Management’s report on internal control over financial reporting

Management of JPMorgan Chase & Co. (“JPMorgan Chase” or the “Firm”) is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is a process designed by, or under the supervision of, the Firm’s principal executive and principal financial officers, or persons performing similar functions, and effected by JPMorgan Chase’s Board of Directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”).

JPMorgan Chase’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 Firm’s assets; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with U.S. GAAP, and that receipts and expenditures of the Firm are being made only in accordance with authorizations of JPMorgan Chase’s management and directors; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Firm’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. Management has completed an assessment of the effectiveness of the Firm’s internal control over financial reporting as of December 31, 2019. In making the assessment, management used the “Internal Control — Integrated Framework” (“COSO 2013”) promulgated by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”).

Based upon the assessment performed, management concluded that as of December 31, 2019, JPMorgan Chase’s internal control over financial reporting was effective based upon the COSO 2013 framework. Additionally, based upon management’s assessment, the Firm determined that there were no material weaknesses in its internal control over financial reporting as of December 31, 2019.

The effectiveness of the Firm’s internal control over financial reporting as of December 31, 2019, has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which appears herein.

James Dimon
Chairman and Chief Executive Officer

Jennifer Piepszak
Executive Vice President and Chief Financial Officer

February 25, 2020

To the Board of Directors and Shareholders of JPMorgan Chase & Co.:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of JPMorgan Chase & Co. and its subsidiaries (the “Firm”) as of December 31, 2019 and 2018, and the related consolidated statements of income, comprehensive income, changes in stockholders’ equity and cash flows for each of the three years in the period ended December 31, 2019, including the related notes (collectively referred to as the “consolidated financial statements”). We also have audited the Firm’s internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Firm as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Firm maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the COSO.

Basis for Opinions

The Firm’s management is responsible for these consolidated financial statements, 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 opinions on the Firm’s consolidated financial statements and on the Firm’s internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Firm 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 audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated 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 consolidated 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 consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

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 (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) 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 (iii) 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.

PricewaterhouseCoopers LLP • 300 Madison Avenue • New York, NY 10017

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that (i) relate to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Fair Value of Certain Level 3 Financial Instruments

As described in Notes 2 and 3 to the consolidated financial statements, the Firm carries $802.8 billion of its assets and $233.8 billion of its liabilities at fair value on a recurring basis. Included in these balances are $8.1 billion of trading assets and $37.7 billion of liabilities measured at fair value on a recurring basis, collectively financial instruments, which are classified as level 3 as they contain one or more inputs to valuation which are unobservable and significant to their fair value measurement. The Firm utilized internally developed valuation models and unobservable inputs to estimate fair value of the level 3 financial instruments. The unobservable inputs used by management to estimate the fair value of certain of these financial instruments include volatility relating to interest rates and correlation relating to interest rates, equity prices and foreign exchange rates.

The principal considerations for our determination that performing procedures relating to the fair value of certain level 3 financial instruments is a critical audit matter are (i) there was significant judgment and estimation by management in determining the inputs to estimate fair value, which in turn led to a high degree of auditor judgment, subjectivity, and effort in performing procedures related to the fair value of these financial instruments, and (ii) the audit effort involved professionals with specialized skill and knowledge to assist in evaluating the audit evidence obtained from these procedures.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the Firm's processes for determining fair value which include controls over models, inputs, and data. These procedures also included, among others, the involvement of professionals with specialized skill and knowledge to assist in developing an independent estimate of fair value for a sample of these financial instruments. Developing the independent estimate involved testing the completeness and accuracy of data provided by management, developing independent inputs and, as appropriate, evaluating and utilizing management's aforementioned unobservable inputs; and comparing management's estimate to the independently developed estimate of fair value.

Fair Value of Mortgage Servicing Rights Assets

As described in Note 15 to the consolidated financial statements, the Firm has elected to account for the Firm's mortgage servicing rights assets at fair value, with balances of $4.7 billion as of December 31, 2019. Management estimates the fair value of mortgage servicing rights using an option-adjusted spread model, which projects cash flows over multiple interest rate scenarios in conjunction with the Firm's prepayment model, and then discounts these cash flows at risk-adjusted rates. The key economic assumptions used to determine the fair value of mortgage servicing rights are prepayment speeds and option adjusted spread.

The principal considerations for our determination that performing procedures relating to the fair value of mortgage servicing rights assets is a critical audit matter are (i) there was significant judgment and estimation by management in determining the fair value of mortgage servicing rights, which in turn led to a high degree of auditor judgment, subjectivity and effort in performing procedures and in evaluating the audit evidence obtained related to the prepayment speed and option adjusted spread assumptions, and (ii) the audit effort involved professionals with specialized skill and knowledge to assist in evaluating the audit evidence obtained from these procedures.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the valuation of mortgage servicing rights, including controls over the Firm's models, assumptions, and data. These procedures also included, among others, the involvement of professionals with specialized skill and knowledge to assist in testing management's process including testing and evaluating the reasonableness of prepayment speed and option adjusted spread assumptions used in the model.

Allowance for Loan Losses - Wholesale Loan, Credit Card Loan and Consumer Loan Portfolios

As described in Note 13 to the consolidated financial statements, the Firm's allowance for loan losses represents management's estimate of probable credit losses inherent in the Firm's retained loan portfolios, which primarily consists of wholesale loans, credit card loans and consumer loans. As of December 31, 2019, the allowance for loan losses was $13.1 billion on total retained loans of $945.6 billion. The Firm's allowance for loan losses is determined for each of the retained loan portfolios utilizing a statistical credit loss estimate. These statistical credit loss estimates are calculated using statistical credit loss factors, specifically the probability of default and loss severity for the credit card and consumer loans and the probability of default and loss given default for the wholesale loans. Management then applies judgment to adjust these statistical loss estimates to take into consideration model imprecision, external factors and economic events that have occurred but are not yet reflected in the loss factors.

The principal considerations for our determination that performing procedures relating to the allowance for loan losses for the wholesale loan, credit card loan, and consumer loan portfolios is a critical audit matter are (i) there was significant judgment and estimation by management in determining the modeling techniques utilized in their statistical credit loss estimates, which in turn led to a high degree of auditor judgment, subjectivity and effort in performing procedures and in evaluating audit evidence obtained relating to the statistical credit loss estimates and the appropriateness of the adjustments to the statistical loss estimates, and (ii) the audit effort involved professionals with specialized skill and knowledge to assist in evaluating the audit evidence.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the Firm's allowance for loan losses estimation processes. These procedures also included, among others, testing management's process for estimating the allowance for loan losses, which included evaluating the appropriateness of the models and methodologies used in the statistical credit loss estimates for the wholesale, credit card and consumer loan portfolios; testing the completeness and accuracy of data; and evaluating the reasonableness of assumptions and judgments used in the statistical credit loss estimate and the adjustments to the statistical credit loss estimates. This included, as relevant, evaluating the reasonableness of probabilities of default, loss severities and loss given default. Evaluating management's adjustment to the statistical credit loss estimate included evaluating the reasonableness of the impacts of model imprecision and external factors and economic events which have occurred but are not yet otherwise reflected in the statistical credit loss estimate. The procedures included the use of professionals with specialized skill and knowledge to assist in evaluating the appropriateness of certain models, methodologies and inputs into the statistical credit loss estimates.

PricewaterhouseCoopers LLP

February 25, 2020

We have served as the Firm's auditor since 1965.

Consolidated statements of income

Year ended December 31, (in millions, except per share data)	2019	2018	2017
Revenue			
Investment banking fees	$ 7,501	$ 7,550	$ 7,412
Principal transactions	14,018	12,059	11,347
Lending- and deposit-related fees	6,369	6,052	5,933
Asset management, administration and commissions	17,165	17,118	16,287
Investment securities gains/(losses)	258	(395)	(66)
Mortgage fees and related income	2,036	1,254	1,616
Card income	5,304	4,989	4,433
Other income	5,731	5,343	3,646
Noninterest revenue	58,382	53,970	50,608
Interest income[(a)]	84,040	76,100	63,971
Interest expense[(a)]	26,795	21,041	13,874
Net interest income	57,245	55,059	50,097
Total net revenue	115,627	109,029	100,705
Provision for credit losses	5,585	4,871	5,290
Noninterest expense			
Compensation expense	34,155	33,117	31,208
Occupancy expense	4,322	3,952	3,723
Technology, communications and equipment expense	9,821	8,802	7,715
Professional and outside services	8,533	8,502	7,890
Marketing	3,579	3,290	2,900
Other expense	5,087	5,731	6,079
Total noninterest expense	65,497	63,394	59,515
Income before income tax expense	44,545	40,764	35,900
Income tax expense	8,114	8,290	11,459
Net income	$ 36,431	$ 32,474	$ 24,441
Net income applicable to common stockholders	$ 34,642	$ 30,709	$ 22,567
Net income per common share data			
Basic earnings per share	$ 10.75	$ 9.04	$ 6.35
Diluted earnings per share	10.72	9.00	6.31
Weighted-average basic shares	3,221.5	3,396.4	3,551.6
Weighted-average diluted shares	3,230.4	3,414.0	3,576.8

(a) In the second quarter of 2019, the Firm implemented certain presentation changes that impacted interest income and interest expense, but had no effect on net interest income. These changes were applied retrospectively and, accordingly, prior period amounts were revised to conform with the current presentation. Refer to Note 7 for additional information.

The Notes to Consolidated Financial Statements are an integral part of these statements.

Consolidated statements of comprehensive income

Year ended December 31, (in millions)	2019	2018	2017
Net income	**$ 36,431**	$ 32,474	$ 24,441
Other comprehensive income/(loss), after–tax			
Unrealized gains/(losses) on investment securities	**2,855**	(1,858)	640
Translation adjustments, net of hedges	**20**	20	(306)
Fair value hedges	**30**	(107)	NA
Cash flow hedges	**172**	(201)	176
Defined benefit pension and OPEB plans	**964**	(373)	738
DVA on fair value option elected liabilities	**(965)**	1,043	(192)
Total other comprehensive income/(loss), after–tax	**3,076**	(1,476)	1,056
Comprehensive income	**$ 39,507**	$ 30,998	$ 25,497

The Notes to Consolidated Financial Statements are an integral part of these statements.

Consolidated balance sheets

December 31, (in millions, except share data)	2019	2018
Assets		
Cash and due from banks	**$ 21,704**	$ 22,324
Deposits with banks	**241,927**	256,469
Federal funds sold and securities purchased under resale agreements (included **$14,561** and $13,235 at fair value)	**249,157**	321,588
Securities borrowed (included **$6,237** and $5,105 at fair value)	**139,758**	111,995
Trading assets (included assets pledged of **$111,522** and $89,073)	**411,103**	413,714
Investment securities (included **$350,699** and $230,394 at fair value and assets pledged of **$10,325** and $11,432)	**398,239**	261,828
Loans (included **$7,104** and $3,151 at fair value)	**959,769**	984,554
Allowance for loan losses	**(13,123)**	(13,445)
Loans, net of allowance for loan losses	**946,646**	971,109
Accrued interest and accounts receivable	**72,861**	73,200
Premises and equipment	**25,813**	14,934
Goodwill, MSRs and other intangible assets	**53,341**	54,349
Other assets (included **$9,111** and $9,630 at fair value and assets pledged of **$3,349** and $3,457)	**126,830**	121,022
Total assets[(a)]	**$ 2,687,379**	$ 2,622,532
Liabilities		
Deposits (included **$28,589** and $23,217 at fair value)	**$ 1,562,431**	$ 1,470,666
Federal funds purchased and securities loaned or sold under repurchase agreements (included **$549** and $935 at fair value)	**183,675**	182,320
Short-term borrowings (included **$5,920** and $7,130 at fair value)	**40,920**	69,276
Trading liabilities	**119,277**	144,773
Accounts payable and other liabilities (included **$3,728** and $3,269 at fair value)	**210,407**	196,710
Beneficial interests issued by consolidated VIEs (included **$36** and $28 at fair value)	**17,841**	20,241
Long-term debt (included **$75,745** and $54,886 at fair value)	**291,498**	282,031
Total liabilities[(a)]	**2,426,049**	2,366,017
Commitments and contingencies (refer to Notes 28, 29 and 30)		
Stockholders' equity		
Preferred stock ($1 par value; authorized 200,000,000 shares: issued **2,699,250** and 2,606,750 shares)	**26,993**	26,068
Common stock ($1 par value; authorized 9,000,000,000 shares; issued **4,104,933,895** shares)	**4,105**	4,105
Additional paid-in capital	**88,522**	89,162
Retained earnings	**223,211**	199,202
Accumulated other comprehensive income/loss	**1,569**	(1,507)
Shares held in restricted stock units ("RSU") trust, at cost (**472,953** shares)	**(21)**	(21)
Treasury stock, at cost (**1,020,912,567** and 829,167,674 shares)	**(83,049)**	(60,494)
Total stockholders' equity	**261,330**	256,515
Total liabilities and stockholders' equity	**$ 2,687,379**	$ 2,622,532

(a) The following table presents information on assets and liabilities related to VIEs that are consolidated by the Firm at December 31, 2019 and 2018. The assets of the consolidated VIEs are used to settle the liabilities of those entities. The holders of the beneficial interests do not have recourse to the general credit of JPMorgan Chase. The assets and liabilities in the table below include third-party assets and liabilities of consolidated VIEs and exclude intercompany balances that eliminate in consolidation. Refer to Note 14 for a further discussion.

December 31, (in millions)	2019	2018
Assets		
Trading assets	**$ 2,633**	$ 1,966
Loans	**42,931**	59,456
All other assets	**881**	1,013
Total assets	**$ 46,445**	$ 62,435
Liabilities		
Beneficial interests issued by consolidated VIEs	**$ 17,841**	$ 20,241
All other liabilities	**447**	312
Total liabilities	**$ 18,288**	$ 20,553

The Notes to Consolidated Financial Statements are an integral part of these statements.

