TSR is negative for the three-year performance period, regardless of TSR ranking, the payout will not exceed 100.0% of the number of PSUs granted. We estimate the fair value of PSUs granted under the three-year PSU program using the Monte Carlo simulation model, as these awards contain a market condition.

Certain grants of PSUs that were issued in 2016 with a three-year performance period exceeded the applicable performance parameters. As a result, an additional 99,622 units above target were considered granted in the first quarter of 2019.

The following weighted-average assumptions were used to determine the weighted-average fair values of the PSU awards granted under the three-year PSU program:

	Year Ended	
	December 31,	
	2018	2017
Weighted-average risk free interest rate ⁽¹⁾	2.36 %	1.44 %
Expected volatility ⁽²⁾	18.7 %	19.2 %
Weighted-average grant date share price	\$86.24	\$69.45
Weighted-average fair value at grant date	\$116.86	\$81.57

(1) The risk-free interest rate for periods within the expected life of the award is based on the U.S. Treasury yield curve in effect at the time of grant.

(2) We use historic volatility for PSU awards issued under the three-year PSU program, as implied volatility data could

not be obtained for all the companies in the peer groups used for relative performance measurement within the program.

In addition, the annual dividend assumption utilized in the Monte Carlo simulation model is based on Nasdaq's dividend yield at the date of grant.

Summary of PSU Activity

The following table summarizes our PSU activity for the years ended December 31, 2018, 2017 and 2016:

	PSUs		Three-Year Program	
	One-Year Program Number of Awards	Weighted-Average Grant Date Fair Value	Number of Awards	Weighted-Average Grant Date Fair Value
Unvested balances at December 31, 2015	423,967	\$ 41.34	1,439,718	\$ 49.41
Granted ⁽¹⁾	242,642	\$ 58.33	761,501	\$ 66.89
Vested	(242,793)	\$ 39.63	(879,926)	\$ 43.81
Forfeited	(45,050)	\$ 47.72	(6,625)	\$ 69.11
Unvested balances at December 31, 2016	378,766	\$ 52.55	1,314,668	\$ 63.18
Granted ⁽¹⁾	197,075	\$ 65.51	803,712	\$ 55.57
Vested	(202,073)	\$ 49.93	(1,079,925)	\$ 42.83
Forfeited	(40,764)	\$ 55.92	(28,497)	\$ 87.86
Unvested balances at December 31, 2017	333,004	\$ 61.39	1,009,958	\$ 78.18
Granted ⁽¹⁾	177,831	\$ 80.97	484,075	\$ 90.92
Vested	(170,257)	\$ 58.49	(655,204)	\$ 64.08
Forfeited	(26,347)	\$ 61.83	(1,079)	\$ 81.57
Unvested balances at December 31, 2018	314,231	\$ 74.01	837,750	\$ 96.57

(1) Includes target awards granted and certain additional awards granted based on overachievement of performance parameters.

As of December 31, 2018, \$14 million of total unrecognized compensation cost related to the one-year PSU program is expected to be recognized over a weighted-average period of 1.6 years. For the three-year PSU program, \$28 million of total unrecognized compensation cost is expected to be recognized over a weighted-average period of 1.4 years.

Stock Options

In January 2017, our CEO received 268,817 performance-based non-qualified stock options which will vest annually over a three-year period, with each vesting contingent upon the

achievement of annual performance parameters. On January 29, 2019, Nasdaq's management compensation committee and board of directors determined that the performance goal for 2018 was met, resulting in the settlement of the second one-third of the grant. There were no stock option awards granted during the years ended December 31, 2018 and 2016.

The weighted-average grant date fair value was \$66.68. We estimated the fair value of this stock option award using the Black-Scholes valuation model using the following assumptions:

Expected life (in years)	6
Weighted-average risk free interest rate	2.1 %
Expected volatility	25.6%
Dividend yield	1.92%

Our computation of expected life was based on an estimate of the average length of time between option grant and exercise. The interest rate for periods within the expected life of the award was based on the U.S. Treasury yield curve in effect at the time of grant. Our computation of expected volatility was an estimate of the future upward/downward fluctuations in the underlying share price. We used Nasdaq's historical volatility for the trailing 6-year period as of the grant date. Our computation of dividend yield was based on annualized dividends expressed as a percentage of share

price.

Summary of Stock Option Activity

A summary of stock option activity for the years ended December 31, 2018, 2017 and 2016 is as follows:

	Number of Stock Options	Weighted-Average Exercise Price
Outstanding at December 31, 2015	2,626,487	\$ 27.74
Exercised	(1,219,820)	34.00
Forfeited	(296)	23.31
Outstanding at December 31, 2016	1,406,371	\$ 22.32
Granted	268,817	66.68
Exercised	(1,102,830)	21.98
Forfeited	(978)	21.33
Outstanding at December 31, 2017	571,380	\$ 43.84
Exercised	(118,094)	24.44
Forfeited	(5,570)	25.29
Outstanding at December 31, 2018	447,716	\$ 49.19
Exercisable at December 31, 2018	268,504	\$ 37.51

We received net cash proceeds of \$3 million from the exercise of 118,094 stock options for the year ended December 31, 2018, received net cash proceeds of \$24 million from the exercise of 1,102,830 stock options for the year ended December 31, 2017, and received net cash proceeds of \$41 million from the exercise of 1,219,820 stock options for the year ended December 31, 2016.

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The following table summarizes significant ranges of outstanding and exercisable stock options as of December 31, 2018:

Range of Exercise Prices	Outstanding		Exercisable				Aggregate Intrinsic	
	Number of Stock Options	Weighted-Average Remaining Contractual Term (in years)	Weighted-Average Exercise Price	Aggregate Intrinsic Value (in millions)	Number Exercisable	Weighted-Average Remaining Contractual Term (in years)	Weighted-Average Exercise Price	Aggregate Intrinsic Value (in millions)
\$18.67-\$20.10	76,844	1.17	\$ 19.74	\$ 5	76,844	1.17	\$ 19.74	\$ 5
\$25.28-\$66.68	370,872	6.42	55.29	10	191,660	4.94	44.64	7
Total	447,716	5.52	\$ 49.19	\$ 15	268,504	3.86	\$ 37.51	\$ 12

The aggregate intrinsic value in the above table represents the total pre-tax intrinsic value (i.e., the difference between our closing stock price on December 31, 2018 of \$81.57 and the exercise price, times the number of shares) based on stock options with an exercise price less than Nasdaq's closing price of \$81.57 as of December 31, 2018, which would have been received by the option holders had the option holders exercised their stock options on that date. This amount can change based on the fair market value of our common stock. The total number of in-the-money stock options exercisable as of December 31, 2018 was 0.3 million and the weighted-average exercise price was \$37.51. As of December 31, 2017, 0.3 million outstanding stock options were exercisable and the weighted-average exercise price was \$23.55.

The total pre-tax intrinsic value of stock options exercised was \$7 million during 2018, \$54 million during 2017 and \$40 million during 2016.

ESPP

We have an ESPP under which approximately 1.9 million shares of our common stock have been reserved for future issuance as of December 31, 2018. Under our ESPP, employees may purchase shares having a value not exceeding 10.0% of their annual compensation, subject to applicable annual Internal Revenue Service limitations. We record compensation expense related to the 15.0% discount that is given to our employees. The following table summarizes employee activity and expenses associated with the ESPP for the years ended December 31, 2018, 2017 and 2016.

	Year Ended December 31,		
	2018	2017	2016
Number of shares purchased by employees	205,785	235,859	233,464
Weighted-average price of shares purchased	\$66.79	\$ 58.26	\$ 50.39
Compensation expenses	\$3	\$ 3	\$ 4

12. Nasdaq Stockholders' Equity

Common Stock

As of December 31, 2018, 300,000,000 shares of our common stock were authorized, 170,709,425 shares were issued and 165,165,104 shares were outstanding. The holders of common stock are entitled to one vote per share, except that our certificate of incorporation limits the ability of any person to vote in excess of 5.0% of the then-outstanding shares of Nasdaq common stock.

