Northern Trust Corporation

Pillar 3 Regulatory Disclosures

For the quarterly period ended September 30, 2018

Northern Trust Corporation

PILLAR 3 REGULATORY DISCLOSURES

For the quarterly period ended September 30, 2018

Table of Contents Page

Index of Tables | Page

Introduction

Northern Trust Corporation (the "Corporation") is a financial holding company that is a leading provider of wealth management, asset servicing, asset management and banking solutions to corporations, institutions, families and individuals. The Corporation focuses on managing and servicing client assets through its two client-focused reporting segments: Corporate & Institutional Services and Wealth Management. Asset management and related services are provided to Corporate & Institutional Services and Wealth Management clients primarily by the Asset Management business. The Corporation conducts business through various U.S. and non-U.S. subsidiaries, including through its principal subsidiary, The Northern Trust Company (the "Bank"). At September 30, 2018, the Corporation had consolidated total assets of $132.4 billion and stockholders' equity of $10.4 billion.

The Corporation is a bank holding company that has elected to be a financial holding company under the Bank Holding Company Act of 1956, as amended. Consequently, the Corporation and its business activities throughout the world are subject to the supervision, examination, and regulation of the Board of Governors of the Federal Reserve System (the "Federal Reserve"). The Federal Reserve has established risk-based and leverage capital guidelines for bank holding companies, including the Corporation. As discussed below, on July 2, 2013, the Federal Reserve issued final rules implementing a strengthened set of capital requirements, known as Basel III, in the United States.

The Basel Capital Framework, as described below, requires disclosures based on the third pillar of Basel III ("Pillar 3"). The purpose of Pillar 3 disclosures is to provide information on banking institutions' regulatory capital and risk management practices. This report is designed to satisfy these requirements and should be read in conjunction with the Corporation's Quarterly Report on Form 10-Q for the quarterly period ended September 30, 2018 (the "Third Quarter 2018 Form 10-Q") and the Corporation's Annual Report on Form 10-K for the year ended December 31, 2017 (the "2017 Annual Report").

Except where the context otherwise requires, when we use the terms "Northern Trust," "we," "us," and "our," we mean Northern Trust Corporation and its subsidiaries on a consolidated basis. The basis of consolidation used for regulatory reporting is consistent with that used under U.S. generally accepted accounting principles ("GAAP").

- Refer to Note 1, starting on page 93, within the Corporation's 2017 Annual Report and Note 1, starting on page 36, within the Corporation's Third Quarter 2018 Form 10-Q for further information on the basis of presentation of the Corporation's financial statements.

Measures of exposures and other metrics disclosed in this report may not be based on GAAP, may not be directly comparable to measures reported in our 2017 Annual Report or Third Quarter 2018 Form 10-Q and may not be comparable to similar measures used by other companies. These disclosures are not required to be, and have not been, audited by our independent auditors. Our historical filings with the U.S. Securities and Exchange Commission (the "SEC") and other regulatory disclosure documents are located in the Investor Relations section of our website at *www.northerntrust.com*.

Forward-Looking Statements

This document may include statements which constitute “forward-looking statements” within the meaning of the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are identified typically by words or phrases such as “believe,” “expect,” “anticipate,” “intend,” “estimate,” “project,” “likely,” “plan,” “goal,” “target,” “strategy,” and similar expressions or future or conditional verbs such as “may,” “will,” “should,” “would,” and “could.” Forward-looking statements include statements, other than those related to historical facts, that relate to Northern Trust’s financial results and outlook; capital adequacy; dividend policy and share repurchase program; credit quality including allowance levels; anticipated expense levels; contingent liabilities; acquisitions; strategies; industry trends; and expectations regarding the impact of recent legislation. These statements are based on Northern Trust’s current beliefs and expectations of future events or future results, and involve risks and uncertainties that are difficult to predict and subject to change. These statements are also based on assumptions about many important factors, including the factors discussed in Northern Trust’s most recent annual report on Form 10-K and other filings with the U.S. Securities and Exchange Commission, all of which are available on Northern Trust’s website. We caution you not to place undue reliance on any forward-looking statement as actual results may differ materially from those expressed or implied by forward-looking statements. Northern Trust assumes no obligation to update its forward-looking statements.

Basel Capital Framework

On September 12, 2010, the Group of Governors and Heads of Supervision, the oversight body of the International Basel Committee on Banking Supervision, announced agreement on the calibration and phase-in arrangements for the Basel III capital requirements. On July 2, 2013, the Federal Reserve issued final rules implementing Basel III capital requirements in the United States. The U.S. implementation of Basel III, among other things: (1) increases the minimum capital thresholds for banking organizations and tightens the standards for what qualifies as capital; (2) introduces a new Common Equity Tier 1 capital measure; and (3) presents two methodologies for calculating risk-weighted assets, a standardized approach and an advanced approach. For large and internationally active banks and bank-holding companies, including the Bank and the Corporation, Basel III became effective on January 1, 2014, although certain requirements will be phased in over several years.

The Basel capital framework seeks the alignment of capital requirements with the underlying risks a bank faces and consists of the following three complementary "pillars" designed to reinforce the safety and soundness of the financial system.

Pillar 1 — Minimum Capital Requirements

Pillar 1 provides a framework for calculating minimum regulatory capital requirements. Pillar 1 consists of three risk types: credit risk, operational risk and market risk.

Pillar 2 — Supervisory Review

Pillar 2 addresses the need for banks to consider all material risks and determine the level of capital required to remain solvent during extreme circumstances and requires banks to have sound internal capital adequacy assessment processes. The internal capital adequacy assessment process includes setting objectives for capital that are consistent with the bank's risk profile and the control environment in which it operates.

Pillar 3 — Risk Disclosure and Market Discipline

Pillar 3 requires qualitative and quantitative descriptions of capital structure, capital adequacy, internal control processes, risk management and the nature of underlying risks. The purpose of Pillar 3 disclosures is to provide information on banking institutions' regulatory capital and risk management practices.

Capital Structure

Regulatory Capital

Under a provision of the Dodd-Frank Wall Street Reform and Consumer Protection Act, Northern Trust is subject to a capital floor that is based on the Basel standardized approach. We are therefore required to calculate our risk-based capital ratios under both the standardized and advanced approaches and are subject to the more stringent of the risk-based capital ratios as calculated under the standardized approach and the advanced approach in the assessment of our capital adequacy under the prompt corrective action framework. The Corporation's capital ratios as of September 30, 2018, are shown in the following table.

Table 1: Northern Trust Corporation Capital Ratios

($ In Millions)	As of September 30, 2018	
	Basel Standardized Transitional	Basel Advanced Transitional
Regulatory Capital		
Common Equity Tier 1 Capital	$ 8,587	$ 8,587
Tier 1 Capital	9,453	9,453
Total Capital	10,800	10,660
Assets		
Risk-Weighted Assets	$ 66,728	$ 63,908
Average Adjusted Total Assets	121,244	121,244
Supplementary Leverage Exposure	N/A	137,266
Capital Ratios		
Common Equity Tier 1 Capital	12.9%	13.4%
Tier 1 Capital	14.2%	14.8%
Total Capital	16.2%	16.7%
Tier 1 Leverage	7.8%	7.8%
Supplementary Leverage	N/A	6.9%

The Common Equity Tier 1 ratio is defined as Common Equity Tier 1 capital divided by risk-weighted assets; the Tier 1 Capital ratio is defined as Tier 1 capital divided by risk-weighted assets; and the Total Capital ratio is defined as total capital divided by risk-weighted assets. The Tier 1 Leverage ratio is defined as Tier 1 capital divided by average adjusted total assets (which includes adjustments for goodwill and identifiable intangible assets). The Supplementary Leverage ratio is defined as Tier 1 capital divided by supplementary leverage exposure.

Northern Trust is required to maintain minimum ratios of capital to risk-weighted assets and adjusted quarterly average assets, the current levels of which are as shown in the following table.

Table 2: Minimum Capital Ratios

	As of September 30, 2018	
	Well-Capitalized Ratios	Minimum Capital Ratios
Capital Ratios		
Common Equity Tier 1 Capital	6.5%	4.5%
Tier 1 Capital	8.0%	6.0%
Total Capital	10.0%	8.0%
Tier 1 Leverage	5.0% [(a)]	4.0%
Supplementary Leverage	N/A	3.0%

(a) Represents requirements for bank subsidiaries pursuant to regulations issued under the FDIC Improvement Act. There is no Tier 1 leverage component in the definition of a "well capitalized" bank holding company.