Consolidated statements of changes in stockholders' equity

Year ended December 31, (in millions, except per share data)	2019	2018	2017
Preferred stock			
Balance at January 1	$ **26,068**	$ 26,068	$ 26,068
Issuance	**5,000**	1,696	1,258
Redemption	**(4,075)**	(1,696)	(1,258)
Balance at December 31	**26,993**	26,068	26,068
Common stock			
Balance at January 1 and December 31	**4,105**	4,105	4,105
Additional paid-in capital			
Balance at January 1	**89,162**	90,579	91,627
Shares issued and commitments to issue common stock for employee share-based compensation awards, and related tax effects	**(591)**	(738)	(734)
Other	**(49)**	(679)	(314)
Balance at December 31	**88,522**	89,162	90,579
Retained earnings			
Balance at January 1	**199,202**	177,676	162,440
Cumulative effect of change in accounting principles	**62**	(183)	–
Net income	**36,431**	32,474	24,441
Dividends declared:			
Preferred stock	**(1,587)**	(1,551)	(1,663)
Common stock (**$3.40**, $2.72 and $2.12 per share for 2019, 2018 and 2017, respectively)	**(10,897)**	(9,214)	(7,542)
Balance at December 31	**223,211**	199,202	177,676
Accumulated other comprehensive income			
Balance at January 1	**(1,507)**	(119)	(1,175)
Cumulative effect of change in accounting principles	**–**	88	–
Other comprehensive income/(loss), after-tax	**3,076**	(1,476)	1,056
Balance at December 31	**1,569**	(1,507)	(119)
Shares held in RSU Trust, at cost			
Balance at January 1 and December 31	**(21)**	(21)	(21)
Treasury stock, at cost			
Balance at January 1	**(60,494)**	(42,595)	(28,854)
Repurchase	**(24,121)**	(19,983)	(15,410)
Reissuance	**1,566**	2,084	1,669
Balance at December 31	**(83,049)**	(60,494)	(42,595)
Total stockholders' equity	$ **261,330**	$ 256,515	$ 255,693

The Notes to Consolidated Financial Statements are an integral part of these statements.

Consolidated statements of cash flows

Year ended December 31, (in millions)	2019	2018	2017
Operating activities			
Net income	**$ 36,431**	$ 32,474	$ 24,441
Adjustments to reconcile net income to net cash provided by/(used in) operating activities:			
Provision for credit losses	**5,585**	4,871	5,290
Depreciation and amortization	**8,368**	7,791	6,179
Deferred tax expense	**949**	1,721	2,312
Other	**1,996**	2,717	2,136
Originations and purchases of loans held-for-sale	**(70,980)**	(102,141)	(94,628)
Proceeds from sales, securitizations and paydowns of loans held-for-sale	**79,182**	93,453	93,270
Net change in:			
Trading assets	**(652)**	(38,371)	5,673
Securities borrowed	**(27,631)**	(6,861)	(8,653)
Accrued interest and accounts receivable	**(78)**	(5,849)	(15,868)
Other assets	**(17,949)**	(8,833)	3,982
Trading liabilities	**(14,516)**	18,290	(26,256)
Accounts payable and other liabilities	**(352)**	14,630	(16,508)
Other operating adjustments	**5,693**	295	7,803
Net cash provided by/(used in) operating activities	**6,046**	14,187	(10,827)
Investing activities			
Net change in:			
Federal funds sold and securities purchased under resale agreements	**72,396**	(123,201)	31,448
Held-to-maturity securities:			
Proceeds from paydowns and maturities	**3,423**	2,945	4,563
Purchases	**(13,427)**	(9,368)	(2,349)
Available-for-sale securities:			
Proceeds from paydowns and maturities	**52,200**	37,401	56,117
Proceeds from sales	**70,181**	46,067	90,201
Purchases	**(242,149)**	(95,091)	(105,309)
Proceeds from sales and securitizations of loans held-for-investment	**62,095**	29,826	15,791
Other changes in loans, net	**(53,697)**	(81,586)	(61,650)
All other investing activities, net	**(5,035)**	(4,986)	(563)
Net cash provided by/(used in) investing activities	**(54,013)**	(197,993)	28,249
Financing activities			
Net change in:			
Deposits	**101,002**	26,728	57,022
Federal funds purchased and securities loaned or sold under repurchase agreements	**1,347**	23,415	(6,739)
Short-term borrowings	**(28,561)**	18,476	16,540
Beneficial interests issued by consolidated VIEs	**4,289**	1,712	(1,377)
Proceeds from long-term borrowings	**61,085**	71,662	56,271
Payments of long-term borrowings	**(69,610)**	(76,313)	(83,079)
Proceeds from issuance of preferred stock	**5,000**	1,696	1,258
Redemption of preferred stock	**(4,075)**	(1,696)	(1,258)
Treasury stock repurchased	**(24,001)**	(19,983)	(15,410)
Dividends paid	**(12,343)**	(10,109)	(8,993)
All other financing activities, net	**(1,146)**	(1,430)	407
Net cash provided by financing activities	**32,987**	34,158	14,642
Effect of exchange rate changes on cash and due from banks and deposits with banks	**(182)**	(2,863)	8,086
Net increase/(decrease) in cash and due from banks and deposits with banks	**(15,162)**	(152,511)	40,150
Cash and due from banks and deposits with banks at the beginning of the period	**278,793**	431,304	391,154
Cash and due from banks and deposits with banks at the end of the period	**$ 263,631**	$ 278,793	$ 431,304
Cash interest paid	**$ 29,918**	$ 21,152	$ 14,153
Cash income taxes paid, net	**5,624**	3,542	4,325

The Notes to Consolidated Financial Statements are an integral part of these statements.

Note 1 – Basis of presentation

JPMorgan Chase & Co. ("JPMorgan Chase" or the "Firm"), a financial holding company incorporated under Delaware law in 1968, is a leading global financial services firm and one of the largest banking institutions in the U.S. with operations worldwide. The Firm is a leader in investment banking, financial services for consumers and small business, commercial banking, financial transaction processing and asset management. Refer to Note 32 for a discussion of the Firm's business segments.

The accounting and financial reporting policies of JPMorgan Chase and its subsidiaries conform to U.S. GAAP. Additionally, where applicable, the policies conform to the accounting and reporting guidelines prescribed by regulatory authorities.

Certain amounts reported in prior periods have been reclassified to conform with the current presentation.

Consolidation

The Consolidated Financial Statements include the accounts of JPMorgan Chase and other entities in which the Firm has a controlling financial interest. All material intercompany balances and transactions have been eliminated.

Assets held for clients in an agency or fiduciary capacity by the Firm are not assets of JPMorgan Chase and are not included on the Consolidated balance sheets.

The Firm determines whether it has a controlling financial interest in an entity by first evaluating whether the entity is a voting interest entity or a variable interest entity.

Voting interest entities

Voting interest entities are entities that have sufficient equity and provide the equity investors voting rights that enable them to make significant decisions relating to the entity's operations. For these types of entities, the Firm's determination of whether it has a controlling interest is primarily based on the amount of voting equity interests held. Entities in which the Firm has a controlling financial interest, through ownership of the majority of the entities' voting equity interests, or through other contractual rights that give the Firm control, are consolidated by the Firm.

Investments in companies in which the Firm has significant influence over operating and financing decisions (but does not own a majority of the voting equity interests) are accounted for (i) in accordance with the equity method of accounting (which requires the Firm to recognize its proportionate share of the entity's net earnings), or (ii) at fair value if the fair value option was elected. These investments are generally included in other assets, with income or loss included in noninterest revenue.

Certain Firm-sponsored asset management funds are structured as limited partnerships or limited liability companies. For many of these entities, the Firm is the general partner or managing member, but the non-affiliated partners or members have the ability to remove the Firm as the general partner or managing member without cause (i.e., kick-out rights), based on a simple majority vote, or the non-affiliated partners or members have rights to participate in important decisions. Accordingly, the Firm does not consolidate these voting interest entities. However, in the limited cases where the non-managing partners or members do not have substantive kick-out or participating rights, the Firm evaluates the funds as VIEs and consolidates the funds if the Firm is the general partner or managing member and has a potentially significant interest.

The Firm's investment companies and asset management funds have investments in both publicly-held and privately-held entities, including investments in buyouts, growth equity and venture opportunities. These investments are accounted for under investment company guidelines and, accordingly, irrespective of the percentage of equity ownership interests held, are carried on the Consolidated balance sheets at fair value, and are recorded in other assets, with income or loss included in noninterest revenue. If consolidated, the Firm retains such specialized investment company guidelines.

Variable interest entities

VIEs are entities that, by design, either (1) lack sufficient equity to permit the entity to finance its activities without additional subordinated financial support from other parties, or (2) have equity investors that do not have the ability to make significant decisions relating to the entity's operations through voting rights, or do not have the obligation to absorb the expected losses, or do not have the right to receive the residual returns of the entity.

The most common type of VIE is an SPE. SPEs are commonly used in securitization transactions in order to isolate certain assets and distribute the cash flows from those assets to investors. The basic SPE structure involves a company selling assets to the SPE; the SPE funds the purchase of those assets by issuing securities to investors. The legal documents that govern the transaction specify how the cash earned on the assets must be allocated to the SPE's investors and other parties that have rights to those cash flows. SPEs are generally structured to insulate investors from claims on the SPE's assets by creditors of other entities, including the creditors of the seller of the assets.

The primary beneficiary of a VIE (i.e., the party that has a controlling financial interest) is required to consolidate the assets and liabilities of the VIE. The primary beneficiary is the party that has both (1) the power to direct the activities of the VIE that most significantly impact the VIE's economic performance; and (2) through its interests in the VIE, the obligation to absorb losses or the right to receive benefits from the VIE that could potentially be significant to the VIE.

To assess whether the Firm has the power to direct the activities of a VIE that most significantly impact the VIE's economic performance, the Firm considers all the facts and circumstances, including its role in establishing the VIE and its ongoing rights and responsibilities. This assessment includes, first, identifying the activities that most significantly impact the VIE's economic performance; and second, identifying which party, if any, has power over those activities. In general, the parties that make the most significant decisions affecting the VIE (such as asset managers, collateral managers, servicers, or owners of call options or liquidation rights over the VIE's assets) or have the right to unilaterally remove those decision-makers are deemed to have the power to direct the activities of a VIE.

To assess whether the Firm has the obligation to absorb losses of the VIE or the right to receive benefits from the VIE that could potentially be significant to the VIE, the Firm considers all of its economic interests, including debt and equity investments, servicing fees, and derivatives or other arrangements deemed to be variable interests in the VIE. This assessment requires that the Firm apply judgment in determining whether these interests, in the aggregate, are considered potentially significant to the VIE. Factors considered in assessing significance include: the design of the VIE, including its capitalization structure; subordination of interests; payment priority; relative share of interests held across various classes within the VIE's capital structure; and the reasons why the interests are held by the Firm.

The Firm performs on-going reassessments of: (1) whether entities previously evaluated under the majority voting-interest framework have become VIEs, based on certain events, and are therefore subject to the VIE consolidation framework; and (2) whether changes in the facts and circumstances regarding the Firm's involvement with a VIE cause the Firm's consolidation conclusion to change.

Refer to Note 14 for further discussion of the Firm's VIEs.

Revenue recognition

Interest income

The Firm recognizes interest income on loans, debt securities, and other debt instruments, generally on a level-yield basis, based on the underlying contractual rate. Refer to Note 7 for further discussion of interest income.

Revenue from contracts with customers

JPMorgan Chase recognizes noninterest revenue from certain contracts with customers, in investment banking fees, deposit-related fees, asset management administration and commissions, and components of card income, when the Firm's related performance obligations are satisfied. Refer to Note 6 for further discussion of the Firm's revenue from contracts with customers.

Principal transactions revenue

JPMorgan Chase carries a portion of its assets and liabilities at fair value. Changes in fair value are reported primarily in principal transactions revenue. Refer to Notes 2 and 3 for further discussion of fair value measurement. Refer to Note 6 for further discussion of principal transactions revenue.

Use of estimates in the preparation of consolidated financial statements

The preparation of the Consolidated Financial Statements requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, revenue and expense, and disclosures of contingent assets and liabilities. Actual results could be different from these estimates.

Foreign currency translation

JPMorgan Chase revalues assets, liabilities, revenue and expense denominated in non-U.S. currencies into U.S. dollars using applicable exchange rates.

Gains and losses relating to translating functional currency financial statements for U.S. reporting are included in the Consolidated statements of comprehensive income. Gains and losses relating to nonfunctional currency transactions, including non-U.S. operations where the functional currency is the U.S. dollar, are reported in the Consolidated statements of income.

Offsetting assets and liabilities

U.S. GAAP permits entities to present derivative receivables and derivative payables with the same counterparty and the related cash collateral receivables and payables on a net basis on the Consolidated balance sheets when a legally enforceable master netting agreement exists. U.S. GAAP also permits securities sold and purchased under repurchase agreements and securities borrowed or loaned under securities loan agreements to be presented net when specified conditions are met, including the existence of a legally enforceable master netting agreement. The Firm has elected to net such balances when the specified conditions are met.

The Firm uses master netting agreements to mitigate counterparty credit risk in certain transactions, including derivative contracts, resale, repurchase, securities borrowed and securities loaned agreements. A master netting agreement is a single agreement with a counterparty that permits multiple transactions governed by that agreement to be terminated or accelerated and settled through a single payment in a single currency in the event of a default (e.g., bankruptcy, failure to make a required payment or securities transfer or deliver collateral or margin when due). Upon the exercise of derivatives termination rights by the non-defaulting party (i) all transactions are terminated, (ii) all transactions are valued and the positive values of "in the money" transactions are netted against the negative values of "out of the money" transactions and (iii) the only remaining payment obligation is of one of the parties to pay the netted termination amount. Upon exercise of default rights under repurchase agreements and securities loan agreements in general (i) all transactions are terminated and accelerated, (ii) all values of securities or cash held or to be delivered are calculated, and all such sums are netted against each other and (iii) the only remaining payment obligation is of one of the parties to pay the netted termination amount.