Common Stock in Treasury, at Cost

We account for the purchase of treasury stock under the cost method with the shares of stock repurchased reflected as a reduction to Nasdaq stockholders' equity and included in common stock in treasury, at cost in the Consolidated Balance Sheets. Shares repurchased under our share repurchase program are currently retired and canceled. When treasury shares are reissued, they are recorded at the average cost of the treasury shares acquired. We held 5,544,321 shares of common stock in treasury as of December 31, 2018 and 4,932,402 shares as of December 31, 2017, most of which are related to shares of our common stock repurchased for the settlement of employee tax

withholding obligations arising from the vesting of restricted stock and PSUs.

Share Repurchase Program

In January 2018, our board of directors authorized an additional \$500 million for the share repurchase program bringing the total capacity to \$726 million.

These purchases may be made from time to time at prevailing market prices in open market purchases, privately-negotiated transactions, block purchase techniques or otherwise, as determined by our management. The purchases are primarily funded from existing cash balances. The share repurchase program may be suspended, modified or discontinued at any time. The share repurchase program has no defined expiration date.

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A summary of our share repurchase activity, reported based on settlement date is as follows:

	Year Ended	
	December 31,	
	2018	2017
Number of shares of common stock repurchased	4,508,426	6,843,519
Average price paid per share	\$87.43	\$ 71.56
Total purchase price (in millions)	\$394	\$ 203

As discussed above in "Common Stock in Treasury, at Cost," shares repurchased under our share repurchase program are currently retired and cancelled. As of December 31, 2018, the

remaining amount authorized for share repurchases under the program was \$332 million.

Other Repurchases of Common Stock

For the year ended December 31, 2018, we repurchased 611,919 shares of our common stock in settlement of employee tax withholding obligations arising from the vesting of restricted stock.

Preferred Stock

Our certificate of incorporation authorizes the issuance of 30,000,000 shares of preferred stock, par value \$0.01 per share, issuable from time to time in one or more series. As of December 31, 2018 and December 31, 2017, no shares of preferred stock were issued or outstanding.

* * * * *

Cash Dividends on Common Stock

During 2018, our board of directors declared the following cash dividends:

Declaration Date	Dividend Per Common Share	Record Date	Total Amount Paid (in millions)	Payment Date
January 30, 2018	\$ 0.38	March 16, 2018	\$ 63	March 30, 2018
March 26, 2018	0.44	June 15, 2018	73	June 29, 2018
July 24, 2018	0.44	September 14, 2018	72	September 28, 2018
October 24, 2018	0.44	December 14, 2018	72	December 28, 2018
			\$ 280	

The total amount paid of \$280 million was recorded in retained earnings in the Consolidated Balance Sheets at December 31, 2018.

In March 2018, the board of directors approved a regular quarterly cash dividend of \$0.44 per share on our outstanding common stock which reflects a 16.0% increase from our prior quarterly cash dividend of \$0.38. In January 2019, the board of directors declared a regular quarterly cash dividend of \$0.44 per share on our outstanding common stock. The dividend is payable on March 29, 2019 to shareholders of record at the close of business on March 15, 2019. The estimated amount of this dividend is \$73 million. Future declarations of quarterly dividends and the establishment of future record and payment dates are subject to approval by the board of directors. Our board of directors maintains a dividend policy with the intention to provide stockholders with regular and growing dividends over the long term as earnings and cash flow grow.

13. Earnings Per Share

The following table sets forth the computation of basic and diluted earnings per share:

	Year Ended December 31,		
	2018	2017	2016
	(in millions, except share and per share amounts)		
Numerator:			
Net income attributable to common shareholders	\$458	\$ 729	\$ 106
Denominator:			
Weighted-average common shares outstanding for basic earnings per share	165,349,667	164,299	165,182,290
Weighted-average effect of dilutive securities:			
Employee equity awards ⁽¹⁾	1,988,618	1,892	3,258,136
Contingent issuance of common stock	353,218	58,840	360,571
Weighted-average common shares outstanding for diluted earnings per share	167,691,699	166,185,031	168,800,997
Basic and diluted earnings per share:			
Basic earnings per share	\$2.77	\$ 4.38	\$ 0.64
Diluted earnings per share	\$2.73	\$ 4.30	\$ 0.63

(1) PSUs, which are considered contingently issuable, are included in the computation of dilutive earnings per share on a weighted average basis when management determines the related performance criteria are met.

There were no securities that were antidilutive for the year ended December 31, 2018. Securities that were not included in the computation of diluted earnings per share because their effect was antidilutive totaled 267,465 for the year ended December 31, 2017 and 264,134 for the year ended December 31, 2016.

14. Fair Value of Financial Instruments

The following tables present our financial assets and financial liabilities that are measured at fair value on a recurring basis as of December 31, 2018 and December 31, 2017. We did not have any financial liabilities measured at fair value on a recurring basis as of December 31, 2017.

	December 31, 2018			
	Total	Level 1	Level 2	Level 3
	(in millions)			
Assets at Fair Value				
Financial investments, at fair value	\$268	\$133	\$135	\$ —
Default fund and margin deposit investments	1,649	327	1,322	—
Total Assets at Fair Value	\$1,917	\$460	\$1,457	\$ —
Liabilities at Fair Value				
Other financial instruments	\$112	\$—	\$112	\$ —
Total Liabilities at Fair Value	\$112	\$—	\$112	\$ —

	December 31, 2017			
	Total	Level 1	Level 2	Level 3
	(in millions)			
Assets at Fair Value				
Financial investments, at fair value	\$235	\$135	\$100	\$ —
Default fund and margin deposit investments	2,129	371	1,758	—
Total Assets at Fair Value	\$2,364	\$506	\$1,858	\$ —

As of December 31, 2018 and December 31, 2017, Level 1 financial investments, at fair value were primarily comprised of trading securities, mainly highly rated European government

debt securities. As of December 31, 2018 and December 31, 2017, Level 2 financial investments, at fair value were primarily comprised of trading securities, mainly corporate bonds and European mortgage bonds. Of the Level 1 and Level 2 financial investments, at fair value, \$166 million as of December 31, 2018 and \$160 million as of December 31, 2017 are assets primarily utilized to meet regulatory capital requirements, mainly for our clearing operations at Nasdaq Clearing.

Our Level 1 default fund and margin deposit investments were primarily comprised of highly rated European and U.S. government debt securities. Level 2 default fund and margin deposit investments were primarily comprised of central bank certificates and reverse repurchase agreements, as of December 31, 2018 and December 31, 2017.

Our Level 2 other financial instruments include a liability associated with Nasdaq Clearing's requirement to fulfill the settlement of certain contracts of a defaulted member. As of December 31, 2018, the fair value of this guarantee was \$112 million and is included in other current liabilities in the Consolidated Balance Sheets. Collateral of \$112 million was recorded in other current assets which offsets this liability. See Note 15, "Clearing Operations," for further discussion of default fund contributions and margin deposits.

Financial Instruments Not Measured at Fair Value on a Recurring Basis

Some of our financial instruments are not measured at fair value on a recurring basis but are recorded at amounts that approximate fair value due to their liquid or short-term nature. Such financial assets and financial liabilities include: cash and cash equivalents, restricted cash, receivables, net, certain other current assets, accounts payable and accrued expenses, Section 31 fees payable to SEC, accrued personnel costs, commercial paper and certain other current liabilities.

Our investments in OCC and EuroCCP N.V. are accounted for under the equity method of accounting. See "Equity Method Investments," of Note 2, "Summary of Significant Accounting Policies," and "Equity Method Investments," of Note 6, "Investments," for further discussion.