Effective January 1, 2016, the Basel III capital requirements establish a capital conservation buffer and a countercyclical capital buffer above the regulatory minimum capital ratio requirements. Northern Trust must maintain capital ratios in excess of the minimum capital requirements, as expanded by these buffers, in order to avoid limitations on capital distributions, including dividend payments, as well as on certain discretionary bonus payments to executive officers.

The capital conservation buffer was initially set at 0.625% beginning on January 1, 2016, and increases by 0.625% per year until it is fully phased in at 2.5% on January 1, 2019.

The countercyclical conservation buffer is an extension of the capital conservation buffer and it can range from 0% to 2.5%. The countercyclical capital conservation buffer is subject to the countercyclical conservation buffer rate set by the national jurisdictions where Northern Trust's private sector credit exposures are located and reflects a weighted average of the countercyclical capital buffer amounts set by those jurisdictions.

The table below reflects Northern Trust's private sector credit exposures located in national jurisdictions that have set their countercyclical capital conservation buffer above 0%.

Table 3: Credit Exposures Subject to a Countercyclical Capital Buffer

($ In Millions)		As of September 30, 2018
	Transitional Countercyclical Buffer Rate	Credit Exposures
Hong Kong	1.406%	$ 310.9
Norway	1.500%	745.3
Sweden	1.500%	829.8
United Kingdom	0.375%	3,476.6

The capital conservation buffer and countercyclical capital buffer rates applicable to Northern Trust are reflected in the table below.

Table 4: Prescribed Regulatory Capital Buffers

	As of September 30, 2018	
	Northern Trust Corporation	The Northern Trust Company
Capital Conservation Buffer	1.8750%	1.8750%
Countercyclical Conservation Buffer	0.0211%	0.0218%

Northern Trust is not subject to any limitation on capital distributions as its capital ratios exceed the minimum capital requirements, as expanded by the capital conservation buffer and the countercyclical conservation buffer. Capital distributions for institutions that do not exceed these ratio requirements would be limited to between 0% and 60% of total eligible retained income. Eligible retained income, defined as net income for the preceding four calendar quarters net of any capital distributions not reflected within net income, was $245.0 million and $652.7 million for Northern Trust Corporation and The Northern Trust Company, respectively, as of September 30, 2018.

For regulatory purposes, Northern Trust’s capital is classified into Common Equity Tier 1 capital, Tier 1 capital and Tier 2 capital. Under the Basel III transitional provisions, certain items were phased in from 2014 through 2017, including the capital treatment for accumulated other comprehensive income and other items required for risk-based capital calculations. Floating rate capital securities will continue to be phased out through 2021.

The methods for the calculation of Northern Trust’s risk-based capital ratios will change as the provisions of the Basel III final rule related to floating rate capital securities are phased out. These ongoing methodology changes will result in differences in our reported capital ratios from one reporting period to the next that are independent of applicable changes to our capital base, asset composition, off-balance-sheet exposures or risk profile.

The table below presents the components of the Corporation's regulatory capital as defined under Basel III as of September 30, 2018.

Table 5: Components of Regulatory Capital

($ In Millions)	As of September 30, 2018	
	Basel Standardized Transitional	Basel Advanced Transitional
Regulatory Capital		
Common Stock and Related Surplus	$ (487)	$ (487)
Retained Earnings	10,496	10,496
Accumulated Other Comprehensive Income	(527)	(527)
Common Stockholders' Equity	**$ 9,482**	**$ 9,482**
Adjustments for:		
Goodwill and Other Intangible Assets (Net of deferred tax liability)	(777)	(777)
Other	(118)	(118)
Common Equity Tier 1 Capital	**$ 8,587**	**$ 8,587**
Preferred Stock	882	882
Other	(16)	(16)
Tier 1 Capital	**$ 9,453**	**$ 9,453**
Long-Term Debt [(a)]	1,099	1,099
Floating Rate Capital Securities	108	108
Allowance for Credit Losses	140	—
Total Capital	**$ 10,800**	**$ 10,660**

(a) *Long-term debt that qualifies for risk-based capital amortizes for the purpose of inclusion in Tier 2 capital during the five years before maturity.*

- Refer to Note 12, starting on page 124, Note 13, starting on page 124, and Note 14, starting on page 125, to the consolidated financial statements included within the Corporation's 2017 Annual Report for the terms and conditions of the main features of all regulatory capital instruments.

Risk-Weighted Assets

The Corporation's risk-weighted assets, as calculated under Basel III methodologies as of September 30, 2018, are presented in the following table. For credit risk, the Basel III Standardized Transitional risk-weighted assets reflect prescribed regulatory risk-weights, while the Basel III Advanced risk-weighted assets reflect the results of the Advanced Internal Ratings Based approach ("AIRB"), which is described in the Credit Risk section. Market risk-weighted assets are calculated based on the final Market Risk Rule approved by the Federal Reserve in June 2012, and are identical for both the standardized and advanced approaches. Market risk is further discussed in the Market Risk section. Risk-weighted assets as calculated under the advanced approaches may show variability over time due to changes in data, methodology, models, regulatory guidance or other items.

Table 6: Risk-Weighted Assets

($ In Millions)		As of September 30, 2018		
		Basel Standardized Transitional		Basel Advanced Transitional
Wholesale Exposures	$	57,850	$	40,035
Securitization Exposures		892		945
Equity Exposures		1,667		1,767
Other Assets		6,155		4,707
Credit Valuation Adjustment [(a)]		N/A		623
Total Credit Risk-Weighted Assets	**$**	**66,564**	**$**	**48,077**
Operational Risk-Weighted Assets [(b)]		**N/A**	**$**	**15,667**
Market Risk-Weighted Assets	**$**	**164**	**$**	**164**
Total Risk-Weighted Assets	**$**	**66,728**	**$**	**63,908**

(a) The credit valuation adjustment is included only in the Basel III Advanced calculations.

(b) Operational risk-weighted assets are included only in the Basel III Advanced calculations and are the result of the Advanced Measurement Approach ("AMA"), which is described in the Operational Risk section.

Supplementary Leverage Ratio

The table below presents the components of the Corporation's supplementary leverage ratio as of September 30, 2018. Line items reflecting components of the supplementary leverage ratio that are not relevant to the Corporation have been omitted.

Table 7: Summary Comparison of Accounting Assets and Total Leverage Exposure

($ In Millions)		As of September 30, 2018
Line No.		
1	Total Consolidated Assets	132,378
4	Adjustment for Derivatives Exposures	2,438
5	Adjustment for Repo-Style Transactions	49
6	Adjustment for Off-Balance-Sheet Exposures	13,535
7.a	Other Adjustments	(912)
7.b	Adjustments for Frequency Calculations	(10,222)
8	**Total Supplementary Leverage Exposures**	**137,266**

Table 8: Supplementary Leverage Ratio

($ In Millions)		As of September 30, 2018
Line No.		
On-Balance-Sheet Exposures		
1	On-Balance-Sheet Assets (excluding on-balance-sheet assets for repo-style transactions and derivative exposures, but including cash collateral received in derivative transactions)	119,239
2	LESS: Amounts Deducted from Tier 1 Capital	(912)
3	Total On-Balance-Sheet Exposures (excluding on-balance-sheet assets for repo-style transactions and derivative exposures, but including cash collateral received in derivative transactions)	118,327
Derivative Exposures		
4	Replacement Cost for Derivative Exposures (that is, net of cash variation margin)	1,160
5	Add-On Amounts for Potential Future Exposure ("PFE") for Derivative Exposures	2,438
11	Total Derivative Exposures	3,598
Repo-Style Transactions		
12	On-Balance-Sheet Assets for Repo-Style Transactions	1,757
14	Counterparty Credit Risk for All Repo-Style Transactions	49
16	Total Exposures for Repo-Style Transactions	1,806
Other Off-Balance-Sheet Exposures		
17	Off-Balance-Sheet Exposures at Gross Notional Amounts	27,855
18	LESS: Adjustments for Conversion to Credit Equivalent Amounts	(14,320)
19	Off-Balance-Sheet Exposures	13,535
Capital and Total Leverage Exposure		
20	Tier 1 Capital	9,453
21	Total Leverage Exposure	137,266
Supplementary Leverage Ratio		
22	Supplementary Leverage Ratio	6.9%

The Northern Trust Company and Our Other Subsidiaries

The Bank is an Illinois banking corporation headquartered in Chicago, Illinois, and, as discussed above, is our principal subsidiary. Founded in 1889, the Bank conducts its business through its U.S. operations and its various U.S. and non-U.S. branches and subsidiaries. At September 30, 2018, the Bank had consolidated assets of $131.9 billion and equity capital of $9.5 billion.