Typical master netting agreements for these types of transactions also often contain a collateral/margin agreement that provides for a security interest in, or title transfer of, securities or cash collateral/margin to the party that has the right to demand margin (the "demanding party"). The collateral/margin agreement typically requires a party to transfer collateral/margin to the demanding party with a value equal to the amount of the margin deficit on a net basis across all transactions governed by the master netting agreement, less any threshold. The collateral/margin agreement grants to the demanding party, upon default by the counterparty, the right to set-off any amounts payable by the counterparty against any posted collateral or the cash equivalent of any posted collateral/margin. It also grants to the demanding party the right to liquidate collateral/margin and to apply the proceeds to an amount payable by the counterparty.

Refer to Note 5 for further discussion of the Firm's derivative instruments. Refer to Note 11 for further discussion of the Firm's securities financing agreements.

Statements of cash flows

For JPMorgan Chase's Consolidated statements of cash flows, cash is defined as those amounts included in cash and due from banks and deposits with banks.

Accounting standard adopted January 1, 2020

Financial Instruments – Credit Losses ("CECL")

The adoption of this guidance established a single allowance framework for all financial assets carried at amortized cost and certain off-balance sheet credit exposures. This framework requires that management's estimate reflects credit losses over the full remaining expected life and considers expected future changes in macroeconomic conditions.

The following table presents the impacts to the allowance for credit losses and retained earnings upon adoption of this guidance on January 1, 2020:

(in billions)	December 31, 2019	CECL adoption impact	January 1, 2020
Allowance for credit losses			
Consumer, excluding credit card	$ 3.2	$ 0.2	$ 3.4
Credit card	5.7	5.5	11.2
Wholesale	5.4	(1.4)	4.0
Firmwide	$ 14.3	$ 4.3	$ 18.6
Retained earnings			
Firmwide allowance increase		$ 4.3	
Balance sheet reclassification[(a)]		(0.8)	
Total pre-tax impact		3.5	
Tax effect		(0.8)	
Decrease to retained earnings		$ 2.7	

(a) Represents the recognition of the nonaccretable difference on purchased credit deteriorated assets and the Firm's election to recognize the reserve for uncollectible accrued interest on credit card loans in the allowance, both of which resulted in a corresponding increase to loans.

Accounting standards adopted January 1, 2018

Effective January 1, 2018, the Firm adopted several accounting standards resulting in a net decrease of $183 million to retained earnings and a net increase of $88 million to AOCI. Certain of these standards were adopted retrospectively and, accordingly, prior period amounts were revised. The adoption of the recognition and measurement guidance resulted in $505 million of fair value gains in the first quarter of 2018, recorded in total net revenue, on certain equity investments that were previously held at cost.

Significant accounting policies

The following table identifies JPMorgan Chase's other significant accounting policies and the Note and page where a detailed description of each policy can be found.

Fair value measurement	Note 2	page 154
Fair value option	Note 3	page 175
Derivative instruments	Note 5	page 180
Noninterest revenue and noninterest expense	Note 6	page 195
Interest income and Interest expense	Note 7	page 198
Pension and other postretirement employee benefit plans	Note 8	page 199
Employee share-based incentives	Note 9	page 206
Investment securities	Note 10	page 208
Securities financing activities	Note 11	page 214
Loans	Note 12	page 217
Allowance for credit losses	Note 13	page 237
Variable interest entities	Note 14	page 242
Goodwill and Mortgage servicing rights	Note 15	page 250
Premises and equipment	Note 16	page 254
Leases	Note 18	page 254
Long-term debt	Note 20	page 257
Income taxes	Note 25	page 265
Off-balance sheet lending-related financial instruments, guarantees and other commitments	Note 28	page 272
Litigation	Note 30	page 279

Note 2 – Fair value measurement

JPMorgan Chase carries a portion of its assets and liabilities at fair value. These assets and liabilities are predominantly carried at fair value on a recurring basis (i.e., assets and liabilities that are measured and reported at fair value on the Firm's Consolidated balance sheets). Certain assets, liabilities and unfunded lending-related commitments are measured at fair value on a nonrecurring basis; that is, they are not measured at fair value on an ongoing basis but are subject to fair value adjustments only in certain circumstances (for example, when there is evidence of impairment).

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair value is based on quoted market prices or inputs, where available. If prices or quotes are not available, fair value is based on valuation models and other valuation techniques that consider relevant transaction characteristics (such as maturity) and use, as inputs, observable or unobservable market parameters, including yield curves, interest rates, volatilities, prices (such as commodity, equity or debt prices), correlations, foreign exchange rates and credit curves. Valuation adjustments may be made to ensure that financial instruments are recorded at fair value, as described below.

The level of precision in estimating unobservable market inputs or other factors can affect the amount of gain or loss recorded for a particular position. Furthermore, while the Firm believes its valuation methods are appropriate and consistent with those of other market participants, the methods and assumptions used reflect management judgment and may vary across the Firm's businesses and portfolios.

The Firm uses various methodologies and assumptions in the determination of fair value. The use of different methodologies or assumptions by other market participants compared with those used by the Firm could result in the Firm deriving a different estimate of fair value at the reporting date.

Valuation process

Risk-taking functions are responsible for providing fair value estimates for assets and liabilities carried on the Consolidated balance sheets at fair value. The Firm's VCG, which is part of the Firm's Finance function and independent of the risk-taking functions, is responsible for verifying these estimates and determining any fair value adjustments that may be required to ensure that the Firm's positions are recorded at fair value. The VGF is composed of senior finance and risk executives and is responsible for overseeing the management of risks arising from valuation activities conducted across the Firm. The Firmwide VGF is chaired by the Firmwide head of the VCG (under the direction of the Firm's Controller), and includes sub-forums covering the CIB, CCB, CB, AWM and certain corporate functions including Treasury and CIO.

Price verification process

The VCG verifies fair value estimates provided by the risk-taking functions by leveraging independently derived prices, valuation inputs and other market data, where available. Where independent prices or inputs are not available, the VCG performs additional review to ensure the reasonableness of the estimates. The additional review may include evaluating the limited market activity including client unwinds, benchmarking valuation inputs to those used for similar instruments, decomposing the valuation of structured instruments into individual components, comparing expected to actual cash flows, reviewing profit and loss trends, and reviewing trends in collateral valuation. There are also additional levels of management review for more significant or complex positions.

The VCG determines any valuation adjustments that may be required to the estimates provided by the risk-taking functions. No adjustments to quoted prices are applied for instruments classified within level 1 of the fair value hierarchy (refer to the discussion below for further information on the fair value hierarchy). For other positions, judgment is required to assess the need for valuation adjustments to appropriately reflect liquidity considerations, unobservable parameters, and, for certain portfolios that meet specified criteria, the size of the net open risk position. The determination of such adjustments follows a consistent framework across the Firm:

- Liquidity valuation adjustments are considered where an observable external price or valuation parameter exists but is of lower reliability, potentially due to lower market activity. Liquidity valuation adjustments are made based on current market conditions. Factors that may be considered in determining the liquidity adjustment include analysis of: (1) the estimated bid-offer spread for the instrument being traded; (2) alternative pricing points for similar instruments in active markets; and (3) the range of reasonable values that the price or parameter could take.
- The Firm manages certain portfolios of financial instruments on the basis of net open risk exposure and, as permitted by U.S. GAAP, has elected to estimate the fair value of such portfolios on the basis of a transfer of the entire net open risk position in an orderly transaction. Where this is the case, valuation adjustments may be necessary to reflect the cost of exiting a larger-than-normal market-size net open risk position. Where applied, such adjustments are based on factors that a relevant market participant would consider in the transfer of the net open risk position, including the size of the adverse market move that is likely to occur during the period required to reduce the net open risk position to a normal market-size.
- Uncertainty adjustments related to unobservable parameters may be made when positions are valued using prices or input parameters to valuation models that are unobservable due to a lack of market activity or because they cannot be implied from observable market data. Such prices or parameters must be estimated and are, therefore, subject to management judgment.

Adjustments are made to reflect the uncertainty inherent in the resulting valuation estimate.

- Where appropriate, the Firm also applies adjustments to its estimates of fair value in order to appropriately reflect counterparty credit quality (CVA), the Firm's own creditworthiness (DVA) and the impact of funding (FVA), using a consistent framework across the Firm. Refer to Credit and funding adjustments on page 171 of this Note for more information on such adjustments.

Valuation model review and approval
If prices or quotes are not available for an instrument or a similar instrument, fair value is generally determined using valuation models that consider relevant transaction terms such as maturity and use as inputs market-based or independently sourced parameters. Where this is the case the price verification process described above is applied to the inputs in those models.

Under the Firm's Estimations and Model Risk Management Policy, the Model Risk function reviews and approves new models, as well as material changes to existing models, prior to implementation in the operating environment. In certain circumstances exceptions may be granted to the Firm's policy to allow a model to be used prior to review or approval. The Model Risk function may also require the user to take appropriate actions to mitigate the model risk if it is to be used in the interim. These actions will depend on the model and may include, for example, limitation of trading activity.

Valuation hierarchy
A three-level valuation hierarchy has been established under U.S. GAAP for disclosure of fair value measurements. The valuation hierarchy is based on the observability of inputs to the valuation of an asset or liability as of the measurement date. The three levels are defined as follows.

- Level 1 – inputs to the valuation methodology are quoted prices (unadjusted) for identical assets or liabilities in active markets.
- Level 2 – inputs to the valuation methodology include quoted prices for similar assets and liabilities in active markets, and inputs that are observable for the asset or liability, either directly or indirectly, for substantially the full term of the financial instrument.
- Level 3 – one or more inputs to the valuation methodology are unobservable and significant to the fair value measurement.

A financial instrument's categorization within the valuation hierarchy is based on the lowest level of input that is significant to the fair value measurement.

The following table describes the valuation methodologies generally used by the Firm to measure its significant products/instruments at fair value, including the general classification of such instruments pursuant to the valuation hierarchy.

Product/instrument	Valuation methodology	Classifications in the valuation hierarchy
Securities financing agreements	Valuations are based on discounted cash flows, which consider: • Derivative features: refer to the discussion of derivatives below for further information. • Market rates for the respective maturity • Collateral characteristics	Predominantly level 2
Loans and lending-related commitments — wholesale		
Loans carried at fair value (e.g., trading loans and non-trading loans) and associated lending-related commitments	Where observable market data is available, valuations are based on: • Observed market prices (circumstances are infrequent) • Relevant broker quotes • Observed market prices for similar instruments Where observable market data is unavailable or limited, valuations are based on discounted cash flows, which consider the following: • Credit spreads derived from the cost of CDS; or benchmark credit curves developed by the Firm, by industry and credit rating • Prepayment speed • Collateral characteristics	Level 2 or 3
Loans — consumer		
Trading loans — conforming residential mortgage loans expected to be sold	Fair value is based on observable prices for mortgage-backed securities with similar collateral and incorporates adjustments to these prices to account for differences between the securities and the value of the underlying loans, which include credit characteristics, portfolio composition, and liquidity.	Predominantly level 2
Investment and trading securities	Quoted market prices	Level 1
	In the absence of quoted market prices, securities are valued based on: • Observable market prices for similar securities • Relevant broker quotes • Discounted cash flows In addition, the following inputs to discounted cash flows are used for the following products: Mortgage- and asset-backed securities specific inputs: • Collateral characteristics • Deal-specific payment and loss allocations • Current market assumptions related to yield, prepayment speed, conditional default rates and loss severity Collateralized loan obligations ("CLOs") specific inputs: • Collateral characteristics • Deal-specific payment and loss allocations • Expected prepayment speed, conditional default rates, loss severity • Credit spreads • Credit rating data	Level 2 or 3
Physical commodities	Valued using observable market prices or data.	Level 1 or 2

Product/instrument	Valuation methodology	Classifications in the valuation hierarchy
Derivatives	Exchange-traded derivatives that are actively traded and valued using the exchange price.	Level 1
	Derivatives that are valued using models such as the Black-Scholes option pricing model, simulation models, or a combination of models that may use observable or unobservable valuation inputs as well as considering the contractual terms. The key valuation inputs used will depend on the type of derivative and the nature of the underlying instruments and may include equity prices, commodity prices, interest rate yield curves, foreign exchange rates, volatilities, correlations, CDS spreads and recovery rates. Additionally, the credit quality of the counterparty and of the Firm as well as market funding levels may also be considered. In addition, specific inputs used for derivatives that are valued based on models with significant unobservable inputs are as follows: Structured credit derivatives specific inputs include: • CDS spreads and recovery rates • Credit correlation between the underlying debt instruments Equity option specific inputs include: • Forward equity price • Equity volatility • Equity correlation • Equity-FX correlation • Equity-IR correlation Interest rate and FX exotic options specific inputs include: • Interest rate volatility • Interest rate spread volatility • Interest rate correlation • Foreign exchange correlation • Interest rate-FX correlation Commodity derivatives specific inputs include: • Commodity volatility • Forward commodity price Additionally, adjustments are made to reflect counterparty credit quality (CVA) and the impact of funding (FVA). Refer to page 171 of this Note.	Level 2 or 3
Mortgage servicing rights	Refer to Mortgage servicing rights in Note 15.	Level 3
Private equity direct investments	Fair value is estimated using all available information; the range of potential inputs include: • Transaction prices • Trading multiples of comparable public companies • Operating performance of the underlying portfolio company • Adjustments as required, since comparable public companies are not identical to the company being valued, and for company-specific issues and lack of liquidity. • Additional available inputs relevant to the investment.	Level 2 or 3
Fund investments (e.g., mutual/collective investment funds, private equity funds, hedge funds, and real estate funds)	Net asset value • NAV is supported by the ability to redeem and purchase at the NAV level.	Level 1
	• Adjustments to the NAV as required, for restrictions on redemption (e.g., lock-up periods or withdrawal limitations) or where observable activity is limited.	Level 2 or 3[(a)]
Beneficial interests issued by consolidated VIEs	Valued using observable market information, where available. In the absence of observable market information, valuations are based on the fair value of the underlying assets held by the VIE.	Level 2 or 3

(a) Excludes certain investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient.