We also consider our debt obligations to be financial instruments. The fair value of our debt obligations, utilizing discounted cash flow analyses for our floating rate debt and prevailing market rates for our fixed rate debt, was \$3.9 billion as of December 31, 2018 and \$4.4 billion as of December 31, 2017. The discounted cash flow analyses are based on borrowing rates currently available to us for debt with similar terms and maturities. The fair value of our commercial paper approximates the carrying value since the rates of interest on this short-term debt approximate market rates as of December 31, 2018. Our commercial paper and our fixed rate and floating rate debt are categorized as Level 2 in the fair value hierarchy.

For further discussion of our debt obligations, see Note 9, "Debt Obligations."

Non-Financial Assets Measured at Fair Value on a Non-Recurring Basis

Our non-financial assets, which include goodwill, intangible assets, and other long-lived assets, are not required to be carried at fair value on a recurring basis. Fair value measures of non-financial assets are primarily used in the impairment analysis of these assets. Any resulting asset impairment would require that the non-financial asset be recorded at its fair value. Nasdaq uses Level 3 inputs to measure the fair value of the above assets on a non-recurring basis. As of December 31, 2018 and December 31, 2017, there were no non-financial assets measured at fair value on a non-recurring basis.

15. Clearing Operations

Nasdaq Clearing

Nasdaq Clearing is authorized and supervised under EMIR as a multi-asset clearinghouse by the SFSA. Such authorization is effective for all member states of the European Union and certain other non-member states that are part of the European Economic Area, including Norway. The clearinghouse acts as the CCP for exchange and OTC trades in equity derivatives, fixed income derivatives, resale and repurchase contracts, power derivatives, emission allowance derivatives, fuel oil derivatives, and seafood derivatives.

Through our clearing operations in the financial markets, which include the resale and repurchase market, the commodities markets, and the seafood market, Nasdaq Clearing is the legal counterparty for, and guarantees the fulfillment of, each contract cleared. These contracts are not used by Nasdaq Clearing for the purpose of trading on its own behalf. As the legal counterparty of each transaction, Nasdaq Clearing bears the counterparty risk between the purchaser and seller in the contract. In its guarantor role, Nasdaq Clearing has precisely equal and offsetting claims to and from clearing members on opposite sides of each contract, standing as the CCP on every contract cleared. In

accordance with the rules and regulations of Nasdaq Clearing, default fund and margin collateral requirements are calculated for each clearing member's positions in accounts with the CCP. See "Default Fund Contributions and Margin Deposits" below for further discussion of Nasdaq Clearing's default fund and margin requirements.

Nasdaq Clearing maintains four member sponsored default funds: one related to financial markets, one related to commodities markets, one related to the seafood market, and a mutualized fund. Under this structure, Nasdaq Clearing and its clearing members must contribute to the total regulatory capital related to the clearing operations of Nasdaq Clearing. This structure applies an initial separation of default fund contributions for the financial, commodities and seafood markets in order to create a buffer for each market's counterparty risks. Simultaneously, a mutualized default fund provides capital efficiencies to Nasdaq Clearing's members with regard to total regulatory capital required. See "Default Fund Contributions" below for further discussion of Nasdaq Clearing's default fund. Power of assessment and a liability

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waterfall also have been implemented. See “Power of Assessment” and “Liability Waterfall” below for further discussion. These requirements ensure the alignment of risk between Nasdaq Clearing and its clearing members.

Nasdaq Commodities Clearing Default

In September 2018, a member of the Nasdaq Clearing commodities market defaulted due to inability to post sufficient collateral to cover increased margin requirements for the positions of the relevant member, which had experienced losses due to sharp adverse movements in the Nordic - German power market spread. Nasdaq Clearing followed default procedures and offset the future market risk on the defaulting member’s positions. The default resulted in a loss of \$133 million which was allocated to Nasdaq Clearing and the members of the commodities default fund in accordance with the liability waterfall as follows:

- the first \$8 million of the loss was allocated to Nasdaq Clearing’s junior capital; and
- the remainder was allocated on a pro-rata basis to the commodities clearing members’ default funds.

During September 2018, Nasdaq Clearing replenished the utilized junior capital of \$8 million for the commodities market and the commodities clearing members replenished their pro rata portions of the default fund. Nasdaq Clearing has also increased its junior capital by \$14 million for the commodity market.

In November 2018, the defaulting member entered into an agreement for a consensual arrangement with creditors, including Nasdaq Clearing, for the recovery of the members’ default fund losses. Any funds recovered will be apportioned to the commodities default fund participants first and thereafter to Nasdaq Clearing in accordance with the default fund rules.

In order to reduce the risk profile of commodities clearing operations, Nasdaq Clearing has increased margin levels by increasing the confidence level on commodity products and thereby shifted the risk from waterfall resources more to each portfolio holder's collateral. In addition, Nasdaq Clearing has launched a risk management enhancement program entailing a range of risk mitigating actions, which commenced in the fourth quarter of 2018 and will continue during 2019.

In December 2018, we recorded a \$23 million charge associated with the clearing default as a result of our initiating a capital relief program. The capital relief program is a voluntary program open to each commodities default fund participant; each such participant who agrees to the capital relief program will receive a proportion of the funds made available under the capital relief program as reflects their proportionate share of the aggregate of the clearing members' default fund replenishments. The capital relief program is in addition to any funds to be recovered from the defaulting member. This charge is recorded in general, administrative and other expense in the Consolidated Statements of Income for 2018.

As a result of the default, a \$112 million liability was recorded in other current liabilities and \$112 million of collateral was

recorded in other current assets in the Consolidated Balance Sheets as of December 31, 2018 in order to allow Nasdaq Clearing to fulfill the settlement of certain contracts of the defaulted member arising from the default management process. We have established mitigating positions. The collateral and liability were previously included in Default Funds and Margin Deposits.

Default Fund Contributions and Margin Deposits

As of December 31, 2018, clearing member default fund contributions and margin deposits were as follows:

	December 31, 2018		
	Cash	Non-Cash	Total
	Contributions	Contributions	Contributions
	(in millions)		
Default fund contributions	\$370	\$ 129	\$ 499
Margin deposits	4,372	3,073	7,445
Total	\$4,742	\$ 3,202	\$ 7,944

In accordance with its investment policy, of the total cash contributions of \$4,742 million, Nasdaq Clearing has invested \$1,483 million in highly rated European and U.S. government debt securities or central bank certificates with maturity dates primarily 90 days or less and \$166 million in reverse repurchase agreements secured with highly rated

government securities with maturity dates that range from 4 days to 17 days. The carrying value of these securities approximates their fair value due to the short-term nature of the instruments and reverse repurchase agreements. The remainder of this balance was held in cash in demand deposit accounts at central banks and large, highly rated financial institutions. Of the total default fund contributions of \$499 million, Nasdaq Clearing can utilize \$436 million as capital resources in the event of a counterparty default. The remaining balance of \$63 million pertains to member posted surplus balances.

In the investment activity related to default fund and margin contributions, we are exposed to counterparty risk related to reverse repurchase agreement transactions, which reflect the risk that the counterparty might become insolvent and, thus, fail to meet its obligations to Nasdaq Clearing. We mitigate this risk by only engaging in transactions with high credit quality reverse repurchase agreement counterparties and by limiting the acceptable collateral under the reverse repurchase agreement to high quality issuers, primarily government securities and other securities explicitly guaranteed by a government. The value of the underlying security is monitored during the lifetime of the contract and in the event the market value of the underlying security falls below the reverse repurchase amount our clearinghouse may require additional collateral or a reset of the contract.