It is expected that the Bank will continue to be the major source of the Corporation's consolidated assets, revenues and net income in the foreseeable future.

The Bank's capital ratios at September 30, 2018, are shown in the following table.

Table 9: The Northern Trust Company Capital Ratios

		The Northern Trust Company As of September 30, 2018
	Basel Standardized Transitional	Basel Advanced Transitional
Capital Ratios		
Common Equity Tier 1	13.2%	14.1%
Tier 1	13.2%	14.1%
Total Capital	14.9%	15.8%
Tier 1 Leverage	7.2%	7.2%
Supplementary Leverage	N/A	6.4%

The Corporation's subsidiary banks located outside the U.S. are also subject to regulatory capital requirements in the jurisdictions in which they operate. As of September 30, 2018, each of Northern Trust's subsidiaries, including the Bank, had capital ratios above their specified minimum requirements.

- Refer to Note 30, starting on page 153, to the consolidated financial statements included within the Corporation's 2017 Annual Report and page 9 of the Corporation's 2017 Annual Report for a description of restrictions on transactions between the Corporation and its subsidiaries.

Capital Adequacy

One of Northern Trust's primary objectives is to maintain a strong capital position to merit the confidence of clients, counterparties, creditors, regulators and stockholders. A strong capital position helps Northern Trust execute its strategies and withstand unforeseen adverse developments.

In addition to the risk management organization and activities described below in the Risk Management Overview section, Northern Trust manages its capital on both a consolidated and legal entity basis. The Capital Committee is responsible for measuring and managing the Corporation's and Bank's capital ratios against levels set forth within the Capital Policy approved by the Capital Governance Committee of the Board of Directors.

Senior management, with oversight from the Capital Governance Committee of the Board of Directors and the full Board of Directors, is responsible for capital management and planning. Northern Trust's capital adequacy assessment process, overseen by the Capital Committee, provides the framework for evaluating the adequacy of capital levels against capital requirements for both the current and projected periods given its risk profile and business growth objectives. The capital adequacy assessment process contains three main components:

- assessing required capital needs for risks that can be reliably quantified;
- understanding the sensitivity of Northern Trust's earnings, balance sheet, risk-weighted assets and capital ratios to current or potential changes in Northern Trust's risk profile and/or economic conditions; and
- evaluating the potential impact of all material risks on Northern Trust's capital position, and its resulting ability to meet its capital management objectives under a wide range of scenarios, including severely stressful conditions.

The stress scenarios included in Northern Trust's capital adequacy assessments are developed with consideration given to Northern Trust's risk profile, key vulnerabilities, business activities and strategic plans, and can include both stressful macroeconomic conditions and idiosyncratic loss events. Northern Trust's capital adequacy assessments are approved by the Capital Governance Committee of the Board of Directors quarterly, support the annual Capital Plan and are coordinated closely with the liquidity risk management processes.

Risk Management Overview

Northern Trust employs an integrated risk management framework to support its strategies. The framework provides a methodology to identify, assess, monitor, measure, manage and report both internal and external risks to Northern Trust, and promotes a culture of risk awareness across the organization. Northern Trust's risk culture encompasses the general awareness, attitude and conduct of employees with respect to risk and the management of risk across all lines of defense within the organization. The key risk categories that are inherent in Northern Trust's business activities include: credit, operational, fiduciary, compliance, market, liquidity, and strategic risk.

- Refer to page 74 of the Corporation's 2017 Annual report for more information on Northern Trust's Risk Management processes.

Northern Trust reinforces a culture of effective risk management by defining risk management accountabilities, embedding such accountabilities in performance expectations across the company, training and developing employees and evaluating and rewarding employee performance.

Risk Governance and Oversight Overview

Risk governance is an integral aspect of corporate governance at Northern Trust, and includes clearly defined accountabilities, expectations, internal controls and processes for risk-based decision-making and escalation of issues. The diagram below provides a high-level overview of Northern Trust's risk governance structure as of September 30, 2018, highlighting the oversight of the Board of Directors and key risk-related committees.

Table 10: Risk Governance Structure

Northern Trust Corporation Board of Directors			
Audit Committee	Business Risk Committee	Capital Governance Committee	Compensation and Benefits Committee

Global Enterprise Risk Committee (GERC)					
Credit Risk Committee	Operational Risk Committee	Fiduciary Risk Committee	Compliance & Ethics Oversight Committee	Market & Liquidity Risk Committee	Model Risk Oversight Committee

The Board of Directors provides oversight of risk management directly and through certain of its committees: the Audit Committee, the Business Risk Committee, the Capital Governance Committee and the Compensation and Benefits Committee. The Board of Directors approves Northern Trust's risk management framework and Corporate Risk Appetite Statement. The Business Risk Committee assumes primary responsibility and oversight with respect to credit risk, operational risk, fiduciary risk, compliance risk, market risk, liquidity risk, and strategic risk. The Audit Committee provides oversight with respect to financial reporting and legal risk, while the Compensation and Benefits Committee oversees the development and operation of Northern Trust's incentive compensation program. The Compensation and Benefits Committee annually reviews management's assessment of the effectiveness of the design and performance of Northern Trust's incentive compensation arrangements and practices in providing incentives that are consistent with Northern Trust's safety and soundness. This assessment includes an evaluation of whether Northern Trust's incentive compensation arrangements and practices discourage inappropriate risk-taking behavior by participants. The Capital Governance Committee of the Board assists the Board in discharging its oversight duties with respect to capital management and resolution planning activities. Among other responsibilities, the Capital Governance Committee oversees Northern Trust's capital adequacy assessments, forecasting, and stress testing processes and activities, including the annual Comprehensive Capital Analysis and Review ("CCAR") exercise, and challenges management, as appropriate, on various elements of such processes and activities. Accordingly, the Capital Governance Committee provides oversight with respect to Northern Trust's linkage of material risks to the capital adequacy assessment process.

The Chief Risk Officer ("CRO") oversees Northern Trust's management of risk, promotes risk awareness and fosters a proactive risk management environment wherein risks inherent in the business strategy are identified, understood, appropriately monitored and mitigated. The CRO reports directly to the Business Risk Committee and the Corporation's Chief Executive Officer. The CRO regularly advises the Business Risk Committee and reports to the Committee at least quarterly on risk exposures, risk management deficiencies and emerging risks. In accordance with the risk management framework, the executive risk management team of Northern Trust, together with the Chief Financial Officer, Head of Capital and Resolution Planning, General Counsel and Chief Audit Executive, meets as the Global Enterprise Risk Committee ("GERC") to provide executive management oversight and guidance with respect to the management of the categories of risk within Northern Trust. Among other risk management responsibilities, GERC receives reports or recommendations from senior risk committees that are responsible for the management of risk, and from time to time may delegate responsibility to such committees for risk issues. Senior risk committees include:

- The Credit Risk Committee ("CRC") establishes and monitors credit-related policies and practices throughout Northern Trust and promotes their uniform application.

- The Operational Risk Committee ("ORC") provides independent oversight and is responsible for setting the Corporate Operational Risk Management Policy and developing the operational risk management framework and programs that support the coordination of operational risk activities.

- The Fiduciary Risk Committee ("FRC") is responsible for establishing and reviewing the fiduciary risk policies and establishing the fiduciary risk framework, governance and programs that support the coordination of fiduciary risk activities.

- The Compliance & Ethics Oversight Committee ("CEOC") provides oversight and direction with respect to compliance policies, implementation of the compliance and ethics program, and the coordination of regulatory compliance initiatives across the Corporation.

- The Market & Liquidity Risk Committee ("MLRC") oversees activities relating to the management of market and liquidity risks by facilitating a focused review of market and liquidity risk exposures and providing rigorous challenge of related policies, key assumptions, and practices.

- The Model Risk Oversight Committee ("MROC") is responsible for providing management attention, direction, and oversight of the model risk management framework and model risk within Northern Trust.

In addition to the aforementioned committees, Northern Trust deploys business and regional risk committees that also report into GERC. For more detail on risk practices at Northern Trust, see the relevant discussions on pages 16, 28, and 31.

Risk Identification and Risk Management Process

As part of the integrated risk framework, Northern Trust has established key risk identification and risk management processes, embedded within its businesses to enable prudent risk-taking behavior. Integral to the risk framework are Northern Trust's processes for definition and communication of acceptable risk appetite and reporting against risk appetite, dynamic assessment of risk against its strategic and business objectives, and a "three lines of defense" operating model.