Product/instrument	Valuation methodology	Classification in the valuation hierarchy
Structured notes (included in deposits, short-term borrowings and long-term debt)	• Valuations are based on discounted cash flow analyses that consider the embedded derivative and the terms and payment structure of the note. • The embedded derivative features are considered using models such as the Black-Scholes option pricing model, simulation models, or a combination of models that may use observable or unobservable valuation inputs, depending on the embedded derivative. The specific inputs used vary according to the nature of the embedded derivative features, as described in the discussion above regarding derivatives valuation. Adjustments are then made to this base valuation to reflect the Firm's own credit risk (DVA). Refer to page 171 of this Note.	Level 2 or 3

The following table presents the assets and liabilities reported at fair value as of December 31, 2019 and 2018, by major product category and fair value hierarchy.

Assets and liabilities measured at fair value on a recurring basis

December 31, 2019 (in millions)	Fair value hierarchy Level 1	Level 2	Level 3	Derivative netting adjustments[f]	Total fair value
Federal funds sold and securities purchased under resale agreements	$ –	$ 14,561	$ –	$ –	$ 14,561
Securities borrowed	–	6,237	–	–	6,237
Trading assets:					
Debt instruments:					
Mortgage-backed securities:					
U.S. GSEs and government agencies[a]	–	44,510	797	–	45,307
Residential – nonagency	–	1,977	23	–	2,000
Commercial – nonagency	–	1,486	4	–	1,490
Total mortgage-backed securities	–	47,973	824	–	48,797
U.S. Treasury, GSEs and government agencies[a]	78,289	10,295	–	–	88,584
Obligations of U.S. states and municipalities	–	6,468	10	–	6,478
Certificates of deposit, bankers' acceptances and commercial paper	–	252	–	–	252
Non-U.S. government debt securities	26,600	27,169	155	–	53,924
Corporate debt securities	–	17,956	558	–	18,514
Loans[b]	–	47,047	1,382	–	48,429
Asset-backed securities	–	2,593	37	–	2,630
Total debt instruments	104,889	159,753	2,966	–	267,608
Equity securities	71,890	244	196	–	72,330
Physical commodities[c]	3,638	3,579	–	–	7,217
Other	–	13,896	232	–	14,128
Total debt and equity instruments[d]	180,417	177,472	3,394	–	361,283
Derivative receivables:					
Interest rate	721	311,173	1,400	(285,873)	27,421
Credit	–	14,252	624	(14,175)	701
Foreign exchange	117	137,938	432	(129,482)	9,005
Equity	–	43,642	2,085	(39,250)	6,477
Commodity	–	17,058	184	(11,080)	6,162
Total derivative receivables	838	524,063	4,725	(479,860)	49,766
Total trading assets[e]	181,255	701,535	8,119	(479,860)	411,049
Available-for-sale securities:					
Mortgage-backed securities:					
U.S. GSEs and government agencies[a]	–	110,117	–	–	110,117
Residential – nonagency	–	12,989	1	–	12,990
Commercial – nonagency	–	5,188	–	–	5,188
Total mortgage-backed securities	–	128,294	1	–	128,295
U.S. Treasury and government agencies	139,436	–	–	–	139,436
Obligations of U.S. states and municipalities	–	29,810	–	–	29,810
Certificates of deposit	–	77	–	–	77
Non-U.S. government debt securities	12,966	8,821	–	–	21,787
Corporate debt securities	–	845	–	–	845
Asset-backed securities:					
Collateralized loan obligations	–	24,991	–	–	24,991
Other	–	5,458	–	–	5,458
Total available-for-sale securities	152,402	198,296	1	–	350,699
Loans	–	7,104	–	–	7,104
Mortgage servicing rights	–	–	4,699	–	4,699
Other assets[e]	7,305	452	724	–	8,481
Total assets measured at fair value on a recurring basis	$ 340,962	$ 928,185	$ 13,543	$ (479,860)	$ 802,830
Deposits	$ –	$ 25,229	$ 3,360	$ –	$ 28,589
Federal funds purchased and securities loaned or sold under repurchase agreements	–	549	–	–	549
Short-term borrowings	–	4,246	1,674	–	5,920
Trading liabilities:					
Debt and equity instruments[d]	59,047	16,481	41	–	75,569
Derivative payables:					
Interest rate	795	276,746	1,732	(270,670)	8,603
Credit	–	14,358	763	(13,469)	1,652
Foreign exchange	109	143,960	1,039	(131,950)	13,158
Equity	–	47,261	5,480	(40,204)	12,537
Commodity	–	19,685	200	(12,127)	7,758
Total derivative payables	904	502,010	9,214	(468,420)	43,708
Total trading liabilities	59,951	518,491	9,255	(468,420)	119,277
Accounts payable and other liabilities	3,231	452	45	–	3,728
Beneficial interests issued by consolidated VIEs	–	36	–	–	36
Long-term debt	–	52,406	23,339	–	75,745
Total liabilities measured at fair value on a recurring basis	$ 63,182	$ 601,409	$ 37,673	$ (468,420)	$ 233,844

December 31, 2018 (in millions)	Fair value hierarchy Level 1	Level 2	Level 3	Derivative netting adjustments[(f)]	Total fair value
Federal funds sold and securities purchased under resale agreements	$ –	$ 13,235	$ –	$ –	$ 13,235
Securities borrowed	–	5,105	–	–	5,105
Trading assets:					
Debt instruments:					
Mortgage-backed securities:					
U.S. GSEs and government agencies[(a)]	–	76,249	549	–	76,798
Residential – nonagency	–	1,798	64	–	1,862
Commercial – nonagency	–	1,501	11	–	1,512
Total mortgage-backed securities	–	79,548	624	–	80,172
U.S. Treasury, GSEs and government agencies[(a)]	51,477	7,702	–	–	59,179
Obligations of U.S. states and municipalities	–	7,121	689	–	7,810
Certificates of deposit, bankers' acceptances and commercial paper	–	1,214	–	–	1,214
Non-U.S. government debt securities	27,878	27,056	155	–	55,089
Corporate debt securities	–	18,655	334	–	18,989
Loans[(b)]	–	40,047	1,706	–	41,753
Asset-backed securities	–	2,756	127	–	2,883
Total debt instruments	79,355	184,099	3,635	–	267,089
Equity securities	71,119	482	232	–	71,833
Physical commodities[(c)]	5,182	1,855	–	–	7,037
Other	–	13,192	301	–	13,493
Total debt and equity instruments[(d)]	155,656	199,628	4,168	–	359,452
Derivative receivables:					
Interest rate	682	266,380	1,642	(245,490)	23,214
Credit	–	19,235	860	(19,483)	612
Foreign exchange	771	166,238	676	(154,235)	13,450
Equity	–	46,777	2,508	(39,339)	9,946
Commodity	–	20,339	131	(13,479)	6,991
Total derivative receivables	1,453	518,969	5,817	(472,026)	54,213
Total trading assets[(e)]	157,109	718,597	9,985	(472,026)	413,665
Available-for-sale securities:					
Mortgage-backed securities:					
U.S. GSEs and government agencies[(a)]	–	68,646	–	–	68,646
Residential – nonagency	–	8,519	1	–	8,520
Commercial – nonagency	–	6,654	–	–	6,654
Total mortgage-backed securities	–	83,819	1	–	83,820
U.S. Treasury and government agencies	56,059	–	–	–	56,059
Obligations of U.S. states and municipalities	–	37,723	–	–	37,723
Certificates of deposit	–	75	–	–	75
Non-U.S. government debt securities	15,313	8,789	–	–	24,102
Corporate debt securities	–	1,918	–	–	1,918
Asset-backed securities:	–	–	–	–	–
Collateralized loan obligations	–	19,437	–	–	19,437
Other	–	7,260	–	–	7,260
Total available-for-sale securities	71,372	159,021	1	–	230,394
Loans	–	3,029	122	–	3,151
Mortgage servicing rights	–	–	6,130	–	6,130
Other assets[(e)]	7,810	195	927	–	8,932
Total assets measured at fair value on a recurring basis	$ 236,291	$ 899,182	$ 17,165	$ (472,026)	$ 680,612
Deposits	$ –	$ 19,048	$ 4,169	$ –	$ 23,217
Federal funds purchased and securities loaned or sold under repurchase agreements	–	935	–	–	935
Short-term borrowings	–	5,607	1,523	–	7,130
Trading liabilities:					
Debt and equity instruments[(d)]	80,199	22,755	50	–	103,004
Derivative payables:					
Interest rate	1,526	239,576	1,680	(234,998)	7,784
Credit	–	19,309	967	(18,609)	1,667
Foreign exchange	695	163,549	973	(152,432)	12,785
Equity	–	46,462	4,733	(41,034)	10,161
Commodity	–	21,158	1,260	(13,046)	9,372
Total derivative payables	2,221	490,054	9,613	(460,119)	41,769
Total trading liabilities	82,420	512,809	9,663	(460,119)	144,773
Accounts payable and other liabilities	3,063	196	10	–	3,269
Beneficial interests issued by consolidated VIEs	–	27	1	–	28
Long-term debt	–	35,468	19,418	–	54,886
Total liabilities measured at fair value on a recurring basis	$ 85,483	$ 574,090	$ 34,784	$ (460,119)	$ 234,238

(a) At December 31, 2019 and 2018, included total U.S. GSE obligations of $104.5 billion and $92.3 billion, respectively, which were mortgage-related.

(b) At December 31, 2019 and 2018, included within trading loans were $19.8 billion and $13.2 billion, respectively, of residential first-lien mortgages, and $3.4 billion and $2.3 billion, respectively, of commercial first-lien mortgages. Residential mortgage loans include conforming mortgage loans originated with the intent to sell to U.S. GSEs and government agencies of $13.6 billion and $7.6 billion, respectively.

(c) Physical commodities inventories are generally accounted for at the lower of cost or net realizable value. "Net realizable value" is a term defined in U.S. GAAP as not exceeding fair value less costs to sell ("transaction costs"). Transaction costs for the Firm's physical commodities inventories are either not applicable or immaterial to the value of the inventory. Therefore, net realizable value approximates fair value for the Firm's physical commodities inventories. When fair value hedging has been applied (or when net realizable value is below cost), the carrying value of physical commodities approximates fair value, because under fair value hedge accounting, the cost basis is adjusted for changes in fair value. Refer to Note 5 for a further discussion of the Firm's hedge accounting relationships. To provide consistent fair value disclosure information, all physical commodities inventories have been included in each period presented.

(d) Balances reflect the reduction of securities owned (long positions) by the amount of identical securities sold but not yet purchased (short positions).

(e) Certain investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient are not required to be classified in the fair value hierarchy. At December 31, 2019 and 2018, the fair values of these investments, which include certain hedge funds, private equity funds, real estate and other funds, were $684 million and $747 million, respectively. Included in these balances at December 31, 2019 and 2018, were trading assets of $54 million and $49 million, respectively, and other assets of $630 million and $698 million, respectively.

(f) As permitted under U.S. GAAP, the Firm has elected to net derivative receivables and derivative payables and the related cash collateral received and paid when a legally enforceable master netting agreement exists. The level 3 balances would be reduced if netting were applied, including the netting benefit associated with cash collateral.

Level 3 valuations

The Firm has established well-structured processes for determining fair value, including for instruments where fair value is estimated using significant unobservable inputs (level 3). Refer to pages 154–158 of this Note for further information on the Firm's valuation process and a detailed discussion of the determination of fair value for individual financial instruments.

Estimating fair value requires the application of judgment. The type and level of judgment required is largely dependent on the amount of observable market information available to the Firm. For instruments valued using internally developed valuation models and other valuation techniques that use significant unobservable inputs and are therefore classified within level 3 of the fair value hierarchy, judgments used to estimate fair value are more significant than those required when estimating the fair value of instruments classified within levels 1 and 2.

In arriving at an estimate of fair value for an instrument within level 3, management must first determine the appropriate valuation model or other valuation technique to use. Second, due to the lack of observability of significant inputs, management must assess relevant empirical data in deriving valuation inputs including transaction details, yield curves, interest rates, prepayment speed, default rates, volatilities, correlations, prices (such as commodity, equity or debt prices), valuations of comparable instruments, foreign exchange rates and credit curves.

The following table presents the Firm's primary level 3 financial instruments, the valuation techniques used to measure the fair value of those financial instruments, the significant unobservable inputs, the range of values for those inputs and, for certain instruments, the weighted averages of such inputs. While the determination to classify an instrument within level 3 is based on the significance of the unobservable inputs to the overall fair value measurement, level 3 financial instruments typically include observable components (that is, components that are actively quoted and can be validated to external sources) in addition to the unobservable components. The level 1 and/or level 2 inputs are not included in the table. In addition, the Firm manages the risk of the observable components of level 3 financial instruments using securities and derivative positions that are classified within levels 1 or 2 of the fair value hierarchy.

The range of values presented in the table is representative of the highest and lowest level input used to value the significant groups of instruments within a product/instrument classification. Where provided, the weighted averages of the input values presented in the table are calculated based on the fair value of the instruments that the input is being used to value.

In the Firm's view, the input range and the weighted average value do not reflect the degree of input uncertainty or an assessment of the reasonableness of the Firm's estimates and assumptions. Rather, they reflect the characteristics of the various instruments held by the Firm and the relative distribution of instruments within the range of characteristics. For example, two option contracts may have similar levels of market risk exposure and valuation uncertainty, but may have significantly different implied volatility levels because the option contracts have different underlyings, tenors, or strike prices. The input range and weighted average values will therefore vary from period-to-period and parameter-to-parameter based on the characteristics of the instruments held by the Firm at each balance sheet date.

For the Firm's derivatives and structured notes positions classified within level 3 at December 31, 2019, interest rate correlation inputs used in estimating fair value were distributed across the range; equity correlation, equity-FX and equity-IR correlation inputs were concentrated in the middle of the range; commodity correlation inputs were concentrated in the middle of the range; credit correlation inputs were concentrated towards the lower end of the range; and forward equity prices and the interest rate-foreign exchange ("IR-FX") correlation inputs were distributed across the range. In addition, the interest rate volatility and interest rate spread volatility inputs used in estimating fair value were distributed across the range; equity volatilities and commodity volatilities were concentrated towards the lower end of the range; and forward commodity prices used in estimating the fair value of commodity derivatives were concentrated in the middle of the range. Prepayment speed inputs used in estimating the fair value of interest rate derivatives were concentrated towards the lower end of the range. Recovery rate inputs used in estimating the fair value of credit derivatives were distributed across the range; credit spreads were concentrated towards the lower end of the range; conditional default rates and loss severity inputs were concentrated towards the upper end of the range and price inputs were concentrated towards the lower end of the range.