Default Fund Contributions

Required contributions to the default funds are proportional to the exposures of each clearing member. When a clearing member is active in more than one market, contributions must

be made to all markets' default funds in which the member is active. Clearing members' eligible contributions may include cash and non-cash contributions. Cash contributions received are held in cash or invested by Nasdaq Clearing, in accordance with its investment policy, either in highly rated government debt securities, time deposits, central bank certificates or reverse repurchase agreements with highly rated government debt securities as collateral. Nasdaq Clearing maintains and manages all cash deposits related to margin collateral. All risks and rewards of collateral ownership, including interest, belong to Nasdaq Clearing. Clearing members' cash contributions are included in default funds and margin deposits in the Consolidated Balance Sheets as both a current asset and a current liability. Non-cash contributions include highly rated government debt securities that must meet specific criteria approved by Nasdaq Clearing. Non-cash contributions are pledged assets that are not recorded in the Consolidated Balance Sheets as Nasdaq Clearing does not take legal ownership of these assets and the risks and rewards remain with the clearing members. These balances may fluctuate over time due to changes in the amount of deposits required and whether members choose to provide cash or non-cash contributions. Assets pledged are held at a nominee account in Nasdaq Clearing's name for the benefit of the clearing members and are immediately accessible by Nasdaq Clearing in the event of a default. In addition to clearing members' required contributions to the liability waterfall, Nasdaq Clearing is also required to contribute capital to the liability waterfall and overall regulatory capital as specified under its clearinghouse rules. As of December 31, 2018, Nasdaq Clearing committed capital totaling \$121 million to the liability waterfall and overall regulatory capital, in the form of government debt securities, which are recorded as financial investments, at fair value in the Consolidated Balance Sheets. The combined regulatory capital of the clearing members and Nasdaq Clearing will serve to secure the obligations of a clearing member exceeding such member's own margin and default fund deposits and may be used to cover losses sustained by a clearing member in the event of a default.

Margin Deposits

Nasdaq Clearing requires all clearing members to provide collateral, which may consist of cash and non-cash contributions, to guarantee performance on the clearing members' open positions, or initial margin. In addition, clearing members must also provide collateral to cover the daily margin call if needed. See "Default Fund Contributions" above for further discussion of cash and non-cash contributions.

Similar to default fund contributions, Nasdaq Clearing maintains and manages all cash deposits related to margin collateral. All risks and rewards of collateral ownership, including interest, belong to Nasdaq Clearing and are recorded in revenues. These cash deposits are recorded in default funds and margin deposits in the Consolidated Balance Sheets as both a current asset and a current liability. Pledged margin collateral is not recorded in our Consolidated Balance Sheets as all risks and rewards of collateral ownership, including interest, belong to the counterparty. Assets pledged are held at a nominee

account in Nasdaq Clearing's name for the benefit of the clearing members and are immediately accessible by Nasdaq Clearing in the event of a default.

Nasdaq Clearing marks to market all outstanding contracts and requires payment from clearing members whose positions have lost value. The mark-to-market process helps identify any clearing members that may not be able to satisfy their financial obligations in a timely manner allowing Nasdaq Clearing the ability to mitigate the risk of a clearing member defaulting due to exceptionally large losses. In the event of a default, Nasdaq Clearing can access the defaulting member's margin and default fund deposits to cover the defaulting member's losses.

Regulatory Capital and Risk Management Calculations

Nasdaq Clearing manages risk through a comprehensive counterparty risk management framework, which is comprised of policies, procedures, standards and financial resources. The level of regulatory capital is determined in accordance with Nasdaq Clearing's regulatory capital policy, as approved by the SFSA. Regulatory capital calculations are continuously updated through a proprietary capital-at-risk calculation model that establishes the appropriate level of capital.

As mentioned above, Nasdaq Clearing is the legal counterparty for each contract cleared and thereby guarantees the fulfillment of each contract. Nasdaq Clearing accounts for this guarantee as a performance guarantee. We determine the fair value of the performance guarantee by considering daily settlement of contracts and other margining and default fund requirements, the risk management program, historical evidence of default payments, and the estimated

probability of potential default payouts. The calculation is determined using proprietary risk management software that simulates gains and losses based on historical market prices, extreme but plausible market scenarios, volatility and other factors present at that point in time for those particular unsettled contracts. Based on this analysis, excluding any liability related to the Nasdaq commodities clearing default (see discussion above), the estimated liability was nominal and no liability was recorded as of December 31, 2018.

Power of Assessment

To further strengthen the contingent financial resources of the clearinghouse, Nasdaq Clearing has power of assessment that provides the ability to collect additional funds from its clearing members to cover a defaulting member's remaining obligations up to the limits established under the terms of the clearinghouse rules. The power of assessment corresponds to 100.0% of the clearing member's aggregate contribution to the financial, commodities and seafood markets' default funds.

Liability Waterfall

The liability waterfall is the priority order in which the capital resources would be utilized in the event of a default where the defaulting clearing member's collateral would not be sufficient to cover the cost to settle its portfolio. If a default occurs and the defaulting clearing member's collateral, including cash

deposits and pledged assets, is depleted, then capital is utilized in the following amount and order:

- junior capital contributed by Nasdaq Clearing, which totaled \$31 million as of December 31, 2018;
- a loss sharing pool related only to the financial market that is contributed to by clearing members and only applies if the defaulting member's portfolio includes interest rate swap products;
- specific market default fund where the loss occurred (i.e., the financial, commodities, or seafood market), which includes capital contributions of the clearing members on a pro-rata basis;
- senior capital contributed to each specific market by Nasdaq Clearing, calculated in accordance with clearinghouse rules, which totaled \$23 million as of December 31, 2018; and
- mutualized default fund, which includes capital contributions of the clearing members on a pro-rata basis.

If additional funds are needed after utilization of the liability waterfall, then Nasdaq Clearing will utilize its power of assessment and additional capital contributions will be required by non-defaulting members up to the limits established under the terms of the clearinghouse rules.

In addition to the capital held to withstand counterparty defaults described above, Nasdaq Clearing also has committed capital of \$67 million to ensure that it can handle an orderly wind-down of its operation, and that it is adequately protected against investment, operational, legal, and business risks.

Market Value of Derivative Contracts Outstanding

The following table includes the market value of derivative contracts outstanding prior to netting:

	December 31, 2018 (in millions)
Commodity and seafood options, futures and forwards ⁽¹⁾⁽²⁾⁽³⁾	\$ 1,196
Fixed-income options and futures ⁽¹⁾⁽²⁾	600
Stock options and futures ⁽¹⁾⁽²⁾	271
Index options and futures ⁽¹⁾⁽²⁾	135
Total	\$ 2,202

We determined the fair value of our option contracts using standard valuation models that were based on

(1) market-based observable inputs including implied volatility, interest rates and the spot price of the underlying instrument.

(2) We determined the fair value of our futures contracts based upon quoted market prices and average quoted market yields.

(3) We determined the fair value of our forward contracts using standard valuation models that were based on market-based observable inputs including LIBOR rates and the spot price of the underlying instrument.

Derivative Contracts Cleared

The following table includes the total number of derivative contracts cleared through Nasdaq Clearing for the years ended December 31, 2018 and 2017:

	December 31, 2018	December 31, 2017
Commodity and seafood options, futures and forwards ⁽¹⁾	1,649,912	2,824,188
Fixed-income options and futures	22,839,794	20,376,383
Stock options and futures	24,978,684	26,023,816
Index options and futures	49,038,297	44,928,284
Total	98,506,687	94,152,671

(1) The total volume in cleared power related to commodity contracts was 1,067 Terawatt hours (TWh) for the year ended December 31, 2018 and 1,199 TWh for the year ended December 31, 2017.

The outstanding contract value of resale and repurchase agreements was \$0.5 billion as of December 31, 2018 and \$2.3 billion as of December 31, 2017. The total number of contracts cleared was 9,223,246 for the year ended December 31, 2018 and was 8,534,986 for the year ended December 31, 2017.