Northern Trust defines the organization's risk appetite as the amount and types of risk that it is willing to assume in its exposures and business activities to achieve its strategic and financial objectives. Northern Trust manages its business activities consistent with the Corporate Risk Appetite Statement, in which specific guidelines are detailed for each key risk category. Northern Trust's Corporate Risk Appetite Statement reflects the expectation that risk is consciously considered as part of day-to-day activities and strategic decisions. Northern Trust's risk assessment process, aligned with this expectation, consists of a series of programs that identify, measure, manage and report risks in line with risk appetite and guidelines. A common risk language used across Northern Trust supports risk identification processes and consistent identification of risk, designation of material risks and grouping of risks into risk themes for effective analysis, oversight and management of Northern Trust's aggregate risk profile.

Northern Trust maintains a "three lines of defense" operating model to embed a robust risk management capability within its businesses. The model, used to communicate risk management expectations across the organization, contains three roles, each a complimentary level of risk management accountability. Within this operating model, Northern Trust's businesses are the first line of defense for protecting it against the risks inherent in its businesses and are supported by dedicated business risk management teams. The Risk Management function, the second line of defense, sets the direction for Northern Trust's risk management activities and provides aggregate risk oversight and reporting in support of risk governance. Audit Services, the third line of defense, provides independent assurance as to the effectiveness of the integrated risk framework.

Systems

Risk data and technology form the infrastructure that enables the successful execution of risk management processes. Data quality principles (such as accuracy, consistency and integrity) are an integral element of Northern Trust's risk measurement and management process, ensuring quality, control and protection of the risk data and systems at both corporate and business levels.

Independent Review and Verification

Risk Control

Risk Control is an internal, independent review function within the Risk Management function. Risk Control is managed by the Chief Risk Control Officer and is comprised of Model Risk Management, Credit Review, Global Compliance Testing and Basel Independent Verification groups, each with its own risk focus and oversight. Model Risk Management is responsible for the implementation and management of the enterprise-wide model risk framework and independently validating new models and reviewing and re-validating existing models. Credit Review provides an independent, ongoing assessment of credit exposure and related credit risk management processes across Northern Trust. Global Compliance Testing evaluates the effectiveness of procedures and controls designed to comply with relevant laws and regulations, as well as corresponding Northern Trust policies governing regulatory compliance activities. Lastly, Basel Independent Verification promotes rigor and accuracy in Northern Trust's ongoing compliance with Basel III. The Business Risk Committee oversees Risk Control generally as well as each of these groups.

Audit Services

Audit Services is an independent control function that assesses and validates controls within Northern Trust's risk management framework. Audit Services is managed by the Chief Audit Executive with oversight from the Audit Committee. Audit Services tests the overall adequacy and effectiveness of the system of internal controls associated with the advanced systems on an ongoing basis and reports the results of these audits directly to the Audit Committee. Audit Services includes professionals with a broad range of audit and industry experience, including risk management expertise. The Chief Audit Executive reports directly to the Audit Committee and the Corporation's Chief Executive Officer.

Credit Risk

Credit risk is the risk to interest income or principal from the failure of a borrower or counterparty to perform on an obligation. Credit risk is inherent in many of Northern Trust's activities. A significant component of credit risk relates to loans, leases, securities, and counterparty-related exposures.

Credit Risk Disclosures – General Qualitative

Credit Risk Framework and Governance

The Credit Risk Management function is the focal point of the credit risk framework and, while independent of the businesses, it works closely with them to achieve the goal of assuring proactive management of credit risk. To monitor and control credit risk, the Credit Risk Management function maintains a framework that consists of policies, standards, and practices designed to promote a conservative credit culture. This function also monitors adherence to corporate policies, standards, and external regulations.

The Credit Risk Management function provides a system of checks and balances for Northern Trust's diverse credit-related activities by monitoring these activities and practices and promoting their uniform application throughout Northern Trust.

The credit risk framework provides authorities for approval of the extension of credit. Individual credit authority for commercial and personal loans is limited to specified amounts and maturities. Credit requests exceeding individual authority because of amount, rating, term or other conditions, are referred to the relevant group credit approval committee. Credit decisions involving exposure in excess of these limits require the approval of the Senior Credit Committee.

The Capital Markets Credit Committee has sole credit authority for the approval, modification, or renewal of credit exposure to all wholesale market counterparties.

The CRC establishes and monitors credit-related policies and practices throughout Northern Trust and promotes their uniform application. The Chief Credit Officer reports directly to the CRO and chairs the CRC. Independent oversight and review of the credit risk framework is provided by Risk Control.

Loans and Leases and Allowance for Credit Losses

- Refer to Note 6, starting on page 51, and Note 7, starting on page 58, to the consolidated financial statements within the Corporation's Third Quarter 2018 Form 10-Q, and pages 58, 61 and 76 within the Corporation's 2017 Annual Report for loans and leases and allowance for credit losses qualitative information.

Credit Risk Disclosures – General Quantitative

Northern Trust's credit risk generally takes the form of loans, leases, securities and counterparty-related exposures. Northern Trust's entire credit risk portfolio is included within the following Basel III credit categories: wholesale exposures, securitization exposures and equity holdings. All Basel III credit exposures that could otherwise qualify for retail treatment, such as personal loans and mortgages, are treated as wholesale exposures. We have determined that applying wholesale treatment, i.e., individually risk-rating each exposure rather than scoring a homogenous pool, is consistent with Northern Trust's underwriting approach, whereby each exposure is individually evaluated.

Loans and Leases and Allowance for Credit Losses

- Refer to Note 6, starting on page 51, and Note 7, starting on page 58, to the consolidated financial statements within the Corporation's Third Quarter 2018 Form 10-Q for loans and leases, allowance for credit losses and net charge-off quantitative information.

Credit Exposures by Geography and Industry

The following tables provide Northern Trust's total credit exposures by regulatory reporting category and geographic distribution as of, and on an average basis for the three months ended, September 30, 2018. Distribution is based on geographic location of the contracting Northern Trust entity.

Table 11: Credit Exposures by Geography

($ In Millions)				As of September 30, 2018
Credit Exposures	Americas	Europe, Middle East and Africa	Asia-Pacific	Total
Loans, net of Unearned Income and Allowance	$ 30,331	$ 897	$ 6	$ 31,234
Loan Commitments	27,109	509	—	27,618
Balances Due from Depository Institutions	19,965	19,479	1,246	40,690
Securities	36,882	12,348	1,286	50,516
Trading Assets	442	167	34	643
Total	**$ 114,729**	**$ 33,400**	**$ 2,572**	**$ 150,701**

($ In Millions)				Averages for the three months ended September 30, 2018
Credit Exposures	Americas	Europe, Middle East and Africa	Asia-Pacific	Total
Loans, net of Unearned Income and Allowance	$ 30,415	$ 1,174	$ 82	$ 31,671
Loan Commitments	27,211	502	—	27,713
Balances Due from Depository Institutions	10,654	18,453	1,868	30,975
Securities	36,587	12,167	1,196	49,950
Trading Assets	301	411	31	743
Total	**$ 105,168**	**$ 32,707**	**$ 3,177**	**$ 141,052**

The following table provides Northern Trust's credit exposures by industry and exposure type with the associated contractual maturity as of September 30, 2018.

Table 12: Credit Exposures by Industry, Exposure Type and Contractual Maturity

($ In Millions)				As of September 30, 2018
	Up to 1 Year	1 to 5 Years	Over 5 Years	Total
Commercial Exposures				
Commercial and Institutional				
Finance and Insurance	$ 3,180	$ 2,420	$ 8	$ 5,608
Holding Companies	11	8	1	20
Manufacturing	2,265	6,257	11	8,533
Mining	221	527	—	748
Public Administration	111	48	12	171
Retail Trade	270	724	16	1,010
Services	4,777	5,620	1,217	11,614
Transportation and Warehousing	74	427	61	562
Utilities	166	1,169	—	1,335
Wholesale Trade	361	640	26	1,027
Other Commercial	264	307	148	719
Total Commercial and Institutional	**$ 11,700**	**$ 18,147**	**$ 1,500**	**$ 31,347**
Commercial Real Estate	639	2,369	583	3,591
Lease Financing, net	36	58	61	155
Non-U.S.	2,156	555	45	2,756
Other	335	—	—	335
Total Commercial	**$ 14,866**	**$ 21,129**	**$ 2,189**	**$ 38,184**
Personal Exposures				
Residential Real Estate	490	754	6,264	7,508
Private Client	8,888	3,667	571	13,126
Other	34	—	—	34
Total Personal	**$ 9,412**	**$ 4,421**	**$ 6,835**	**$ 20,668**
Total Commercial and Personal	**$ 24,278**	**$ 25,550**	**$ 9,024**	**$ 58,852**
Balances Due from Depository Institutions	40,689	1	—	40,690
Securities	9,235	19,265	22,016	50,516
Trading Assets	643	—	—	643
Total Exposures	**$ 74,845**	**$ 44,816**	**$ 31,040**	**$ 150,701**

- Refer to page 67 of the Corporation's 2017 Annual Report for information on undrawn commitments by industry sectors.