Level 3 inputs[(a)]

December 31, 2019							
Product/Instrument	**Fair value (in millions)**	**Principal valuation technique**	**Unobservable inputs[(g)]**	**Range of input values**			**Weighted average**
Residential mortgage-backed securities and loans[(b)]	$ 976	Discounted cash flows	Yield	2%	–	18%	6%
			Prepayment speed	0%	–	26%	13%
			Conditional default rate	0%	–	5%	0%
			Loss severity	0%	–	100%	5%
Commercial mortgage-backed securities and loans[(c)]	99	Market comparables	Price	$0	–	$100	$79
Obligations of U.S. states and municipalities	10	Market comparables	Price	$71	–	$100	$95
Corporate debt securities	558	Market comparables	Price	$4	–	$112	$72
Loans[(d)]	193	Discounted cash flows	Yield	5%	–	28%	8%
	939	Market comparables	Price	$2	–	$116	$70
Asset-backed securities	37	Market comparables	Price	$1	–	$102	$71
Net interest rate derivatives	(395)	Option pricing	Interest rate volatility	6%	–	44%	
			Interest rate spread volatility	20bps	–	30bps	
			Interest rate correlation	(65)%	–	94%	
			IR-FX correlation	(58)%	–	40%	
	63	Discounted cash flows	Prepayment speed	4%	–	30%	
Net credit derivatives	(174)	Discounted cash flows	Credit correlation	31%	–	59%	
			Credit spread	3bps	–	1,308bps	
			Recovery rate	15%	–	70%	
			Conditional default rate	2%	–	18%	
			Loss severity		100%		
	35	Market comparables	Price	$1	–	$115	
Net foreign exchange derivatives	(469)	Option pricing	IR-FX correlation	(58)%	–	65%	
	(138)	Discounted cash flows	Prepayment speed		9%		
Net equity derivatives	(3,395)	Option pricing	Forward equity price[(h)]	92%	–	105%	
			Equity volatility	9%	–	93%	
			Equity correlation	10%	–	97%	
			Equity-FX correlation	(81)%	–	60%	
			Equity-IR correlation	25%	–	35%	
Net commodity derivatives	(16)	Option pricing	Forward commodity price	$39	–	$ 76 per barrel	
			Commodity volatility	5%	–	105%	
			Commodity correlation	(48)%	–	95%	
MSRs	4,699	Discounted cash flows	Refer to Note 15				
Other assets	222	Discounted cash flows	Credit spread		45bps		45bps
			Yield		12%		12%
	734	Market comparables	Price	$17	–	$117	$37
Long-term debt, short-term borrowings, and deposits[(e)]	28,373	Option pricing	Interest rate volatility	6%	–	44%	
			Interest rate correlation	(65)%	–	94%	
			IR-FX correlation	(58)%	–	40%	
			Equity correlation	10%	–	97%	
			Equity-FX correlation	(81)%	–	60%	
			Equity-IR correlation	25%	–	35%	
Other level 3 assets and liabilities, net[(f)]	265						

(a) The categories presented in the table have been aggregated based upon the product type, which may differ from their classification on the Consolidated balance sheets. Furthermore, the inputs presented for each valuation technique in the table are, in some cases, not applicable to every instrument valued using the technique as the characteristics of the instruments can differ.
(b) Comprises U.S. GSEs and government agency securities of $797 million, nonagency securities of $24 million and trading loans of $155 million.
(c) Comprises nonagency securities of $4 million and trading loans of $95 million.
(d) Comprises trading loans.
(e) Long-term debt, short-term borrowings and deposits include structured notes issued by the Firm that are financial instruments that typically contain embedded derivatives. The estimation of the fair value of structured notes includes the derivative features embedded within the instrument. The significant unobservable inputs are broadly consistent with those presented for derivative receivables.
(f) Includes level 3 assets and liabilities that are insignificant both individually and in aggregate.
(g) Price is a significant unobservable input for certain instruments. When quoted market prices are not readily available, reliance is generally placed on price-based internal valuation techniques. The price input is expressed assuming a par value of $100.
(h) Forward equity price is expressed as a percentage of the current equity price.

Changes in and ranges of unobservable inputs

The following discussion provides a description of the impact on a fair value measurement of a change in each unobservable input in isolation, and the interrelationship between unobservable inputs, where relevant and significant. The impact of changes in inputs may not be independent, as a change in one unobservable input may give rise to a change in another unobservable input. Where relationships do exist between two unobservable inputs, those relationships are discussed below. Relationships may also exist between observable and unobservable inputs (for example, as observable interest rates rise, unobservable prepayment rates decline); such relationships have not been included in the discussion below. In addition, for each of the individual relationships described below, the inverse relationship would also generally apply.

The following discussion also provides a description of attributes of the underlying instruments and external market factors that affect the range of inputs used in the valuation of the Firm's positions.

Yield – The yield of an asset is the interest rate used to discount future cash flows in a discounted cash flow calculation. An increase in the yield, in isolation, would result in a decrease in a fair value measurement.

Credit spread – The credit spread is the amount of additional annualized return over the market interest rate that a market participant would demand for taking exposure to the credit risk of an instrument. The credit spread for an instrument forms part of the discount rate used in a discounted cash flow calculation. Generally, an increase in the credit spread would result in a decrease in a fair value measurement.

The yield and the credit spread of a particular mortgage-backed security primarily reflect the risk inherent in the instrument. The yield is also impacted by the absolute level of the coupon paid by the instrument (which may not correspond directly to the level of inherent risk). Therefore, the range of yield and credit spreads reflects the range of risk inherent in various instruments owned by the Firm. The risk inherent in mortgage-backed securities is driven by the subordination of the security being valued and the characteristics of the underlying mortgages within the collateralized pool, including borrower FICO scores, LTV ratios for residential mortgages and the nature of the property and/or any tenants for commercial mortgages. For corporate debt securities, obligations of U.S. states and municipalities and other similar instruments, credit spreads reflect the credit quality of the obligor and the tenor of the obligation.

Prepayment speed – The prepayment speed is a measure of the voluntary unscheduled principal repayments of a prepayable obligation in a collateralized pool. Prepayment speeds generally decline as borrower delinquencies rise. An increase in prepayment speeds, in isolation, would result in a decrease in a fair value measurement of assets valued at a premium to par and an increase in a fair value measurement of assets valued at a discount to par.

Prepayment speeds may vary from collateral pool to collateral pool, and are driven by the type and location of the underlying borrower, and the remaining tenor of the obligation as well as the level and type (e.g., fixed or floating) of interest rate being paid by the borrower. Typically collateral pools with higher borrower credit quality have a higher prepayment rate than those with lower borrower credit quality, all other factors being equal.

Conditional default rate – The conditional default rate is a measure of the reduction in the outstanding collateral balance underlying a collateralized obligation as a result of defaults. While there is typically no direct relationship between conditional default rates and prepayment speeds, collateralized obligations for which the underlying collateral has high prepayment speeds will tend to have lower conditional default rates. An increase in conditional default rates would generally be accompanied by an increase in loss severity and an increase in credit spreads. An increase in the conditional default rate, in isolation, would result in a decrease in a fair value measurement. Conditional default rates reflect the quality of the collateral underlying a securitization and the structure of the securitization itself. Based on the types of securities owned in the Firm's market-making portfolios, conditional default rates are most typically at the lower end of the range presented.

Loss severity – The loss severity (the inverse concept is the recovery rate) is the expected amount of future realized losses resulting from the ultimate liquidation of a particular loan, expressed as the net amount of loss relative to the outstanding loan balance. An increase in loss severity is generally accompanied by an increase in conditional default rates. An increase in the loss severity, in isolation, would result in a decrease in a fair value measurement.

The loss severity applied in valuing a mortgage-backed security investment depends on factors relating to the underlying mortgages, including the LTV ratio, the nature of the lender's lien on the property and other instrument-specific factors.

Correlation – Correlation is a measure of the relationship between the movements of two variables. Correlation is a pricing input for a derivative product where the payoff is driven by one or more underlying risks. Correlation inputs are related to the type of derivative (e.g., interest rate, credit, equity, foreign exchange and commodity) due to the nature of the underlying risks. When parameters are positively correlated, an increase in one parameter will result in an increase in the other parameter. When parameters are negatively correlated, an increase in one parameter will result in a decrease in the other parameter. An increase in correlation can result in an increase or a decrease in a fair value measurement. Given a short correlation position, an increase in correlation, in isolation, would generally result in a decrease in a fair value measurement.

The level of correlation used in the valuation of derivatives with multiple underlying risks depends on a number of factors including the nature of those risks. For example, the correlation between two credit risk exposures would be different than that between two interest rate risk exposures. Similarly, the tenor of the transaction may also impact the correlation input, as the relationship between the underlying risks may be different over different time periods. Furthermore, correlation levels are very much dependent on market conditions and could have a relatively wide range of levels within or across asset classes over time, particularly in volatile market conditions.

Volatility – Volatility is a measure of the variability in possible returns for an instrument, parameter or market index given how much the particular instrument, parameter or index changes in value over time. Volatility is a pricing input for options, including equity options, commodity options, and interest rate options. Generally, the higher the volatility of the underlying, the riskier the instrument. Given a long position in an option, an increase in volatility, in isolation, would generally result in an increase in a fair value measurement.

The level of volatility used in the valuation of a particular option-based derivative depends on a number of factors, including the nature of the risk underlying the option (e.g., the volatility of a particular equity security may be significantly different from that of a particular commodity index), the tenor of the derivative as well as the strike price of the option.

Forward price - Forward price is the price at which the buyer agrees to purchase the asset underlying a forward contract on the predetermined future delivery date, and is such that the value of the contract is zero at inception.

The forward price is used as an input in the valuation of certain derivatives and depends on a number of factors including interest rates, the current price of the underlying asset, and the expected income to be received and costs to be incurred by the seller as a result of holding that asset until the delivery date. An increase in the forward can result in an increase or a decrease in a fair value measurement.

Changes in level 3 recurring fair value measurements

The following tables include a rollforward of the Consolidated balance sheets amounts (including changes in fair value) for financial instruments classified by the Firm within level 3 of the fair value hierarchy for the years ended December 31, 2019, 2018 and 2017. When a determination is made to classify a financial instrument within level 3, the determination is based on the significance of the unobservable inputs to the overall fair value measurement. However, level 3 financial instruments typically include, in addition to the unobservable or level 3 components, observable components (that is, components that are actively quoted and can be validated to external sources); accordingly, the gains and losses in the table below include changes in fair value due in part to observable factors that are part of the valuation methodology. Also, the Firm risk-manages the observable components of level 3 financial instruments using securities and derivative positions that are classified within level 1 or 2 of the fair value hierarchy; as these level 1 and level 2 risk management instruments are not included below, the gains or losses in the following tables do not reflect the effect of the Firm's risk management activities related to such level 3 instruments.

Year ended December 31, 2019 (in millions)	Fair value measurements using significant unobservable inputs: Fair value at January 1, 2019	Total realized/ unrealized gains/ (losses)	Purchases[f]	Sales	Settlements[g]	Transfers into level 3[h]	Transfers (out of) level 3[h]	Fair value at Dec. 31, 2019	Change in unrealized gains/(losses) related to financial instruments held at Dec. 31, 2019
Assets:[a]									
Trading assets:									
Debt instruments:									
Mortgage-backed securities:									
U.S. GSEs and government agencies	$ 549	$ (62)	$ 773	$ (310)	$ (134)	$ 1	$ (20)	$ 797	$ (58)
Residential – nonagency	64	25	83	(86)	(20)	15	(58)	23	2
Commercial – nonagency	11	2	20	(26)	(14)	15	(4)	4	1
Total mortgage-backed securities	624	(35)	876	(422)	(168)	31	(82)	824	(55)
U.S. Treasury, GSEs and government agencies	–	–	–	–	–	–	–	–	–
Obligations of U.S. states and municipalities	689	13	85	(159)	(8)	–	(610)	10	13
Non-U.S. government debt securities	155	1	290	(287)	–	14	(18)	155	4
Corporate debt securities	334	47	437	(247)	(52)	112	(73)	558	40
Loans	1,706	132	727	(708)	(562)	625	(538)	1,382	51
Asset-backed securities	127	–	37	(93)	(40)	28	(22)	37	(3)
Total debt instruments	3,635	158	2,452	(1,916)	(830)	810	(1,343)	2,966	50
Equity securities	232	(41)	58	(103)	(22)	181	(109)	196	(18)
Other	301	(36)	50	(26)	(54)	2	(5)	232	91
Total trading assets – debt and equity instruments	4,168	81 (c)	2,560	(2,045)	(906)	993	(1,457)	3,394	123 (c)
Net derivative receivables:[b]									
Interest rate	(38)	(394)	109	(125)	5	(7)	118	(332)	(599)
Credit	(107)	(36)	20	(9)	8	29	(44)	(139)	(127)
Foreign exchange	(297)	(551)	17	(67)	312	(22)	1	(607)	(380)
Equity	(2,225)	(310)	397	(573)	(503)	(405)	224	(3,395)	(1,608)
Commodity	(1,129)	497	36	(348)	89	(6)	845	(16)	130
Total net derivative receivables	(3,796)	(794) (c)	579	(1,122)	(89)	(411)	1,144	(4,489)	(2,584) (c)
Available-for-sale securities:									
Mortgage-backed securities	1	–	–	–	–	–	–	1	–
Asset-backed securities	–	–	–	–	–	–	–	–	–
Total available-for-sale securities	1	–	–	–	–	–	–	1	–
Loans	122	4 (c)	–	–	(125)	–	(1)	–	–
Mortgage servicing rights	6,130	(1,180) (d)	1,489	(789)	(951)	–	–	4,699	(1,180) (d)
Other assets	927	(198) (c)	194	(165)	(33)	6	(7)	724	(180) (c)