16. Leases

We lease some of our office space under non-cancelable operating leases with third parties and sublease office space to third parties. Some of our lease agreements contain renewal options and escalation clauses based on increases in property taxes and building operating costs.

As of December 31, 2018, future minimum lease payments under non-cancelable operating leases (net of sublease income) are as follows:

	Gross Lease Commitments	Sublease Income	Net Lease Commitments
	(in millions)		
Year ending December 31:			
2019	\$80	\$ 5	\$ 75
2020	74	5	69
2021	66	4	62
2022	48	4	44
2023	45	3	42
Thereafter	347	2	345
Total future minimum lease payments	\$660	\$ 23	\$ 637

Rent expense for operating leases (net of sublease income of \$5 million in 2018, \$3 million in 2017, and \$4 million in 2016) was \$82 million in 2018, \$83 million in 2017, and \$78 million in 2016.

In February 2016, the FASB issued ASU 2016-02, "Leases." We adopted this new guidance on January 1, 2019. See "Leases," of "Recent Accounting Pronouncements," of Note 2, "Summary of Significant Accounting Policies," for further discussion.

17. Income Taxes

Income Before Income Tax Provision

The following table presents the domestic and foreign components of income (loss) before income tax provision:

	Year Ended		
	December 31,		
	2018	2017	2016
	(in millions)		
Domestic	\$636	\$556	\$(153)
Foreign	428	316	286
Income before income tax provision	\$1,064	\$872	\$133

Income Tax Provision

The income tax provision consists of the following amounts:

	Year Ended		
	December 31,		
	2018	2017	2016
	(in millions)		
Current income tax provision:			
Federal	\$103	\$51	\$37
State	56	17	21
Foreign	146	68	106
Total current income tax provision	305	136	164
Deferred income tax provision (benefit):			
Federal	185	(16)	(98)
State	116	24	(35)
Foreign	—	(1)	(4)
Total deferred income provision (benefit)	301	7	(137)
Total income tax provision	\$606	\$143	\$27

We have determined that undistributed earnings of certain non-U.S. subsidiaries will be reinvested for an indefinite period of time. We have both the intent and ability to indefinitely reinvest these earnings. As of December 31, 2018, the cumulative amount of undistributed earnings in these subsidiaries is \$387 million. Given our intent to reinvest these earnings for an indefinite period of time, we have not accrued a deferred tax liability on these earnings. A determination of an unrecognized deferred tax liability related to these earnings is not practicable.

A reconciliation of the income tax provision, based on the U.S. federal statutory rate, to our actual income tax provision for the years ended December 31, 2018, 2017 and 2016 is as follows:

	Year Ended December		
	31,		
	2018	2017	2016
Federal income tax provision at the statutory rate	21.0 %	35.0 %	35.0 %
State income tax provision, net of federal effect	3.7 %	2.6 %	(6.7) %
Change in deferred taxes due to change in law	27.0 %	(9.9) %	(1.2) %
Excess tax benefits related to employee share-based compensation	(0.7) %	(4.0) %	— %
Non-U.S. subsidiary earnings	0.1 %	(6.0) %	(7.3) %
Tax credits and deductions	(0.2) %	(1.0) %	(5.1) %
Change in unrecognized tax benefits	4.7 %	(0.8) %	4.2 %
Other, net	1.4 %	0.5 %	1.4 %
Actual income tax provision	57.0 %	16.4 %	20.3 %

The majority of the increase in our effective tax rate in 2018 compared to 2017 and the decrease in our effective tax rate in 2017 compared to 2016 was the result of the final and provisional impacts from The Tax Cuts and Jobs Act which was enacted on December 22, 2017. See “Tax Cuts and Jobs Act” below for further discussion of the impacts of this legislation on our financial statements. Also impacting the increase in the effective tax rate in 2018 compared to 2017 was the reversal of certain Swedish tax benefits recorded in prior periods and the tax expense associated with the sale of the Public Relations Solutions and Digital Media Services businesses.

We recorded income tax benefits of \$9 million in 2018, \$40 million in 2017 and \$41 million in 2016, primarily related to share-based compensation. In 2018 and 2017, the benefit was included in income tax expense and in 2016, the benefit was recorded as additional paid-in-capital in the Consolidated Balance Sheets due to the adoption of accounting guidance on January 1, 2017. This guidance requires all income tax effects of share-based awards to be recognized as income tax expense or benefit in the income statement when the awards vest or are settled on a prospective basis, as opposed to stockholders’ equity.

We are subject to examination by federal, state and local, and foreign tax authorities. We regularly assess the likelihood of additional assessments by each jurisdiction and have established tax reserves that we believe are adequate in relation to the potential for additional assessments. We believe that the resolution of tax matters will not have a material effect on our financial condition but may be material to our operating results for a particular period and the effective tax rate for that period.

The effective tax rate may vary from period to period depending on, among other factors, the geographic and business mix of earnings and losses. These same and other factors, including

the history of pre-tax earnings and losses, are taken into account in assessing the ability to realize deferred tax assets.

Deferred Income Taxes

The temporary differences, which give rise to our deferred tax assets and (liabilities), consisted of the following:

	December 31,	
	2018	2017
	(in millions)	
Deferred tax assets:		
Deferred revenues	\$ 19	\$ 25
U.S. federal net operating loss	—	1
Foreign net operating loss	23	30
State net operating loss	4	4
Compensation and benefits	33	42
Foreign currency translation	—	292
Tax credits	—	7
Federal benefit of uncertain tax positions	17	—
Other	25	20
Gross deferred tax assets	121	421
Less: valuation allowance	(23)	(30)
Total deferred tax assets, net of valuation allowance	\$ 98	\$ 391
Deferred tax liabilities:		
Amortization of software development costs and depreciation	\$(41)	\$(47)
Amortization of acquired intangible assets	(498)	(510)
Investments	(34)	(26)
Other	(22)	(19)
Gross deferred tax liabilities	(595)	(602)
Net deferred tax liabilities	\$(497)	\$(211)
Reported as:		
Non-current deferred tax assets ⁽¹⁾	4	14
Deferred tax liabilities, net	(501)	(225)
Net deferred tax liabilities	\$(497)	\$(211)

⁽¹⁾ Included in other non-current assets in the Consolidated Balance Sheets.

A valuation allowance has been established with regards to the tax benefits associated with certain net operating losses, or NOLs, as it is more likely than not that these benefits will not be realized in the foreseeable future.

As of December 31, 2018, the expiration dates for the NOLs are as follows:

Jurisdiction	Amount	Expiration Date
	(in millions)	
Foreign NOL	\$ 3	2019-2025
Foreign NOL	20	No expiration date
State NOL	4	2025-2036

Unrecognized Tax Benefits

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

	Year Ended December 31,		
	2018	2017	2016
	(in millions)		
Beginning balance	\$ 45	\$ 48	\$ 40
	28	2	9

Additions as a result of tax positions taken in prior periods			
Additions as a result of tax positions taken in the current period	6	5	3
Reductions related to settlements with taxing authorities	(23)	—	(4)
Reductions as a result of lapses of the applicable statute of limitations	(4)	(10)	—
Ending balance	\$ 52	\$ 45	\$ 48

As of December 31, 2018, we had \$43 million of unrecognized tax benefits, \$45 million as of December 31, 2017 and \$48 million as of December 31, 2016 which, if recognized in the future, would affect our effective tax rate. Nasdaq believes it is reasonably possible that our unrecognized tax benefits could decrease within the next 12 months by as much as \$12 million, principally as a result of potential resolutions or settlements of prior years' tax items.

We recognize interest and/or penalties related to income tax matters in the provision for income taxes in our Consolidated Statements of Income and were \$2 million for the year ended December 31, 2018, \$1 million for 2017 and \$2 million for 2016. Accrued interest and penalties, net of tax effect were \$10 million as of December 31, 2018 and \$9 million as of December 31, 2017.