Advanced Internal Ratings Based Approach for Credit Risk

Internal Rating System Overview

An integral component of credit risk measurement is Northern Trust's internal risk rating system. Northern Trust's internal risk rating system enables identification, measurement, approval and monitoring of credit risk. Northern Trust uses the AIRB approach to calculate regulatory capital using regulatory formulas and exposure level risk information from Northern Trust's internal rating system. Calculations include entity-specific information about the obligor's or counterparty's probability of default ("PD") and exposure-specific information about loss given default ("LGD"), exposure at default ("EAD") and maturity. Northern Trust's internal risk rating system is intended to rank its credit risk without any modeled linkage to external credit ratings.

Obligors are assigned PDs after consideration of both quantitative and qualitative factors. Although the criteria vary, the objective is for assigned PDs to be consistent in the measurement and ranking of risk. LGD and EAD are assigned based on obligor, product, collateral and instrument characteristics.

Risk ratings are assigned at the time an obligation is approved, renewed or amended. Risk ratings are reviewed annually or when new information relevant to the rating is received. Risk ratings are utilized for credit underwriting, management reporting and the calculation of regulatory capital.

The Credit Risk Management function is responsible for the ongoing oversight of each model that supports the internal risk rating system. This oversight includes the development, monitoring and maintenance of the models, as well as providing information to the Credit Risk Committee to support model approval and monitoring of ongoing model performance. Independent model governance and oversight is further supported by the activities of Risk Control as described further in Independent Review and Verification within the Risk Management Overview section.

PD, EAD and LGD Estimation

Northern Trust has developed internal estimates of PD, EAD and LGD, each as defined below:

<u>Probability of default</u> – defined as the empirically based best estimate of the long-run average one-year default rate for the rating grade assigned to an obligor, capturing the average default experience for obligors in the rating grade over a mix of economic conditions sufficient to provide a reasonable estimate.

<u>Exposure at default</u> – defined across various exposures types as:

- On-balance-sheet (other than over-the-counter ("OTC") derivative, repo-style transactions or eligible margin loans) – the carrying value, less any allocated transfer risk reserve (and for available for sale debt securities, less unrealized gains, plus unrealized losses).

- Off-balance-sheet (other than OTC derivative, repo-style transactions or eligible margin loans) – the best estimate of net additions to outstanding amounts owed that are likely to occur over a one-year horizon, assuming the exposure were to go into default. For anything other than a loan commitment, line of credit, trade-related letter of credit or transaction-related contingency, EAD is the notional amount.
- OTC derivative, repo-style transaction or eligible margin loan – as defined by section 32 of the final rule adopted to implement Basel III in the United States.

<u>Loss given default</u> – defined as the greater of:

- an empirically based best estimate of long-run default-weighted average economic loss, per dollar of EAD, that would be incurred if an obligor were to default within a one-year horizon over a mix of economic conditions; or
- an empirically based best estimate of the economic loss, per dollar of EAD that would be incurred if an obligor were to default within a one-year horizon during a period of economic downturn.

PD, EAD and LGD parameter values are estimated using quantitative analysis of internal and external data, informed by a qualitative assessment based on business subject matter expertise. The parameter estimation (quantification) process is conducted in four phases: (1) research and exploratory data analysis; (2) detailed data analytics and modeling; (3) qualitative assessment of results and recommendations; and (4) formal review and approval.

Data used for estimation and validation of PD, EAD and LGD parameters comes from three sources:

- internal credit defaults and recoveries experienced by Northern Trust;
- external credit default and recovery data for comparative benchmark data (not directly combined with internal default history); and
- industry studies and academic works related to credit risk and defaults.

Control Mechanisms

Independent oversight and review of the internal risk rating system is provided by Audit Services and Risk Control as described in Independent Review and Verification within the Risk Management Overview section.

The following table provides a distribution of EAD, Risk-Weighted Assets, Weighted Average PD, Weighted Average LGD, Weighted Average Risk-Weights and Unfunded Commitments by PD ranges as of September 30, 2018.

Table 13: Probability of Default Ranges

($ In Millions)							As of September 30, 2018
	PD Range	EAD Amount	Risk Weighted Assets Amount [(a)]	Weighted Average PD	Weighted Average LGD	Weighted Average Risk-Weight	Unfunded Commitments
Wholesale	0% to <0.15%	$ 95,618	$ 6,908	0.03%	29.05%	7.22%	$ 9,026 [(b)]
	0.15% to <0.50%	36,237	13,004	0.24%	42.40%	35.88%	14,578
	0.50% to <1.35%	11,353	8,883	0.81%	41.65%	78.24%	2,758
	1.35% to <10.00%	8,360	8,506	2.85%	36.02%	101.76%	1,238
	10.00% to <100%	126	269	28.00%	38.46%	213.90%	5
	<100%	199	199	100.00%	32.32%	100.00%	13
Total	**0.0% to <100.0%**	**$151,893**	**$ 37,769**	**0.45%**	**33.57%**	**24.87%**	**$ 27,618**

(a) Represents unscaled risk-weighted assets.
(b) Includes unfunded commitments without a specific PD range.

Counterparty Credit Risk of OTC Derivative Contracts, Repo-Style Transactions and Eligible Margin Loans

Counterparty credit risk for Northern Trust primarily arises from a variety of funding, treasury, trading and custody-related activities, including OTC currency and interest rate derivatives and from indemnified securities lending transactions. Credit exposure to counterparties is managed by use of a framework for setting limits by product type and exposure tenor.

Reporting and Measurement

To calculate exposure, Northern Trust treats repurchase agreements, reverse repurchase agreements and indemnified securities lending transactions as repo-style transactions. Foreign exchange exposures and interest rate derivatives are treated as OTC derivatives. The EAD measurement methodology for each eligible type of counterparty credit exposure, including the use of netting and collateral as risk mitigants, is determined based on operational requirements, the characteristics of the contract type and the portfolio size and complexity.

Repo-style Transactions

The Current Exposure Method with the Collateral Haircut Approach is used to estimate EAD for repurchase agreements and reverse repurchase agreements, whereby exposure amounts are summed with potential future exposure (price volatility) and then adjusted to account for collateral held as estimated using standard supervisory collateral haircuts. Repo-style transactions are not netted; EAD is estimated at the transaction level.

The Collateral Haircut Approach with standard supervisory haircuts is used to determine EAD for indemnified securities lending and indemnified repurchase transactions. For certain U.S-based counterparties, indemnified securities lending exposures are netted across principal lenders when aggregating exposures for the counterparty. As netting is not applicable for non-U.S.-based counterparties, those exposures are estimated for individual principal client lenders with activity to the given counterparty. Indemnified repo transactions are estimated at the principal client lender level and totaled for the counterparty as well.

OTC Derivatives

The Current Exposure Method is used to estimate EAD for OTC derivatives, whereby exposure amounts are summed (recognizing the benefit of eligible single product exposure netting arrangements for certain foreign exchange counterparties) with potential future exposure to derive the total counterparty exposure. Although collateral in the form of a lien on a client's financial assets custodied at Northern Trust often serves as collateral for OTC derivative transactions, the benefit of collateral is not taken into account in the EAD estimate for OTC derivative transactions.

Credit Limits

Credit exposure to counterparties is managed by use of a framework for setting limits by product type and exposure tenor.

Collateral Arrangements

To calculate a counterparty's net credit risk position, repo-style transactions and associated collateral are revalued on a daily basis. OTC interest rate and currency derivatives and associated collateral positions are also revalued on a daily basis, though no benefit for collateral is taken in the capital estimation for these products. Credit derivatives that are not subject to collateral requirements are revalued on a monthly basis.