Year ended December 31, 2019 (in millions)	Fair value measurements using significant unobservable inputs: Fair value at January 1, 2019	Total realized/ unrealized (gains)/ losses	Purchases	Sales	Issuances	Settlements[g]	Transfers into level 3[h]	Transfers (out of) level 3[h]	Fair value at Dec. 31, 2019	Change in unrealized gains/(losses) related to financial instruments held at Dec. 31, 2019
Liabilities:[a]										
Deposits	$ 4,169	$ 278 (c)(e)	$ –	$ –	$ 916	$ (806)	$ 12	$ (1,209)	$ 3,360	$ 307 (c)(e)
Short-term borrowings	1,523	229 (c)(e)	–	–	3,441	(3,356)	85	(248)	1,674	155 (c)(e)
Trading liabilities – debt and equity instruments	50	2 (c)	(22)	41	–	1	16	(47)	41	3 (c)
Accounts payable and other liabilities	10	(2) (c)	(84)	115	–	–	6	–	45	29 (c)
Beneficial interests issued by consolidated VIEs	1	(1) (c)	–	–	–	–	–	–	–	–
Long-term debt	19,418	2,815 (c)(e)	–	–	10,441	(8,538)	651	(1,448)	23,339	2,822 (c)(e)

Year ended December 31, 2018 (in millions)	Fair value at January 1, 2018	Total realized/ unrealized gains/ (losses)	Purchases[f]	Sales	Settlements[g]	Transfers into level 3[h]	Transfers (out of) level 3[h]	Fair value at Dec. 31, 2018	Change in unrealized gains/(losses) related to financial instruments held at Dec. 31, 2018
	Fair value measurements using significant unobservable inputs								
Assets:[a]									
Trading assets:									
Debt instruments:									
Mortgage-backed securities:									
U.S. GSEs and government agencies	$ 307	$ (23)	$ 478	$ (164)	$ (73)	$ 94	$ (70)	$ 549	$ (21)
Residential – nonagency	60	(2)	78	(50)	(7)	59	(74)	64	1
Commercial – nonagency	11	2	18	(18)	(17)	36	(21)	11	(2)
Total mortgage-backed securities	378	(23)	574	(232)	(97)	189	(165)	624	(22)
U.S. Treasury, GSEs and government agencies	1	–	–	–	–	–	(1)	–	–
Obligations of U.S. states and municipalities	744	(17)	112	(70)	(80)	–	–	689	(17)
Non-U.S. government debt securities	78	(22)	459	(277)	(12)	23	(94)	155	(9)
Corporate debt securities	312	(18)	364	(309)	(48)	262	(229)	334	(1)
Loans	2,719	26	1,364	(1,793)	(658)	813	(765)	1,706	(1)
Asset-backed securities	153	28	98	(41)	(55)	45	(101)	127	22
Total debt instruments	4,385	(26)	2,971	(2,722)	(950)	1,332	(1,355)	3,635	(28)
Equity securities	295	(40)	118	(120)	(1)	107	(127)	232	9
Other	690	(285)	55	(40)	(118)	3	(4)	301	(301)
Total trading assets – debt and equity instruments	5,370	(351) [c]	3,144	(2,882)	(1,069)	1,442	(1,486)	4,168	(320) [c]
Net derivative receivables:[b]									
Interest rate	264	150	107	(133)	(430)	(15)	19	(38)	187
Credit	(35)	(40)	5	(7)	(57)	4	23	(107)	(28)
Foreign exchange	(396)	103	52	(20)	30	(108)	42	(297)	(63)
Equity	(3,409)	198	1,676	(2,208)	1,805	(617)	330	(2,225)	561
Commodity	(674)	(73)	1	(72)	(301)	7	(17)	(1,129)	146
Total net derivative receivables	(4,250)	338 [c]	1,841	(2,440)	1,047	(729)	397	(3,796)	803 [c]
Available-for-sale securities:									
Mortgage-backed securities	1	–	–	–	–	–	–	1	–
Asset-backed securities	276	1	–	–	(277)	–	–	–	–
Total available-for-sale securities	277	1 [i]	–	–	(277)	–	–	1	–
Loans	276	(7) [c]	123	–	(196)	–	(74)	122	(7) [c]
Mortgage servicing rights	6,030	230 [d]	1,246	(636)	(740)	–	–	6,130	230 [d]
Other assets	1,265	(328) [c]	61	(37)	(37)	4	(1)	927	(340) [c]

Year ended December 31, 2018 (in millions)	Fair value at January 1, 2018	Total realized/ unrealized (gains)/ losses	Purchases	Sales	Issuances	Settlements[g]	Transfers into level 3[h]	Transfers (out of) level 3[h]	Fair value at Dec. 31, 2018	Change in unrealized (gains)/losses related to financial instruments held at Dec. 31, 2018
	Fair value measurements using significant unobservable inputs									
Liabilities:[a]										
Deposits	$ 4,142	$ (136) [c][e]	$ –	$ –	$ 1,437	$ (736)	$ 2	$ (540)	$ 4,169	$ (204) [c][e]
Short-term borrowings	1,665	(329) [c][e]	–	–	3,455	(3,388)	272	(152)	1,523	(131) [c][e]
Trading liabilities – debt and equity instruments	39	19 [c]	(99)	114	–	(1)	14	(36)	50	16 [c]
Accounts payable and other liabilities	13	–	(12)	5	–	–	4	–	10	–
Beneficial interests issued by consolidated VIEs	39	–	–	1	–	(39)	–	–	1	–
Long-term debt	16,125	(1,169) [c][e]	–	–	11,919	(7,769)	1,143	(831)	19,418	(1,385) [c][e]

	Fair value measurements using significant unobservable inputs								
Year ended December 31, 2017 (in millions)	Fair value at January 1, 2017	Total realized/ unrealized gains/ (losses)	Purchases[f]	Sales	Settlements[g]	Transfers into level 3[h]	Transfers (out of) level 3[h]	Fair value at Dec. 31, 2017	Change in unrealized gains/(losses) related to financial instruments held at Dec. 31, 2017
Assets:[a]									
Trading assets:									
Debt instruments:									
Mortgage-backed securities:									
U.S. GSEs and government agencies	$ 392	$ (11)	$ 161	$ (171)	$ (70)	$ 49	$ (43)	$ 307	$ (20)
Residential – nonagency	83	19	53	(30)	(64)	132	(133)	60	11
Commercial – nonagency	17	9	27	(44)	(13)	64	(49)	11	1
Total mortgage-backed securities	492	17	241	(245)	(147)	245	(225)	378	(8)
U.S. Treasury, GSEs and government agencies	–	–	–	–	–	1	–	1	–
Obligations of U.S. states and municipalities	649	18	152	(70)	(5)	–	–	744	15
Non-U.S. government debt securities	46	–	559	(518)	–	62	(71)	78	–
Corporate debt securities	576	11	872	(612)	(497)	157	(195)	312	18
Loans	4,837	333	2,389	(2,832)	(1,323)	806	(1,491)	2,719	43
Asset-backed securities	302	32	354	(356)	(56)	75	(198)	153	–
Total debt instruments	6,902	411	4,567	(4,633)	(2,028)	1,346	(2,180)	4,385	68
Equity securities	231	39	176	(148)	(4)	59	(58)	295	21
Other	761	100	30	(46)	(162)	17	(10)	690	39
Total trading assets – debt and equity instruments	7,894	550 (c)	4,773	(4,827)	(2,194)	1,422	(2,248)	5,370	128 (c)
Net derivative receivables:[b]									
Interest rate	1,263	72	60	(82)	(1,040)	(8)	(1)	264	(473)
Credit	98	(164)	1	(6)	–	77	(41)	(35)	32
Foreign exchange	(1,384)	43	13	(10)	854	(61)	149	(396)	42
Equity	(2,252)	(417)	1,116	(551)	(245)	(1,482)	422	(3,409)	(161)
Commodity	(85)	(149)	–	–	(433)	(6)	(1)	(674)	(718)
Total net derivative receivables	(2,360)	(615) (c)	1,190	(649)	(864)	(1,480)	528	(4,250)	(1,278) (c)
Available-for-sale securities:									
Mortgage-backed securities	1	–	–	–	–	–	–	1	–
Asset-backed securities	663	15	–	(50)	(352)	–	–	276	14
Total available-for-sale securities	664	15 (i)	–	(50)	(352)	–	–	277	14 (i)
Loans	570	35 (c)	–	(26)	(303)	–	–	276	3 (c)
Mortgage servicing rights	6,096	(232) (d)	1,103	(140)	(797)	–	–	6,030	(232) (d)
Other assets	2,223	244 (c)	66	(177)	(870)	–	(221)	1,265	74 (c)

	Fair value measurements using significant unobservable inputs									
Year ended December 31, 2017 (in millions)	Fair value at January 1, 2017	Total realized/ unrealized (gains)/ losses	Purchases	Sales	Issuances	Settlements[g]	Transfers into level 3[h]	Transfers (out of) level 3[h]	Fair value at Dec. 31, 2017	Change in unrealized (gains)/losses related to financial instruments held at Dec. 31, 2017
Liabilities:[a]										
Deposits	$ 2,117	$ 152 (c)(e)	$ –	$ –	$ 3,027	$ (291)	$ 11	$ (874)	$ 4,142	$ 198 (c)(e)
Short-term borrowings	1,134	42 (c)(e)	–	–	3,289	(2,748)	150	(202)	1,665	7 (c)(e)
Trading liabilities – debt and equity instruments	43	(3) (c)	(46)	48	–	3	3	(9)	39	–
Accounts payable and other liabilities	13	(2) (c)	(1)	–	–	3	–	–	13	(2) (c)
Beneficial interests issued by consolidated VIEs	48	2 (c)	(122)	39	–	(6)	78	–	39	–
Long-term debt	12,850	1,067 (c)(e)	–	–	12,458	(10,985)	1,660	(925)	16,125	552 (c)(e)

(a) Level 3 assets as a percentage of total Firm assets accounted for at fair value (including assets measured at fair value on a nonrecurring basis) were 2%, 3% and 3% at December 31, 2019, 2018 and 2017, respectively. Level 3 liabilities as a percentage of total Firm liabilities accounted for at fair value (including liabilities measured at fair value on a nonrecurring basis) were 16%, 15% and 15% at December 31, 2019, 2018 and 2017, respectively.
(b) All level 3 derivatives are presented on a net basis, irrespective of underlying counterparty.
(c) Predominantly reported in principal transactions revenue, except for changes in fair value for CCB mortgage loans, and lending-related commitments originated with the intent to sell, and mortgage loan purchase commitments, which are reported in mortgage fees and related income.
(d) Changes in fair value for MSRs are reported in mortgage fees and related income.
(e) Realized (gains)/losses due to DVA for fair value option elected liabilities are reported in principal transactions revenue, and they were not material for the years ended December 31, 2019, 2018 and 2017, respectively. Unrealized (gains)/losses are reported in OCI, and they were $319 million, $(277) million and $(48) million for the years ended December 31, 2019, 2018 and 2017, respectively.
(f) Loan originations are included in purchases.
(g) Includes financial assets and liabilities that have matured, been partially or fully repaid, impacts of modifications, deconsolidation associated with beneficial interests in VIEs and other items.
(h) All transfers into and/or out of level 3 are based on changes in the observability and/or significance of the valuation inputs and are assumed to occur at the beginning of the quarterly reporting period in which they occur.
(i) Realized gains/(losses) on AFS securities, as well as other-than-temporary impairment ("OTTI") losses that are recorded in earnings, are reported in investment securities gains/(losses). Unrealized gains/(losses) are reported in OCI. There were no realized gains/(losses) and foreign exchange hedge accounting adjustments recorded in income on AFS securities for the years ended December 31, 2019 and 2017, respectively and $1 million recorded for the year ended December 31, 2018. There were no unrealized gains/(losses) recorded on AFS securities in OCI for the years ended December 31, 2019 and 2018, respectively and $15 million recorded for the year ended December 31, 2017.

Level 3 analysis

Consolidated balance sheets changes

Level 3 assets (including assets measured at fair value on a nonrecurring basis) were 0.6% of total Firm assets at December 31, 2019. The following describes significant changes to level 3 assets since December 31, 2018, for those items measured at fair value on a recurring basis. Refer to Assets and liabilities measured at fair value on a nonrecurring basis on page 172 for further information on changes impacting items measured at fair value on a nonrecurring basis.

For the year ended December 31, 2019

Level 3 assets were $13.5 billion at December 31, 2019, reflecting a decrease of $3.6 billion from December 31, 2018, partially due to a $1.4 billion decrease in MSRs. Refer to the Gains and losses section below for additional information.

Transfers between levels for instruments carried at fair value on a recurring basis

During the year ended December 31, 2019, significant transfers from level 2 into level 3 included the following:

- $993 million of total debt and equity instruments, the majority of which were trading loans, driven by a decrease in observability.
- $904 million of gross equity derivative payables as a result of a decrease in observability and an increase in the significance of unobservable inputs.

During the year ended December 31, 2019, significant transfers from level 3 into level 2 included the following:

- $1.5 billion of total debt and equity instruments, the majority of which were obligations of U.S. states and municipalities and trading loans, driven by an increase in observability.
- $1.1 billion of gross equity derivative receivables and $1.3 billion of gross equity derivative payables as a result of an increase in observability and a decrease in the significance of unobservable inputs.
- $962 million of gross commodities derivative payables as a result of an increase in observability.
- $1.2 billion of deposits as a result of an increase in observability and a decrease in the significance of unobservable inputs.
- $1.4 billion of long-term debt as a result of an increase in observability and a decrease in the significance of unobservable inputs.

During the year ended December 31, 2018, significant transfers from level 2 into level 3 included the following:

- $1.4 billion of total debt and equity instruments, the majority of which were trading loans, driven by a decrease in observability.
- $1.0 billion of gross equity derivative receivables and $1.6 billion of gross equity derivative payables as a result of a decrease in observability and an increase in the significance of unobservable inputs.
- $1.1 billion of long-term debt driven by a decrease in observability and an increase in the significance of unobservable inputs for certain structured notes.