Tax Audits

Nasdaq and its eligible subsidiaries file a consolidated U.S. federal income tax return and applicable state and local income tax returns and non-U.S. income tax returns. Federal income tax returns for the years 2008 through 2014 are currently under examination by the Internal Revenue Services and we are subject to examination by the Internal Revenue Service for years 2015 through 2017. Several state tax returns are currently under examination by the respective tax authorities for the years 2007 through 2016 and we are subject to examination for the year 2017. Non-U.S. tax returns are subject to examination by the respective tax authorities for the years 2009 through 2017. Although the results of such examinations may have an impact on our unrecognized tax benefits, we do not anticipate that such impact will be material to our consolidated financial position or results of operations. In addition, we do not anticipate that the amount of unrecognized tax benefits as of December 31, 2018 will decrease in the next twelve months as we do not expect to settle any material tax audits.

The Swedish Tax Agency has disallowed certain interest expense deductions for the years 2013 - 2016. We appealed to

the Lower Administrative Court for the years 2013 - 2015. In the first quarter of 2018, the Lower Administrative Court denied our appeal. We have appealed to the Administrative Court of Appeal. Through March 31, 2018, we had recorded tax benefits of \$56 million associated with this matter. We continue to pay all assessments from the Swedish Tax Agency while this matter is pending and have paid \$40 million through December 31, 2018. In the second quarter of 2018, the Administrative Court of Appeal decided similar cases against other taxpayers. Although we continue to assert the validity of these interest expense deductions, the decisions of the court lead us to conclude that we can no longer assert that we are more than likely to be successful in our appeal. As such, in 2018, we recorded tax expense of \$41 million, or \$0.24 per diluted share, which is net of any related U.S. tax benefits and reflects the impact of foreign currency translation. We expect to record future quarterly net tax expense of \$1 million related to this matter.

Tax Cuts and Jobs Act

The Tax Cuts and Jobs Act contained several key provisions, including a reduction of the U.S. corporate income tax rate from 35% to 21%. It also imposed a transition tax on unremitted aggregate accumulated earnings of non-U.S. subsidiaries, which did not impact us and the act also created a new requirement to provide U.S. tax on foreign earnings, global intangible low-taxed income, or GILTI, which was immaterial for 2018. To the extent that we incur future expense under the GILTI provisions, we will record the expense as a component of income tax expense as a current-period expense when incurred. We were required to remeasure all of our U.S. deferred tax assets and liabilities as of December 22, 2017 and record the impact of such remeasurement in our 2017 financial statements. The net effect of applying the provisions of the act on our 2017 Consolidated Statement of Income was a non-cash provisional tax benefit of \$89 million, substantially all of which reflects the estimated impact associated with the remeasurement of our net U.S. deferred tax liability at the lower U.S. federal corporate income tax rate.

SAB 118 provided guidance which allowed us to record provisional amounts during a measurement period of up to one year from the enactment date to finalize the recording of any related tax impacts. During the fourth quarter of 2018, we completed our accounting for the tax effects of the act, finalizing our analysis of the act and subsequent guidance issued by the U.S. Internal Revenue Service. As a result, we recorded a \$290 million non-cash tax charge, reducing deferred tax assets relating to foreign currency translation.

Topic 220

On January 1, 2018, we adopted Topic 220. See “Income Statement - Reporting Comprehensive Income,” of “Recent Accounting Pronouncements,” of Note 2, “Summary of

Significant Accounting Policies,” for further discussion of this standard. As a result of the adoption of this standard, we recorded a reclassification of \$417 million related to the Tax Cuts and Jobs Act from accumulated other comprehensive loss to retained earnings within stockholders’ equity in the Consolidated Balance Sheets.

18. Restructuring Charges

2015 Restructuring Plan

During the first quarter of 2015, we performed a comprehensive review of our processes, businesses and systems in a company-wide effort to improve performance, cut costs, and reduce spending. This restructuring plan was completed in the second quarter of 2016.

The following table presents a summary of restructuring plan charges in the Consolidated Statements of Income:

	Year Ended December 31, 2016 (in millions)
Severance and other termination benefits	\$ 22
Facilities-related	1
Asset impairments	8
Other	10
Total restructuring charges	\$ 41

For the year ended December 31, 2016, we recognized restructuring charges totaling \$41 million, including severance costs of \$22 million related to workforce reductions of 201 positions across our organization, \$8 million for asset impairments, primarily related to fixed assets and capitalized software that were retired and \$10 million of other charges.

Restructuring Reserve

Severance

As of December 31, 2016, an accrued severance balance of \$17 million was included in other current liabilities in the Consolidated Balance Sheets and was paid during 2017.

19. Commitments, Contingencies and Guarantees

Guarantees Issued and Credit Facilities Available

In addition to the default fund contributions and margin collateral pledged by clearing members discussed in Note 15, "Clearing Operations," we have obtained financial guarantees and credit facilities which are guaranteed by us through counter indemnities, to provide further liquidity related to our clearing businesses. Financial guarantees issued to us totaled \$12 million as of December 31, 2018 and \$14 million as of December 31, 2017. As discussed in "Other Credit Facilities," of Note 9, "Debt Obligations," clearing-related credit facilities, which are available in multiple currencies, totaled \$220 million as of December 31, 2018 and \$187 million as of December 31, 2017, in available liquidity, none of which was utilized.

Execution Access is an introducing broker which operates the trading platform for our Fixed Income business to trade in U.S.

Treasury securities. Execution Access has a clearing arrangement with Industrial and Commercial Bank of China Financial Services LLC, or ICBC. As of December 31, 2018, we have contributed \$15 million of clearing deposits to ICBC in connection with this clearing arrangement. These deposits are recorded in other current assets in our Consolidated Balance Sheets. Some of the trading activity in Execution Access is cleared by ICBC through the Fixed Income Clearing Corporation, with ICBC acting as agent. Execution Access assumes the counterparty risk of clients that do not clear through the Fixed Income Clearing Corporation. Counterparty risk of clients exists for Execution Access between the trade date and the settlement date of the individual transactions, which is at least one business day (or more, if specified by the U.S. Treasury issuance calendar). Counterparties that do not clear through the Fixed Income Clearing Corporation are subject to a credit due diligence process and may be required to post collateral, provide principal letters, or provide other forms of credit enhancement to Execution Access for the purpose of mitigating counterparty risk. Daily position trading limits are also enforced for such counterparties.

We believe that the potential for us to be required to make payments under these arrangements is mitigated through the pledged collateral and our risk management policies. Accordingly, no contingent liability is recorded in the Consolidated Balance Sheets for these arrangements. However, no guarantee can be provided that these arrangements will at all times be sufficient.

Lease Commitments

We lease some of our office space under non-cancelable operating leases with third parties and sublease office space to third parties. Some of our lease agreements contain renewal options and escalation clauses based on increases in property taxes and building operating costs.

Other Guarantees

Through our clearing operations in the financial markets, Nasdaq Clearing is the legal counterparty for, and guarantees the performance of, its clearing members. See Note 15, "Clearing Operations," for further discussion of Nasdaq Clearing performance guarantees.

We have provided a guarantee related to lease obligations for The Nasdaq Entrepreneurial Center, Inc., which is a not-for-profit organization designed to convene, connect and engage aspiring and current entrepreneurs. This entity is not included in the consolidated financial statements of Nasdaq.

We believe that the potential for us to be required to make payments under these arrangements is unlikely.

Accordingly, no contingent liability is recorded in the Consolidated Balance Sheets for the above guarantees.

Non-Cash Contingent Consideration

As part of the purchase price consideration of a prior acquisition, we have agreed to future annual issuances of 992,247 shares of Nasdaq common stock which approximated certain tax benefits associated with the transaction.