Eligible collateral types are documented by a Credit Support Annex ("CSA") to an International Swaps and Derivatives Association Master Agreement and are controlled under policies aimed at ensuring the collateral agreed to be taken exhibits characteristics such as price transparency, price stability, liquidity, enforceability, independence and eligibility for regulatory purposes. Currently 100% of the collateral held by Northern Trust under CSAs is in the form of cash.

Collateral for Repo-Style Transactions

Northern Trust accepts the following as collateral for the repo-style transactions below:

<u>Repurchase Agreements and Reverse Repurchase Agreements</u>

- cash;
- U.S. government securities;
- U.S. agency and government-sponsored entity securities;
- investment grade commercial paper and corporate bonds; and
- equities included in major indices, subject to stipulated diversification parameters.

Securities Lending Transactions

- cash;
- sovereign debt (includes debt issued by governments of highly-rated Organization for Economic Co-operation and Development ("OECD") countries and corporate debt guaranteed by select highly-rated OECD governments that meet additional pre-agreed guidelines); and
- equities included in major indices, subject to stipulated diversification thresholds.

Based on its nominal loss experience to date, Northern Trust does not currently employ a credit risk valuation adjustment to incorporate creditworthiness within its estimate of the fair value of OTC derivative transactions. Any realized credit loss associated with OTC derivatives or repo-style transactions would be accounted for as a reduction of current earnings.

Wrong-way Risk

Wrong-way risk occurs when the exposure to a particular counterparty is positively correlated with the PD of the counterparty itself or where there is an adverse correlation between a counterparty's PD and the mark-to-market value of the underlying transaction.

Northern Trust uses a range of tools to identify, control and monitor wrong-way risk. These include: the requirement to obtain prior approval before undertaking wrong-way risk transactions outside pre-agreed guidelines; exception reporting; collateral exclusion requirements; sovereign and issuer credit quality requirements for collateral accepted in repo-style transactions; approval of loan/collateral combinations based on historical quantitative correlation analysis; multi-factor stress testing scenarios to identify vulnerabilities and manage exposures against stressed exposure tolerances; and exposure reporting. Country limits and diversification parameters applicable to foreign exchange and credit default swap transactions, respectively, also limit wrong-way risk.

Potential Collateral Requirements

Certain ISDA agreements require a counterparty to post additional collateral in the event of a downgrade of such counterparty's credit rating. Accordingly, Northern Trust regularly monitors its position with regard to counterparty credit rating downgrades.

The following table describes Northern Trust's counterparty exposures by exposure type as of September 30, 2018.

Table 14: Counterparty Exposures

($ In Millions)	As of September 30, 2018
Derivative Contracts	
EAD	$ 3,381
Repo-Style Transactions	
Gross notional exposure	$ 142,119
Cash and securities collateral	148,249
Net exposure	**$ (6,130)**
EAD	$ 10,358

- Refer to Note 3, starting on page 38, and Note 21, starting on page 74, to the consolidated financial statements within the Corporation's Third Quarter 2018 10-Q for derivative contract exposure information.

In the quarter ended September 30, 2018, Northern Trust did not purchase or sell any credit derivatives.

Credit Risk Mitigation

Northern Trust considers cash flow to be the primary source of repayment for client-related credit exposures. However, Northern Trust employs several different types of credit risk mitigants to manage its overall credit risk in the event cash flow is not sufficient to repay a credit exposure. Northern Trust broadly groups its risk mitigation techniques into the following three primary categories:

Physical and Financial Collateral

Northern Trust's primary risk mitigation approaches include the requirement of collateral. Residential and commercial real estate exposures are typically secured by properly margined mortgages on the property. In cases where loans to commercial or certain Wealth Management clients are secured by marketable securities, the daily values of the securities are monitored closely to ensure adherence to collateral coverage policies.

Netting

On-balance-sheet netting is employed on a limited basis. Netting is primarily related to foreign exchange transactions with major banks and institutional clients subject to eligible master netting agreements. Northern Trust has elected to take the credit risk mitigation capital benefit of netting within its regulatory capital calculation at this time.

Guarantees

Personal and corporate guarantees are often taken to facilitate potential collection efforts and to protect Northern Trust's claims relative to other creditors. Northern Trust has elected not to take the credit risk mitigation capital benefit of guarantors within its regulatory capital calculation at this time.

Another important risk management practice is the avoidance of undue concentrations of exposure, such as in any single (or small number of related) obligor/counterparty, loan type, industry, geography, country or risk mitigant. Processes are in place to establish limits on certain concentrations and the monitoring of adherence to the limits.

Securitization

Northern Trust does not act as originator or sponsor for securitizations. In its investment portfolio, Northern Trust has purchased securities that meet the regulatory definition of a securitization. Additionally, Northern Trust has a limited number of commercial loan transactions that have been deemed to be securitizations for regulatory capital purposes. Northern Trust uses the Simplified Supervisory Formula Approach ("SSFA") to calculate risk-weighted assets for securitizations. If the SSFA cannot be applied due to data limitations, a 1,250% risk-weight is applied to the exposure as required by current Basel III guidelines.

The following table describes Northern Trust's securitization exposures as of September 30, 2018.

Table 15: Securitization Exposures

($ In Millions)				As of September 30, 2018
		On-Balance Sheet		Off-Balance Sheet
Asset Backed Securities	$	3,548	$	—
Mortgage Backed Securities		419		—
Loan Exposures		—		28
Total	**$**	**3,967**	**$**	**28**

The following table describes Northern Trust's securitization exposures by risk-weight bands as of September 30, 2018.

Table 16: Securitization Exposures by Risk-Weight Bands

($ In Millions)			As of September 30, 2018		
	Risk-Weight Bands	Approach	Asset Backed Securities	Mortgage Backed Securities	Loan Exposures
Securitizations	0% to <12%	SSFA	$ —	$ —	$ —
	12% to <20%	SSFA	—	—	—
	20% to <50%	SSFA	3,501	419	—
	50% to <75%	SSFA	—	—	—
	75% to <100%	SSFA	47	—	28
	100% to <425%	SSFA	—	—	—
	425% to <1,250%	SSFA	—	—	—
	1,250%	1,250%	—	—	—
Total			**$ 3,548**	**$ 419**	**$ 28**

Independent Review and Verification

Independent oversight and review of the Credit Risk Framework is provided by Risk Control. Refer to Independent Review and Verification within the Risk Management Overview section for more information.

Equities Not Subject to the Market Risk Rule

Northern Trust's equity investments that are not subject to the Market Risk Rule are entered into to meet strategic business needs and for regulatory compliance purposes, rather than for generating capital gains.

The following table presents the carrying and fair values, and associated risk-weights, of Northern Trust's equity investments that are not subject to the Market Risk Rule as of September 30, 2018.

Table 17: Equities Not Subject to the Market Risk Rule

($ In Millions)	As of September 30, 2018			
		Carrying Value		Fair Value
Non-publicly Traded	$	1,140	$	1,140
Publicly Traded		35		35
Total	**$**	**1,175**	**$**	**1,175**

($ In Millions)	As of September 30, 2018					
Risk-Weights		Carrying Value		Risk-Weighted Asset Amount [(a)]		Capital Requirement
0%	$	54	$	—	$	—
20%		247		49		4
100%		809		809		65
400%		—		—		—
1,250%		65		809		65
Total	**$**	**1,175**	**$**	**1,667**	**$**	**134**

(a) Represents unscaled risk-weighted assets.

During the three months ended September 30, 2018, there were no realized gains or losses from sales or liquidations, no unrealized gains or losses recognized on the balance sheet but not through earnings, and no latent revaluation gains or losses.

Operational Risk

Operational risk is the risk of loss from inadequate or failed internal processes, human factors and systems, or from external events. Operational risk is inherent in each of Northern Trust's businesses and corporate functions and reflects the potential for inadequate information systems, operating problems, product design and delivery difficulties, potential legal actions, or other catastrophes to result in losses. Operational risk includes:

- execution, delivery and process management risk;
- risk resulting from business disruption and system failures;
- risk of damage to physical assets;
- risk resulting from clients, products and business practices;
- employment practice and workplace safety risk;
- internal fraud risk;
- external fraud risk;
- compliance risk;
- fiduciary risk; and
- legal risk.

Operational risk includes compliance, fiduciary and legal risks, which under the Corporation's risk structure are governed and managed explicitly.

Northern Trust's operational risk management strategy is to:

- align the operational risk framework with evolving business and industry practice and with regulatory requirements;
- identify, assess and mitigate risks inherent in business strategies;
- promote risk awareness and foster a proactive risk management environment within each business; and
- report key topics and developments to senior governance bodies.