During the year ended December 31, 2018, significant transfers from level 3 into level 2 included the following:

- $1.5 billion of total debt and equity instruments, the majority of which were trading loans, driven by an increase in observability.
- $1.2 billion of gross equity derivative receivables and $1.5 billion of gross equity derivative payables as a result of an increase in observability and a decrease in the significance of unobservable inputs.

During the year ended December 31, 2017, significant transfers from level 2 into level 3 included the following:

- $1.0 billion of gross equity derivative receivables and $2.5 billion of gross equity derivative payables as a result of a decrease in observability and an increase in the significance of unobservable inputs.
- $1.7 billion of long-term debt driven by a decrease in observability and an increase in the significance of unobservable inputs for certain structured notes.

During the year ended December 31, 2017, significant transfers from level 3 into level 2 included the following:

- $1.5 billion of trading loans driven by an increase in observability.
- $1.2 billion of gross equity derivative payables as a result of an increase in observability and a decrease in the significance of unobservable inputs.

All transfers are based on changes in the observability and/or significance of the valuation inputs and are assumed to occur at the beginning of the quarterly reporting period in which they occur.

Gains and losses
The following describes significant components of total realized/unrealized gains/(losses) for instruments measured at fair value on a recurring basis for the years ended December 31, 2019, 2018 and 2017. These amounts exclude any effects of the Firm's risk management activities where the financial instruments are classified as level 1 and 2 of the fair value hierarchy. Refer to Changes in level 3 recurring fair value measurements rollforward tables on pages 165–169 for further information on these instruments.

2019

- $2.1 billion of net losses on assets largely due to MSRs reflecting faster prepayment speeds on lower rates. Refer to Note 15 for additional information on MSRs.
- $3.3 billion of net losses on liabilities predominantly driven by market movements in long-term debt.

2018

- $1.6 billion of net gains on liabilities largely driven by market movements in long-term debt.

2017

- $1.3 billion of net losses on liabilities predominantly driven by market movements in long-term debt.

Credit and funding adjustments – derivatives

Derivatives are generally valued using models that use as their basis observable market parameters. These market parameters generally do not consider factors such as counterparty nonperformance risk, the Firm's own credit quality, and funding costs. Therefore, it is generally necessary to make adjustments to the base estimate of fair value to reflect these factors.

CVA represents the adjustment, relative to the relevant benchmark interest rate, necessary to reflect counterparty nonperformance risk. The Firm estimates CVA using a scenario analysis to estimate the expected positive credit exposure across all of the Firm's existing positions with each counterparty, and then estimates losses based on the probability of default and estimated recovery rate as a result of a counterparty credit event considering contractual factors designed to mitigate the Firm's credit exposure, such as collateral and legal rights of offset. The key inputs to this methodology are (i) the probability of a default event occurring for each counterparty, as derived from observed or estimated CDS spreads; and (ii) estimated recovery rates implied by CDS spreads, adjusted to consider the differences in recovery rates as a derivative creditor relative to those reflected in CDS spreads, which generally reflect senior unsecured creditor risk.

FVA represents the adjustment to reflect the impact of funding and is recognized where there is evidence that a market participant in the principal market would incorporate it in a transfer of the instrument. The Firm's FVA framework, applied to uncollateralized (including partially collateralized) over-the-counter ("OTC") derivatives incorporates key inputs such as: (i) the expected funding requirements arising from the Firm's positions with each counterparty and collateral arrangements; and (ii) the estimated market funding cost in the principal market which, for derivative liabilities, considers the Firm's credit risk (DVA). For collateralized derivatives, the fair value is estimated by discounting expected future cash flows at the relevant overnight indexed swap rate given the underlying collateral agreement with the counterparty, and therefore a separate FVA is not necessary.

The following table provides the impact of credit and funding adjustments on principal transactions revenue in the respective periods, excluding the effect of any associated hedging activities. The FVA presented below includes the impact of the Firm's own credit quality on the inception value of liabilities as well as the impact of changes in the Firm's own credit quality over time.

Year ended December 31, (in millions)	**2019**	2018	2017
Credit and funding adjustments:			
Derivatives CVA	**$ 241**	$ 193	$ 802
Derivatives FVA	**199**	(74)	(295)

Valuation adjustments on fair value option elected liabilities

The valuation of the Firm's liabilities for which the fair value option has been elected requires consideration of the Firm's own credit risk. DVA on fair value option elected liabilities reflects changes (subsequent to the issuance of the liability) in the Firm's probability of default and LGD, which are estimated based on changes in the Firm's credit spread observed in the bond market. Realized (gains)/losses due to DVA for fair value option elected liabilities are reported in principal transactions revenue. Unrealized (gains)/losses are reported in OCI. Refer to page 169 in this Note and Note 24 for further information.

Assets and liabilities measured at fair value on a nonrecurring basis

The following tables present the assets held as of December 31, 2019 and 2018, respectively, for which a nonrecurring fair value adjustment was recorded during the years ended December 31, 2019 and 2018, respectively, by major product category and fair value hierarchy.

	Fair value hierarchy			
December 31, 2019 (in millions)	Level 1	Level 2	Level 3	Total fair value
Loans	**$ –**	**$ 3,462** (b)	**$ 269** (c)	**$ 3,731**
Other assets(a)	**–**	**14**	**1,029**	**1,043**
Total assets measured at fair value on a nonrecurring basis	**$ –**	**$ 3,476**	**$ 1,298**	**$ 4,774**

	Fair value hierarchy			
December 31, 2018 (in millions)	Level 1	Level 2	Level 3	Total fair value
Loans	$ –	$ 273	$ 264	$ 537
Other assets	–	8	815	823
Total assets measured at fair value on a nonrecurring basis	$ –	$ 281	$ 1,079	$ 1,360

(a) Primarily includes equity securities without readily determinable fair values that were adjusted based on observable price changes in orderly transactions from an identical or similar investment of the same issuer (measurement alternative). Of the $1.0 billion in level 3 assets measured at fair value on a nonrecurring basis as of December 31, 2019, $787 million related to such equity securities. These equity securities are classified as level 3 due to the infrequency of the observable prices and/or the restrictions on the shares.

(b) Primarily includes certain mortgage loans that were reclassified to held-for-sale.

(c) Of the $269 million in level 3 assets measured at fair value on a nonrecurring basis as of December 31, 2019, $248 million related to residential real estate loans carried at the net realizable value of the underlying collateral (e.g., collateral-dependent loans and other loans charged off in accordance with regulatory guidance). These amounts are classified as level 3 as they are valued using information from broker's price opinions, appraisals and automated valuation models and discounted based upon the Firm's experience with actual liquidation values. These discounts ranged from 14% to 49% with a weighted average of 28%.

There were no liabilities measured at fair value on a nonrecurring basis at December 31, 2019 and 2018.

Nonrecurring fair value changes

The following table presents the total change in value of assets and liabilities for which a fair value adjustment has been recognized for the years ended December 31, 2019, 2018 and 2017, related to assets and liabilities held at those dates.

December 31, (in millions)	**2019**	2018	2017
Loans	**$ (274)** (a)	$ (68)	$ (159)
Other assets	**168** (b)	132 (b)	(148)
Accounts payable and other liabilities	**–**	–	(1)
Total nonrecurring fair value gains/(losses)	**$ (106)**	$ 64	$ (308)

(a) Primarily includes the impact of certain mortgage loans that were reclassified to held-for-sale.

(b) Included $187 million and $149 million for the years ended December 31, 2019 and 2018, respectively, of net gains as a result of the measurement alternative.

Refer to Note 12 for further information about the measurement of impaired collateral-dependent loans, and other loans where the carrying value is based on the fair value of the underlying collateral (e.g., residential mortgage loans charged off in accordance with regulatory guidance).

Equity securities without readily determinable fair values

The Firm measures certain equity securities without readily determinable fair values at cost less impairment (if any), plus or minus observable price changes from an identical or similar investment of the same issuer, with such changes recognized in other income.

In its determination of the new carrying values upon observable price changes, the Firm may adjust the prices if deemed necessary to arrive at the Firm's estimated fair values. Such adjustments may include adjustments to reflect the different rights and obligations of similar securities, and other adjustments that are consistent with the Firm's valuation techniques for private equity direct investments.

The following table presents the carrying value of equity securities without readily determinable fair values held as of December 31, 2019 and 2018, that are measured under the measurement alternative and the related adjustments recorded during the periods presented for those securities with observable price changes. These securities are included in the nonrecurring fair value tables when applicable price changes are observable.

As of or for the year ended December 31, (in millions)	2019	2018
Other assets		
Carrying value	**$ 2,441**	$ 1,510
Upward carrying value changes[(a)]	**229**	309
Downward carrying value changes/impairment[(b)]	**(42)**	(160)

(a) The cumulative upward carrying value changes between January 1, 2018 and December 31, 2019 were $528 million.
(b) The cumulative downward carrying value changes/impairment between January 1, 2018 and December 31, 2019 were $(200) million.

Included in other assets above is the Firm's interest in approximately 40 million Visa Class B shares, recorded at a nominal carrying value. These shares are subject to certain transfer restrictions currently and will be convertible into Visa Class A shares upon final resolution of certain litigation matters involving Visa. The conversion rate of Visa Class B shares into Visa Class A shares is 1.6228 at December 31, 2019, and may be adjusted by Visa depending on developments related to the litigation matters.

Additional disclosures about the fair value of financial instruments that are not carried on the Consolidated balance sheets at fair value

U.S. GAAP requires disclosure of the estimated fair value of certain financial instruments, which are included in the following table. However, this table does not include other items, such as nonfinancial assets, intangible assets, certain financial instruments, and customer relationships. In the opinion of management, these items, in the aggregate, add significant value to JPMorgan Chase, but their fair value is not disclosed in this table.

Financial instruments for which carrying value approximates fair value

Certain financial instruments that are not carried at fair value on the Consolidated balance sheets are carried at amounts that approximate fair value, due to their short-term nature and generally negligible credit risk. These instruments include cash and due from banks, deposits with banks, federal funds sold, securities purchased under resale agreements and securities borrowed, short-term receivables and accrued interest receivable, short-term borrowings, federal funds purchased, securities loaned and sold under repurchase agreements, accounts payable, and accrued liabilities. In addition, U.S. GAAP requires that the fair value of deposit liabilities with no stated maturity (i.e., demand, savings and certain money market deposits) be equal to their carrying value; recognition of the inherent funding value of these instruments is not permitted.

The following table presents by fair value hierarchy classification the carrying values and estimated fair values at December 31, 2019 and 2018, of financial assets and liabilities, excluding financial instruments that are carried at fair value on a recurring basis, and their classification within the fair value hierarchy.

	December 31, 2019					December 31, 2018				
		Estimated fair value hierarchy					Estimated fair value hierarchy			
(in billions)	Carrying value	Level 1	Level 2	Level 3	Total estimated fair value	Carrying value	Level 1	Level 2	Level 3	Total estimated fair value
Financial assets										
Cash and due from banks	**$ 21.7**	**$ 21.7**	**$ –**	**$ –**	**$ 21.7**	$ 22.3	$ 22.3	$ –	$ –	$ 22.3
Deposits with banks	**241.9**	**241.9**	**–**	**–**	**241.9**	256.5	256.5	–	–	256.5
Accrued interest and accounts receivable	**71.3**	**–**	**71.2**	**0.1**	**71.3**	72.0	–	71.9	0.1	72.0
Federal funds sold and securities purchased under resale agreements	**234.6**	**–**	**234.6**	**–**	**234.6**	308.4	–	308.4	–	308.4
Securities borrowed	**133.5**	**–**	**133.5**	**–**	**133.5**	106.9	–	106.9	–	106.9
Investment securities, held-to-maturity	**47.5**	**0.1**	**48.8**	**–**	**48.9**	31.4	–	31.5	–	31.5
Loans, net of allowance for loan losses[(a)]	**939.5**	**–**	**214.1**	**734.9**	**949.0**	968.0	–	241.5	728.5	970.0
Other	**61.3**	**–**	**60.6**	**0.8**	**61.4**	60.5	–	59.6	1.0	60.6
Financial liabilities										
Deposits	**$ 1,533.8**	**$ –**	**$ 1,534.1**	**$ –**	**$ 1,534.1**	$ 1,447.4	$ –	$ 1,447.5	$ –	$ 1,447.5
Federal funds purchased and securities loaned or sold under repurchase agreements	**183.1**	**–**	**183.1**	**–**	**183.1**	181.4	–	181.4	–	181.4
Short-term borrowings	**35.0**	**–**	**35.0**	**–**	**35.0**	62.1	–	62.1	–	62.1
Accounts payable and other liabilities	**164.0**	**0.1**	**160.0**	**3.5**	**163.6**	160.6	0.2	157.0	3.0	160.2
Beneficial interests issued by consolidated VIEs	**17.8**	**–**	**17.9**	**–**	**17.9**	20.2	–	20.2	–	20.2
Long-term debt and junior subordinated deferrable interest debentures	**215.5**	**–**	**218.3**	**3.5**	**221.8**	227.1	–	224.6	3.3	227.9

(a) Fair value is typically estimated using a discounted cash flow model that incorporates the characteristics of the underlying loans (including principal, contractual interest rate and contractual fees) and other key inputs, including expected lifetime credit losses, interest rates, prepayment rates, and primary origination or secondary market spreads. For certain loans, the fair value is measured based on the value of the underlying collateral. The difference between the estimated fair value and carrying value of a financial asset or liability is the result of the different methodologies used to determine fair value as compared with carrying value. For example, credit losses are estimated for a financial asset's remaining life in a fair value calculation but are estimated for a loss emergence period in the allowance for loan losses calculation; future loan income (interest and fees) is incorporated in a fair value calculation but is generally not considered in the allowance for loan losses.

The majority of the Firm's lending-related commitments are not carried at fair value on a recurring basis on the Consolidated balance sheets. The carrying value of the wholesale allowance for lending-related commitments and the estimated fair value of these wholesale lending-related commitments were as follows for the periods indicated.