Such

contingent future issuances of Nasdaq common stock will be paid ratably through 2027 if Nasdaq's total gross revenues equal or exceed \$25 million in each such year. The contingent future issuances of Nasdaq common stock are subject to anti-dilution protections and acceleration upon certain events.

Escrow Agreements

In connection with prior acquisitions, we entered into escrow agreements to secure the payment of post-closing adjustments and to ensure other closing conditions. As of December 31, 2018, these escrow agreements provide for future payment of \$12 million which is included in other current liabilities in the Consolidated Balance Sheets.

Routing Brokerage Activities

One of our broker-dealer subsidiaries, Nasdaq Execution Services, provides a guarantee to securities clearinghouses and exchanges under its standard membership agreements, which require members to guarantee the performance of other members. If a member becomes unable to satisfy its obligations to a clearinghouse or exchange, other members would be required to meet its shortfalls. To mitigate these performance risks, the exchanges and clearinghouses often require members to post collateral, as well as meet certain minimum financial standards. Nasdaq Execution Services' maximum potential liability under these arrangements cannot be quantified. However, we believe that the potential for Nasdaq Execution Services to be required to make payments under these arrangements is unlikely. Accordingly, no contingent liability is recorded in the Consolidated Balance Sheets for these arrangements.

Acquisition of Cinnober

For further discussion of our acquisition of Cinnober, see “Acquisition of Cinnober,” of Note 3, “Acquisitions and Divestiture,” to the consolidated financial statements.

Other Commitment

We have a 40.0% ownership in OCC. Under the OCC's capital plan, the OCC shareholders have committed to contribute up to \$200 million in equity capital if certain capital thresholds are breached, including up to \$80 million to be contributed by Nasdaq. See “Equity Method Investments,” of Note 6, “Investments,” for further discussion of our equity method investment in OCC.

Offer for Oslo Børs VPS

For further discussion of our offer for Oslo Børs VPS, see “Offer for Oslo Børs VPS,” of Note 21, “Subsequent Events.”

Legal and Regulatory Matters

Litigation

As previously disclosed, we are named as one of many defendants in *City of Providence v. BATS Global Markets, Inc., et al.*, 14 Civ. 2811 (S.D.N.Y.), which was filed on April 18, 2014 in the United States District Court for the Southern District of New York. The district court appointed lead counsel, who

filed an amended complaint on September 2, 2014. The amended complaint names as defendants seven national exchanges, as well as Barclays PLC, which operated a private alternative trading system. On behalf of a putative class of securities traders, the plaintiffs allege that the defendants engaged in a scheme to manipulate the markets through high-frequency trading; the amended complaint asserts claims against us under Section 10(b) of the Exchange Act and Rule 10b-5, as well as under Section 6(b) of the Exchange Act. The plaintiffs seek injunctive and monetary relief of an unspecified amount. We filed a motion to dismiss the amended complaint on November 3, 2014. In response, the plaintiffs filed a second amended complaint on November 24, 2014, which names the same defendants and alleges essentially the same violations. We then filed a motion to dismiss the second amended complaint on January 23, 2015. On August 26, 2015, the district court entered an order dismissing the second amended complaint in its entirety with prejudice, concluding that most of the plaintiffs' theories were foreclosed by absolute immunity and in any event that the plaintiffs failed to state any claim. The plaintiffs appealed the judgment of dismissal to the United States Court of Appeals for the Second Circuit. On December 19, 2017, the Second Circuit issued an opinion vacating the district court's judgment of dismissal and remanding to the district court for further proceedings. The exchanges filed a petition before the Second Circuit seeking panel or en banc rehearing on January 31, 2018, which the Second Circuit denied on March 13, 2018. On May 18, 2018, the exchanges filed a motion to dismiss the amended complaint, raising issues not addressed in the proceedings to date. Given the preliminary nature of the proceedings, we are unable to estimate what, if any, liability may result from this litigation. However, we believe that the claims are without merit and will continue to litigate vigorously.

Nasdaq Commodities Clearing Default

During September 2018, a clearing member of Nasdaq Clearing's commodities market was declared in default. Consistent with our regulatory obligations, we notified all relevant regulators and are cooperating fully with information requests. We are engaging in discussions with the other members regarding the default and recovery process towards the defaulting member. We are unable to predict the outcome or exact timing of this matter. See "Nasdaq Commodities Clearing Default," of Note 15, "Clearing Operations," for further information on this event.

SEC Decisions

In recent years, certain industry groups have challenged the level of fees that U.S. exchanges charge for market data and

connectivity. We have defeated two challenges in federal appeals court pertaining to market data and an additional challenge at the administrative level within the SEC. However, in October 2018, the SEC reversed that administrative decision and found that Nasdaq had not met a burden of demonstrating that certain challenged fees were fair and reasonable; we estimate that this decision will reduce our revenues by approximately \$1 million. Nasdaq has appealed this decision to the U.S. Court of Appeals for the District of Columbia Circuit. In addition, the SEC remanded a series of additional challenges to market data and connectivity fees back to Nasdaq for further consideration. Nasdaq has also appealed this decision to the U.S. Court of Appeals for the District of Columbia Circuit. We are unable to predict the outcome or the timing of the ultimate resolution of these matters.

Other Matters

Except as disclosed above and in prior reports filed under the Exchange Act, we are not currently a party to any litigation or proceeding that we believe could have a material adverse effect on our business, consolidated financial condition, or operating results. However, from time to time, we have been threatened with, or named as a defendant in, lawsuits or involved in regulatory proceedings.

In the normal course of business, Nasdaq discusses matters with its regulators raised during regulatory examinations or otherwise subject to their inquiries. Management believes that censures, fines, penalties or other sanctions that could result from any ongoing examinations or inquiries will not have a material impact on its consolidated financial position or results of operations. However, we are 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.

Tax Audits

We are engaged in ongoing discussions and audits with taxing authorities on various tax matters, the resolutions of which are uncertain. Currently, there are matters that may lead to assessments, some of which may not be resolved for

several years. Based on currently available information, we believe we have adequately provided for any assessments that could result from those proceedings where it is more likely than not that we will be assessed. We review our positions on these matters as they progress. See “Tax Audits,” of Note 17, “Income Taxes,” for further discussion.

* * * * *

20. Business Segments

We manage, operate and provide our products and services in four business segments: Market Services, Corporate Services, Information Services and Market Technology. See Note 1, “Organization and Nature of Operations,” for further discussion of our reportable segments. In early 2018, we realigned our businesses to better serve the needs of our corporate clients. As a result, beginning in the second quarter of 2018, our B Wise internal audit, regulatory compliance management, and operational risk management software solutions are now offered as part of governance, risk & compliance products and services within our Corporate

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Solutions business. B Wise was previously part of our Market Technology segment. We have restated prior periods to conform to the current year presentation.

Our management allocates resources, assesses performance and manages these businesses as four separate segments. We evaluate the performance of our segments based on several factors, of which the primary financial measure is operating income. Results of individual businesses are presented based on our management accounting practices and structure.