The goal of these activities is to keep the operational risk profile and losses within the Board-approved Corporate Risk Appetite Statement and guidelines.

Risk Control provides independent oversight and review of the operational risk framework.

Operational Risk Framework and Governance

Operational risk is identified, monitored, measured, managed and reported through the operational risk framework. The framework consists of risk management policies, programs and practices designed to promote a sound operational environment. The framework is deployed consistently and globally across all businesses and its objective is to identify and measure the factors that influence risk and drive action to reduce future loss events. The Operational Risk Management function is responsible for defining the operational risk framework and providing independent oversight of the framework across Northern Trust. It is the responsibility of each business to implement the enterprise-wide operational risk framework as well as business-specific risk management programs to identify, monitor, measure, manage and report on operational risk and mitigate Northern Trust's exposure to loss.

Several key programs support the operational risk framework, including:

- Loss Event Data Program - a program that collects internal and external loss data for use in monitoring operational risk exposure, various business analyses and the Basel AMA capital quantification. Both internal and external loss data are used in the operational risk capital quantification. Thresholds drive analysis, action and escalation through Northern Trust's businesses and the Operational Risk Management function.

- Risk and Control Self-Assessment - a structured risk management process used by Northern Trust's businesses to analyze the risks that are present in their respective business environments and to assess the adequacy of associated internal controls.

- Operational Risk Scenario Analysis - a systematic process of obtaining expert opinions from business managers and risk management experts to derive reasoned assessments of the likelihood of occurrence and the potential loss impact of plausible high-severity operational losses.

- Product and Process Risk Management Program - a program used for evaluating and managing risks associated with the introduction of new and modified noncredit products and services, significant changes to operating processes, and related significant loss events.

- Outsourcing Risk Management Program - a program that provides processes for appropriate risk assessment, measurement, monitoring and management of outsourced technology and business process outsourcing.

- Business Process Transition Risk Management Program - a program designed to manage effectively the risk associated with transitioning and migrating business processes to different geographic or jurisdictional locations within the organization.

- Information Security and Technology Risk Management - a program that communicates and implements compliance and risk management processes and controls to address information security, including cyber threats and technology risks to the organization.

- Business Continuity and Disaster Recovery Management Program - a program designed to minimize business impact and support the resumption of mission critical functions for clients following an incident.

- Physical Security - a program that provides for the safety of Northern Trust partners, clients, and visitors worldwide by setting and enforcing standards, providing training, establishing partnerships, and encouraging continual improvement in workplace security.

- Insurance Management Program - a program designed to reduce the monetary impact of certain operational loss events.

As discussed in Risk Control, Model Risk Management is also part of the operational risk framework.

The ORC is responsible for overseeing the activities of Northern Trust related to the management of operational risk including establishing the Corporate Operational Risk Management Policy and approving the operational risk framework and programs. The purpose of this committee is to provide executive management's insight and guidance to the management of existing and emerging operational risks. In addition, the ORC serves as an escalation point for significant issues raised by its programs.

Operational Risk Measurement

Northern Trust utilizes the AMA capital quantification process to estimate required capital for the Corporation and applicable U.S. banking subsidiaries. Northern Trust's AMA capital quantification process incorporates outputs from the Loss Event Data, Risk and Control Self-Assessment and Operational Risk Scenario Analysis programs to derive required capital. While internal loss data is the foundation for the capital quantification, external loss event data and qualitative risk and control self-assessments are also utilized to inform the creation of scenario analysis data employed in the capital quantification process. Business environment factor information is used to estimate loss frequency. The AMA capital quantification process uses a Loss Distribution Approach methodology to combine frequency and severity distributions to arrive at an estimate of the potential aggregate loss at the 99.9th percentile of the aggregate loss distribution over a one-year time horizon.

The result of the AMA quantification process is the measure of operational risk-weighted assets as disclosed in Table 6.

Independent Review and Verification

Independent oversight and review of the Operational Risk Framework is provided by Risk Control. Refer to Independent Review and Verification within the Risk Management Overview section for more information.

Market Risk

There are two types of market risk, interest rate risk and trading risk. Interest rate risk is the potential for movements in interest rates to cause changes in net interest income and the market value of equity. Trading risk is the potential for movements in market variables such as foreign exchange and interest rates to cause changes in the value of trading positions.

Market Risk Framework and Governance

Northern Trust maintains a market risk framework consisting of risk management policies and practices to keep its risk profile within the Board-approved Corporate Risk Appetite Statement. All market risk activities are overseen by the Risk Management function, which is independent of the businesses undertaking the activities.

Exposure limits for market risk are set by the Board and committee structures have been established to implement and monitor adherence to corporate policies, external regulations and established procedures. Limits are monitored based on measures such as sensitivity of net interest income ("NII"), sensitivity of market value of equity ("MVE"), and Value-at-Risk ("VaR") across a range of time horizons.

The Asset and Liability Management Committee ("ALCO") provides first line management oversight and is responsible for approving strategies and activities within the risk appetite, overseeing balance sheet resources, and reviewing reporting such as stress test results. The MLRC provides second line oversight and is responsible for approving sub-policies and procedures, establishing and monitoring risk metrics, and approving methodologies and key assumptions that drive market risk measurement.

Interest Rate Risk

Interest Rate Risk Overview

Interest rate risk is the risk to NII, associated with the balance sheet, or MVE due to changes in interest rates. Changes in interest rates can have a positive or negative impact on NII depending on the positioning of assets, liabilities and off-balance-sheet instruments. Changes in interest rates also can impact the values of assets, liabilities and off-balance-sheet positions, which indirectly impact the MVE. To mitigate interest rate risk, the structure of the balance sheet is managed so that movements of interest rates on assets and liabilities (adjusted for hedges) are highly correlated, which allows Northern Trust's interest-bearing assets and liabilities to contribute to NII even in periods of volatile interest rates.

There are four commonly recognized types of structured interest rate risk:

- repricing, which arises from differences in the maturity and repricing terms of assets and liabilities;
- yield curve, which arises from changes in the shape of the yield curve;
- basis, which arises from imperfect correlation in the adjustment of the rates earned and paid on different financial instruments with otherwise similar repricing characteristics; and

- behavioral characteristics embedded optionality, which arises from client or counterparty behavior in response to interest rate changes.

Interest Rate Risk Analysis, Monitoring, and Reporting

Northern Trust uses two primary measurement techniques to manage interest rate risk: NII and MVE sensitivity. NII sensitivity provides management with a short-term view of the impact of interest rate changes on NII. MVE sensitivity provides management with a long-term view of interest rate changes on MVE as of the period-end balance sheet. Both simulation models use the same initial market interest rates and product balances.

Northern Trust limits aggregate interest rate risk (as measured by the NII sensitivity and MVE sensitivity simulation techniques) to an acceptable level within the context of risk appetite. A variety of actions may be used to implement risk management strategies to modify interest rate risk including:

- purchase of securities;
- sale of debt securities that are classified as available for sale;
- issuance of senior notes and subordinated notes;
- collateralized borrowings from the Federal Home Loan Bank;
- placing and taking Eurodollar time deposits; and
- hedges with various types of derivative financial instruments.

Net Interest Income ("NII") Sensitivity

NII sensitivity measures the change in NII under various interest rate scenarios.

- Refer to page 81 within the Corporation's 2017 Annual Report for further information on Northern Trust's NII sensitivity and stress testing of interest rates.

The following table shows the estimated NII impact over the next twelve months of 100 and 200 basis point upward and 50 basis point downward movements in interest rates relative to forward rates. Each rate movement is assumed to occur gradually over a one-year period.

Table 18: Net Interest Income Sensitivity

($ In Millions)	As of September 30, 2018	
	Increase (Decrease)	
Increase in Interest Rates above Market Implied Forward Rates	Estimated Impact on Next Twelve Months of Net Interest Income	
100 basis points	$	(1)
200 basis points	$	(2)
Decrease in Interest Rates below Market Implied Forward Rates		
50 basis points	$	(51)

The NII sensitivity analysis does not incorporate any management actions that may be used to mitigate adverse effects of actual interest rate movement. For that reason and others, the estimated impacts do not reflect the likely actual results but serve as estimates of interest rate risk. NII sensitivity is not comparable to actual results disclosed elsewhere or directly predictive of future values of other measures provided. The estimated impacts presented above are not directly comparable to those presented in documents prepared by the Corporation prior to the filing of its Annual Report on Form 10-K for the year ended December 31, 2017 with the U.S. Securities and Exchange Commission due to changes to client deposit pricing assumptions and the implementation of interest rate risk model enhancements.