The following table presents certain information regarding our operating segments for the years ended December 31, 2018, 2017 and 2016:

	Market Services (in millions)	Corporate Services	Information Services	Market Technology	Corporate Items	Consolidated
Year Ended December 31, 2018						
Total revenues	\$2,709	\$ 528	\$ 714	\$ 270	\$ 56	\$ 4,277
Transaction-based expenses	(1,751)	—	—	—	—	(1,751)
Revenues less transaction-based expenses	958	528	714	270	56	2,526
Depreciation and amortization	95	41	51	\$ 21	2	210
Operating income (loss)	544	163	460	34	(173)	1,028
Total assets	10,299	734	3,352	467	848	15,700
Purchase of property and equipment	28	29	17	37	—	111
Year Ended December 31, 2017						
Total revenues	\$2,418	\$ 501	\$ 588	\$ 247	\$ 194	\$ 3,948
Transaction-based expenses	(1,537)	—	—	—	—	(1,537)
Revenues less transaction-based expenses	881	501	588	247	194	2,411
Depreciation and amortization	95	44	26	14	9	188
Operating income (loss)	481	158	418	57	(123)	991
Total assets	9,471	865	3,420	572	1,026	15,354
Purchase of property and equipment	59	41	10	34	—	144
Year Ended December 31, 2016						
Total revenues	\$2,255	\$ 477	\$ 540	\$ 241	\$ 191	\$ 3,704
Transaction-based expenses	(1,428)	—	—	—	—	(1,428)
Revenues less transaction-based expenses	827	477	540	241	191	2,276
Depreciation and amortization	87	42	18	13	10	170
Operating income (loss)	450	130	383	73	(200)	836
Total assets	8,626	1,263	2,439	497	586	13,411
Purchase of property and equipment	62	37	8	27	—	134

Certain amounts are allocated to corporate items in our management reports as we believe they do not contribute to a meaningful evaluation of a particular segment's ongoing operating performance. These items include the following: 2018 Divestiture: We have included in corporate items the revenues and expenses of the Public Relations Solutions and Digital Media Services businesses which were part of the Corporate Solutions business within our Corporate Services segment as these businesses were sold in April 2018. See "2018 Divestiture," of Note 3, "Acquisitions and Divestiture," for further discussion.

Amortization expense of acquired intangible assets: We amortize intangible assets acquired in connection with various acquisitions. Intangible asset amortization expense can vary from period to period due to episodic acquisitions completed, rather than from our ongoing business operations. As such, if

intangible asset amortization is included in performance measures, it is more difficult to assess the day-to-day operating performance of the segments, and the relative operating performance of the segments between periods. Management does not consider intangible asset amortization expense for the purpose of evaluating the performance of our segments or their managers or when making decisions to allocate resources. Therefore, we believe performance

measures excluding intangible asset amortization expense provide management with a more useful representation of our segments' ongoing activity in each period.

Merger and strategic initiatives expense: We have pursued various strategic initiatives and completed a divestiture and a number of acquisitions in recent years which have resulted in expenses which would not have otherwise been incurred. These expenses generally include integration costs, as well as legal, due diligence and other third party transaction costs. The

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frequency and the amount of such expenses vary significantly based on the size, timing and complexity of the transaction.

Clearing Default: For the year ended December 31, 2018, we recorded \$31 million in expense related to the clearing default. In September 2018, we recorded an \$8 million loss relating to this default. In December 2018, we recorded a \$23 million charge as a result of initiating a capital relief program. See “Nasdaq Commodities Clearing Default,” of Note 15, “Clearing Operations,” for further discussion of the default. We have excluded these charges as we believe they are non-recurring, as there has never been a loss due to member default in our clearinghouse, and they should be excluded when evaluating the ongoing operating performance of the Market Services segment. Any expenses associated with the enhancement of processes and procedures relating to our clearing business will be reflected within the Market Services segment.

Other significant items: We have included certain other charges or gains in corporate items, to the extent we believe they should

be excluded when evaluating the ongoing operating performance of each individual segment. For 2018, other significant items primarily included charges related to uncertain positions pertaining to sales and use tax and VAT and certain litigation costs. For 2017, other significant items primarily included loss on extinguishment of debt. For 2016, other significant items primarily included restructuring charges of \$41 million which were associated with our 2015 restructuring plan, a regulatory fine received by our Nordic exchanges and clearinghouse, accelerated expense for equity awards previously granted due to the retirement of the company’s former CEO, and the release of a sublease loss reserve due to the early exit of a facility. We believe the exclusion of such amounts allows management and investors to better understand the ongoing financial results of each segment.

Accordingly, we do not allocate these costs for purposes of disclosing segment results because they do not contribute to a meaningful evaluation of a particular segment’s ongoing operating performance.

* * * * *

A summary of our corporate items is as follows:

	Year Ended December 31,		
	2018	2017	2016
	(in millions)		
Revenues - divested businesses	\$56	\$194	\$191
Expenses:			
Amortization expense of acquired intangible assets	109	92	82
Merger and strategic initiatives expense	21	44	76
Clearing default	31	—	—
Extinguishment of debt	—	10	—
Restructuring charges	—	—	41
Regulatory matter	—	—	6
Expenses - divested businesses	51	167	168
Executive compensation	—	—	12
Other	17	4	6
Total expenses	229	317	391
Operating loss	\$(173)	\$(123)	\$(200)

Total assets increased \$346 million as of December 31, 2018 compared with December 31, 2017 primarily due to an increase in default funds and margin deposits (with a corresponding increase in current liabilities), due to higher cash default fund contributions directly related to member exposure and an increase in margin level requirements as a result of the Nasdaq Commodities clearing default in September 2018. This increase was partially offset by a decrease in goodwill and intangible assets, net reflecting the impact of changes in foreign exchange rates and amortization of intangible assets. Total assets increased \$2.0 billion as of December 31, 2017 compared with December 31, 2016 primarily due to an increase in default funds and margin deposits (with a corresponding increase in current

liabilities), reflecting an increase in cash margin deposits pledged by members of our Nasdaq Clearing business due to an increase in clearing volume. Also contributing to the increase was an increase in goodwill and intangible assets associated with our 2017 and 2016 acquisitions.

For further discussion of our segments' results, see "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations-Segment Operating Results."

Geographic Data

The following table presents total revenues and property and equipment, net by geographic area for 2018, 2017 and 2016. Revenues are classified based upon the location of the customer.

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Property and equipment information is based on the physical location of the assets. On January 1, 2018, we adopted Topic 606 using the full retrospective method which required restatement of 2017 and 2016 financial statements.

	Property Total and Revenues equipment, Net	
2018:	(in millions)	
United States	\$3,379	\$ 224
All other countries	898	152
Total	\$4,277	\$ 376
2017:		
United States	\$3,081	\$ 247
All other countries	867	153
Total	\$3,948	\$ 400
2016:		
United States	\$2,679	\$ 244
All other countries	1,025	118
Total	\$3,704	\$ 362

Our property and equipment, net for all other countries primarily includes assets held in Sweden. No single customer accounted for 10.0% or more of our revenues in 2018, 2017 and 2016.

* * * * *

21. Subsequent Events

Acquisition of Cinnober

For further discussion of our acquisition of Cinnober, see “Acquisition of Cinnober,” of Note 3, “Acquisitions and Divestiture,” to the consolidated financial statements.

Offer for Oslo Børs VPS

In February 2019, we, through our indirect wholly-owned subsidiary Nasdaq AB, made a public offer, or the Offer, to acquire all of the issued shares of Oslo Børs VPS Holding ASA, or Oslo Børs VPS, at NOK 152 per share plus interest payments at a rate of 6% per annum on the Offer price, pro-rated per day from January 29, 2019 until the conditions to the Offer have been fulfilled or waived. The Offer price values the entire issued share capital of Oslo Børs VPS at NOK 6,537 million, or approximately \$770 million. Oslo Børs VPS’ board of directors has unanimously recommended that its shareholders accept the Offer. The acceptance period will be open from February 4, 2019 to March 4, 2019 and is subject to extension or re-opening.

The Offer is subject to the fulfillment or waiver of certain customary conditions, including but not limited to acceptances from shareholders holding 90% or more of the shares of Oslo Børs VPS, certain regulatory clearances, limited confirmatory due diligence and completion of the Offer by December 31, 2019.

Agreement to Sell B Wise

In February 2019, we entered into an agreement with SAI Global to sell B Wise, our internal audit, regulatory compliance management, and operational risk management software that comprises our governance, risk and compliance product offering. Subject to regulatory approvals, works council and other representative body consultations and notifications in applicable jurisdictions, as well as other customary closing conditions, the transaction is expected to close in the first half of 2019.

B Wise is part of our Corporate Solutions business within our Corporate Services segment.