Market Value of Equity ("MVE") Sensitivity

A second technique used to measure interest rate risk is MVE sensitivity, which measures the change in the MVE under various interest rate scenarios.

- Refer to page 82 within the Corporation's 2017 Annual Report for further information on Northern Trust's MVE sensitivity and stress testing of interest rates.

The following table shows the estimated impact on MVE of 100 and 200 basis point shocks up and a 50 basis point shock down from current market implied forward rates.

Table 19: Market Value of Equity Sensitivity

($ In Millions)	As of September 30, 2018
	Increase (Decrease)
Increase in Interest Rates above Market Implied Forward Rates	Estimated Impact on Market Value of Equity
100 basis points	$ 76
200 basis points	$ (225)
Decrease in Interest Rates below Market Implied Forward Rates	
50 basis points	$ (243)

The MVE simulations do not incorporate any management actions that may be used to mitigate adverse effects of actual interest rate movements. For that reason and others, the estimated impacts do not reflect the likely actual results but serve as estimates of interest rate risk. MVE sensitivity is not comparable to actual results disclosed elsewhere or directly predictive of future values of other measures provided. The estimated impacts presented above are not directly comparable to those presented in documents prepared by the Corporation prior to the filing of its Annual Report on Form 10-K for the year ended December 31, 2017 with the U.S. Securities and Exchange Commission due to changes to client deposit pricing assumptions and the implementation of interest rate risk model enhancements.

Foreign Currency Risk

Foreign Currency Non-Trading Risk Overview

Northern Trust's balance sheet is exposed to nontrading foreign currency risk as a result of its holdings of non-U.S.-dollar-denominated assets and liabilities, investment in non-U.S. subsidiaries, and future non-U.S.-dollar-denominated revenue and expense. To manage currency exposures on the balance sheet, Northern Trust attempts to match its assets and liabilities by currency. If those currency offsets do not exist on the balance sheet, Northern Trust will use foreign exchange derivative contracts to mitigate its currency exposure. Foreign exchange contracts are also used to reduce Northern Trust's currency exposure to future non-U.S. dollar denominated revenue and expense.

Trading Risk

Trading risk arises from providing foreign exchange, securities brokerage and interest rate derivatives services to clients. Securities and derivatives activities are limited and their trading risks are *de minimis*.

Foreign Currency Trading Risk Overview

Northern Trust provides foreign exchange services to clients. Most of these services are provided in connection with Northern Trust's growing global custody business. In the normal course of business Northern Trust also engages in trading of non-U.S. currencies for its own account. Both activities are considered trading activities. The primary market risk associated with global foreign exchange trading activities is foreign exchange risk.

Foreign currency trading positions exist when aggregate obligations to purchase and sell a currency other than the U.S. dollar do not offset each other in amount, or offset each other over different time periods.

Foreign Currency Risk Measurement

Northern Trust measures daily the risk of loss associated with all non-U.S. currency positions using a VaR model and applying the historical simulation methodology. This statistical model provides estimates, based on a variety of high confidence levels, of the potential loss in value that might be incurred if an adverse shift in non-U.S. currency exchange rates were to occur over a small number of days. The model incorporates foreign currency and interest rate volatilities and correlations in price movements among the currencies. VaR is computed for each trading desk and for the global portfolio.

VaR measures are computed in a vended software application which reads foreign exchange positions from Northern Trust's trading systems each day. Data vendors provide foreign exchange rates and interest rates for all currencies. The Risk Management function monitors on a daily basis VaR model inputs and outputs for reasonableness.

Foreign Currency Risk Monitoring, Reporting and Analysis

Northern Trust monitors several variations of the foreign exchange VaR measures to meet specific regulatory and internal management needs. Variations include different methodologies (historical, variance-covariance and Monte Carlo), equally weighted and exponentially weighted volatilities, horizons of one day and ten days, confidence levels ranging from 95% to 99.95% and look back periods of one year and four years. Those alternative measures provide management an array of corroborating metrics and alternative perspectives on Northern Trust's market risks.

Automated daily reports are produced and distributed to business managers and risk managers. The Risk Management function also reviews and reports several variations of the VaR measures in historical time series format to provide management with a historical perspective on risk.

The table below presents the levels of total regulatory VaR and its subcomponents for global foreign currency as of September 30, 2018, and June 30, 2018, based on the historical simulation methodology, a 99% confidence level, a one-day horizon and equally-weighted volatility. The total VaR for foreign currency is typically less than the sum of its two components due to diversification benefits derived from the two subcomponents.

Table 20: Foreign Currency Value-at-Risk

($ In Millions)	Total VaR (Spot and Forward)		Foreign Exchange Spot VaR		Foreign Exchange Forward VaR	
	September 30, 2018	June 30, 2018	September 30, 2018	June 30, 2018	September 30, 2018	June 30, 2018
High	$ 0.2	$ 0.2	$ 0.2	$ 0.2	$ 0.1	$ 0.2
Low	0.1	0.1	—	—	—	—
Average	0.1	0.1	0.1	0.1	0.1	0.1
Quarter End	0.1	0.1	0.1	0.1	0.1	0.1

<u>Stressed VaR Reporting</u>

The table below presents levels of Stressed Value-at-Risk ("SVaR") for foreign currency based on the same assumptions and inputs as above but replaying the severe one-year financial crisis period of August 2008 to August 2009.

Table 21: Foreign Currency Stressed Value-at-Risk

($ In Millions)	Stressed VaR 99% 1-day	
	September 30, 2018	June 30, 2018
High	$ 2.0	$ 2.0
Low	0.9	0.6
Average	1.3	1.3
Quarter End	1.0	1.0

During the most recent period presented, Northern Trust did not incur an actual trading loss in excess of the daily VaR estimate.

Valuation Practices

Northern Trust updates interest rates and foreign exchange rates daily through automated data feeds from independent internal source systems and established data vendors. Rates and prices are fed into pricing models which use standard methodologies to determine initial and theoretical mark-to-market valuations of positions. Those valuations serve as base market levels from which the VaR and stress test models calculate potential changes in values. Theoretical mark-to-market valuations prepared for risk management purposes may differ from valuations prepared in accordance with GAAP.

Foreign exchange positions do not include any options that require valuation.

Risk management and operations staff provides independent assessment of valuation inputs, processes and outputs for accuracy within approved thresholds and determines any valuation adjustments that may be required.

Other Nonmaterial Trading Activities

- Refer to page 84 within the Corporation's 2017 Annual Report for discussion regarding market risk associated with other trading activities.

Stress Tests

Northern Trust monitors stress test results on an ongoing basis to assess the potential for exceeding required capital. Northern Trust runs a number of stress tests on the foreign exchange portfolio, including quadrupling volatility, measuring at an extreme number of standard deviations, stressing correlations to extremes, taking tail averages (conditional VaR or expected shortfall), zero diversification benefit and zero correlation between spot and forward risks. Northern Trust runs daily a SVaR, which replays a severe one-year financial crisis period of August 2008 to August 2009. In assessing capital adequacy, Northern Trust considers in particular the results of stress tests run daily that reenact eight of the most severe historical events over a simulated ten-day period.

Independent Review and Verification

Independent oversight and review of the Market Risk Framework is provided by Risk Control. Refer to Independent Review and Verification within the Risk Management Overview section for more information.

References to the Corporation's SEC Filings

The Corporation's SEC filings contain important information relative to this report. Specific references are listed below.

DISCLOSURE MAP

Pillar 3 Requirement	Description	Pillar 3 Report	Q3 2018 Form 10-Q	2017 Annual Report
		Disclosure Starts on Page Number		
Introduction	Basis of Presentation	1	36	93
Capital Structure	Terms and conditions of capital instruments	7		124, 125
	Restrictions on transactions between the Corporation and its subsidiaries	10		9, 153
Risk Management Overview	Risk management processes	12		74
Credit Risk: General Disclosure	Loans and leases	16, 17	51	76, 113
	Allowance for credit losses	16, 17	58	58, 61, 119
	Industries	18		67
Counterparty Credit Risk of OTC Derivative Contracts, Repo-Style Transactions and Eligible Margin Loans	Derivative contract exposures	22	38, 74	102, 144
Market Risk: Interest Rate	NII sensitivity	32	26	81
	Stress testing	32, 33		82
	MVE sensitivity	33	27	82
Market Risk: Foreign Currency	VaR and SVaR	35	27	83
	Other trading activities	36		84