	December 31, 2019					December 31, 2018				
		Estimated fair value hierarchy					Estimated fair value hierarchy			
(in billions)	Carrying value[(a)]	Level 1	Level 2	Level 3	Total estimated fair value	Carrying value[(a)]	Level 1	Level 2	Level 3	Total estimated fair value[(b)]
Wholesale lending-related commitments	**$ 1.2**	**$ –**	**$ –**	**$ 1.9**	**$ 1.9**	$ 1.0	$ –	$ –	$ 2.2	$ 2.2

(a) Excludes the current carrying values of the guarantee liability and the offsetting asset, each of which is recognized at fair value at the inception of the guarantees.
(b) The prior period amounts have been revised to conform with the current period presentation.

The Firm does not estimate the fair value of consumer lending-related commitments. In many cases, the Firm can reduce or cancel these commitments by providing the borrower notice or, in some cases as permitted by law, without notice. Refer to page 156 of this Note for a further discussion of the valuation of lending-related commitments.

Note 3 – Fair value option

The fair value option provides an option to elect fair value as an alternative measurement for selected financial assets, financial liabilities, unrecognized firm commitments, and written loan commitments.

The Firm has elected to measure certain instruments at fair value for several reasons including to mitigate income statement volatility caused by the differences between the measurement basis of elected instruments (e.g., certain instruments that otherwise would be accounted for on an accrual basis) and the associated risk management arrangements that are accounted for on a fair value basis, as well as to better reflect those instruments that are managed on a fair value basis.

The Firm's election of fair value includes the following instruments:

- Loans purchased or originated as part of securitization warehousing activity, subject to bifurcation accounting, or managed on a fair value basis, including lending-related commitments
- Certain securities financing agreements, such as those with an embedded derivative and/or a maturity of greater than one year
- Owned beneficial interests in securitized financial assets that contain embedded credit derivatives, which would otherwise be required to be separately accounted for as a derivative instrument
- Structured notes, which are predominantly financial instruments that contain embedded derivatives, that are issued as part of client-driven activities
- Certain long-term beneficial interests issued by CIB's consolidated securitization trusts where the underlying assets are carried at fair value

Changes in fair value under the fair value option election

The following table presents the changes in fair value included in the Consolidated statements of income for the years ended December 31, 2019, 2018 and 2017, for items for which the fair value option was elected. The profit and loss information presented below only includes the financial instruments that were elected to be measured at fair value; related risk management instruments, which are required to be measured at fair value, are not included in the table.

	2019			2018			2017		
December 31, (in millions)	Principal transactions	All other income	Total changes in fair value recorded[e]	Principal transactions	All other income	Total changes in fair value recorded[e]	Principal transactions	All other income	Total changes in fair value recorded[e]
Federal funds sold and securities purchased under resale agreements	**$ (36)**	**$ –**	**$ (36)**	$ (35)	$ –	$ (35)	$ (97)	$ –	$ (97)
Securities borrowed	**133**	**–**	**133**	22	–	22	50	–	50
Trading assets:									
Debt and equity instruments, excluding loans	**2,482**	**(1)** [c]	**2,481**	(1,680)	1 [c]	(1,679)	1,943	2 [c]	1,945
Loans reported as trading assets:									
Changes in instrument-specific credit risk	**763**	**2** [c]	**765**	414	1 [c]	415	330	14 [c]	344
Other changes in fair value	**254**	**1,224** [c]	**1,478**	160	185 [c]	345	217	747 [c]	964
Loans:									
Changes in instrument-specific credit risk	**(26)**	**–**	**(26)**	(1)	–	(1)	(1)	–	(1)
Other changes in fair value	**1**	**–**	**1**	(1)	–	(1)	(12)	3 [c]	(9)
Other assets	**5**	**6** [d]	**11**	5	(45) [d]	(40)	11	(55) [d]	(44)
Deposits[a]	**(1,730)**	**–**	**(1,730)**	181	–	181	(533)	–	(533)
Federal funds purchased and securities loaned or sold under repurchase agreements	**(8)**	**–**	**(8)**	11	–	11	11	–	11
Short-term borrowings[a]	**(693)**	**–**	**(693)**	862	–	862	(747)	–	(747)
Trading liabilities	**6**	**–**	**6**	1	–	1	(1)	–	(1)
Other liabilities	**(16)**	**–**	**(16)**	–	–	–	–	–	–
Long-term debt[a][b]	**(6,173)**	**1** [c]	**(6,172)**	2,695	–	2,695	(2,022)	–	(2,022)

(a) Unrealized gains/(losses) due to instrument-specific credit risk (DVA) for liabilities for which the fair value option has been elected is recorded in OCI, while realized gains/(losses) are recorded in principal transactions revenue. Realized gains/(losses) due to instrument-specific credit risk recorded in principal transactions revenue were not material for the years ended December 31, 2019, 2018 and 2017.
(b) Long-term debt measured at fair value predominantly relates to structured notes. Although the risk associated with the structured notes is actively managed, the gains/(losses) reported in this table do not include the income statement impact of the risk management instruments used to manage such risk.
(c) Reported in mortgage fees and related income.
(d) Reported in other income.
(e) Changes in fair value exclude contractual interest, which is included in interest income and interest expense for all instruments other than hybrid financial instruments. Refer to Note 7 for further information regarding interest income and interest expense.

Determination of instrument-specific credit risk for items for which a fair value election was made

The following describes how the gains and losses that are attributable to changes in instrument-specific credit risk, were determined.

- Loans and lending-related commitments: For floating-rate instruments, all changes in value are attributed to instrument-specific credit risk. For fixed-rate instruments, an allocation of the changes in value for the period is made between those changes in value that are interest rate-related and changes in value that are credit-related. Allocations are generally based on an analysis of borrower-specific credit spread and recovery information, where available, or benchmarking to similar entities or industries.
- Long-term debt: Changes in value attributable to instrument-specific credit risk were derived principally from observable changes in the Firm's credit spread as observed in the bond market.
- Securities financing agreements: Generally, for these types of agreements, there is a requirement that collateral be maintained with a market value equal to or in excess of the principal amount loaned; as a result, there would be no adjustment or an immaterial adjustment for instrument-specific credit risk related to these agreements.

Difference between aggregate fair value and aggregate remaining contractual principal balance outstanding

The following table reflects the difference between the aggregate fair value and the aggregate remaining contractual principal balance outstanding as of December 31, 2019 and 2018, for loans, long-term debt and long-term beneficial interests for which the fair value option has been elected.

	2019			2018		
December 31, (in millions)	Contractual principal outstanding	Fair value	Fair value over/ (under) contractual principal outstanding	Contractual principal outstanding	Fair value	Fair value over/ (under) contractual principal outstanding
Loans[a]						
Nonaccrual loans						
Loans reported as trading assets	**$ 3,717**	**$ 1,111**	**$ (2,606)**	$ 4,240	$ 1,350	$ (2,890)
Loans	**178**	**139**	**(39)**	39	–	(39)
Subtotal	**3,895**	**1,250**	**(2,645)**	4,279	1,350	(2,929)
All other performing loans						
Loans reported as trading assets	**48,570**	**47,318**	**(1,252)**	42,215	40,403	(1,812)
Loans	**7,046**	**6,965**	**(81)**	3,186	3,151	(35)
Total loans	**$ 59,511**	**$ 55,533**	**$ (3,978)**	$ 49,680	$ 44,904	$ (4,776)
Long-term debt						
Principal-protected debt	**$ 40,124** (c)	**$ 39,246**	**$ (878)**	$ 32,674 (c)	$ 28,718	$ (3,956)
Nonprincipal-protected debt[b]	**NA**	**36,499**	**NA**	NA	26,168	NA
Total long-term debt	**NA**	**$ 75,745**	**NA**	NA	$ 54,886	NA
Long-term beneficial interests						
Nonprincipal-protected debt[b]	**NA**	**$ 36**	**NA**	NA	$ 28	NA
Total long-term beneficial interests	**NA**	**$ 36**	**NA**	NA	$ 28	NA

(a) There were no performing loans that were ninety days or more past due as of December 31, 2019 and 2018.
(b) Remaining contractual principal is not applicable to nonprincipal-protected structured notes and long-term beneficial interests. Unlike principal-protected structured notes and long-term beneficial interests, for which the Firm is obligated to return a stated amount of principal at maturity, nonprincipal-protected structured notes and long-term beneficial interests do not obligate the Firm to return a stated amount of principal at maturity, but for structured notes to return an amount based on the performance of an underlying variable or derivative feature embedded in the note. However, investors are exposed to the credit risk of the Firm as issuer for both nonprincipal-protected and principal-protected notes.
(c) Where the Firm issues principal-protected zero-coupon or discount notes, the balance reflects the contractual principal payment at maturity or, if applicable, the contractual principal payment at the Firm's next call date.

At December 31, 2019 and 2018, the contractual amount of lending-related commitments for which the fair value option was elected was $4.6 billion and $6.9 billion, respectively, with a corresponding fair value of $(94) million and $(92) million, respectively. Refer to Note 28 for further information regarding off-balance sheet lending-related financial instruments.

Structured note products by balance sheet classification and risk component

The following table presents the fair value of structured notes, by balance sheet classification and the primary risk type.

	December 31, 2019				December 31, 2018			
(in millions)	Long-term debt	Short-term borrowings	Deposits	Total	Long-term debt	Short-term borrowings	Deposits	Total
Risk exposure								
Interest rate	**$ 35,470**	**$ 34**	**$ 16,692**	**$ 52,196**	$ 24,137	$ 62	$ 12,372	$ 36,571
Credit	**5,715**	**875**	**–**	**6,590**	4,009	995	–	5,004
Foreign exchange	**3,862**	**48**	**5**	**3,915**	3,169	157	38	3,364
Equity	**29,294**	**4,852**	**8,177**	**42,323**	21,382	5,422	7,368	34,172
Commodity	**472**	**32**	**1,454**	**1,958**	372	34	1,207	1,613
Total structured notes	**$ 74,813**	**$ 5,841**	**$ 26,328**	**$ 106,982**	$ 53,069	$ 6,670	$ 20,985	$ 80,724

Note 4 – Credit risk concentrations

Concentrations of credit risk arise when a number of clients, counterparties or customers are engaged in similar business activities or activities in the same geographic region, or when they have similar economic features that would cause their ability to meet contractual obligations to be similarly affected by changes in economic conditions.

JPMorgan Chase regularly monitors various segments of its credit portfolios to assess potential credit risk concentrations and to obtain additional collateral when deemed necessary and permitted under the Firm's agreements. Senior management is significantly involved in the credit approval and review process, and risk levels are adjusted as needed to reflect the Firm's risk appetite.

In the Firm's consumer portfolio, concentrations are managed primarily by product and by U.S. geographic region, with a key focus on trends and concentrations at the portfolio level, where potential credit risk concentrations can be remedied through changes in underwriting policies and portfolio guidelines. Refer to Note 12 for additional information on the geographic composition of the Firm's consumer loan portfolios. In the wholesale portfolio, credit risk concentrations are evaluated primarily by industry and monitored regularly on both an aggregate portfolio level and on an individual client or counterparty basis.

The Firm's wholesale exposure is managed through loan syndications and participations, loan sales, securitizations, credit derivatives, master netting agreements, collateral and other risk-reduction techniques. Refer to Note 12 for additional information on loans.

The Firm does not believe that its exposure to any particular loan product or industry segment (e.g., real estate), or its exposure to residential real estate loans with high LTV ratios, results in a significant concentration of credit risk.

Terms of loan products and collateral coverage are included in the Firm's assessment when extending credit and establishing its allowance for loan losses.

The table below presents both on-balance sheet and off-balance sheet consumer and wholesale-related credit exposure by the Firm's three credit portfolio segments as of December 31, 2019 and 2018.

	2019				2018			
		On-balance sheet				On-balance sheet		
December 31, (in millions)	Credit exposure[g]	Loans	Derivatives	Off-balance sheet[h]	Credit exposure[g]	Loans	Derivatives	Off-balance sheet[h]
Consumer, excluding credit card	**$ 386,452**	**$ 335,040**	**$ –**	**$ 51,412**	$ 419,798	$ 373,732	$ –	$ 46,066
Receivables from customers	**–**	**–**	**–**	**–**	154	–	–	–
Total Consumer, excluding credit card	**386,452**	**335,040**	**–**	**51,412**	419,952	373,732	–	46,066
Credit card	**819,644**	**168,924**	**–**	**650,720**	762,011	156,632	–	605,379
Total consumer-related	**1,206,096**	**503,964**	**–**	**702,132**	1,181,963	530,364	–	651,445
Wholesale-related[a]								
Real Estate	**149,267**	**116,244**	**619**	**32,404**	143,316	115,737	164	27,415
Individuals and Individual Entities[b]	**102,292**	**91,980**	**694**	**9,618**	97,077	86,586	1,017	9,474
Consumer & Retail	**99,331**	**30,879**	**1,424**	**67,028**	94,815	36,921	1,093	56,801
Technology, Media & Telecommunications	**59,021**	**14,680**	**2,766**	**41,575**	72,646	16,980	2,667	52,999
Industrials	**58,250**	**19,096**	**878**	**38,276**	58,528	19,126	958	38,444
Asset Managers	**51,775**	**23,939**	**7,160**	**20,676**	42,807	16,806	9,033	16,968
Banks & Finance Cos	**50,091**	**30,639**	**5,165**	**14,287**	49,920	28,825	5,903	15,192
Healthcare	**46,638**	**13,951**	**2,078**	**30,609**	48,142	16,347	1,874	29,921
Oil & Gas	**41,570**	**13,064**	**852**	**27,654**	42,600	13,008	559	29,033
Utilities	**34,753**	**5,085**	**2,573**	**27,095**	28,172	5,591	1,740	20,841
State & Municipal Govt[c]	**26,697**	**9,924**	**2,000**	**14,773**	27,351	10,319	2,000	15,032
Automotive	**17,317**	**5,408**	**368**	**11,541**	17,339	5,170	399	11,770
Chemicals & Plastics	**17,276**	**4,710**	**459**	**12,107**	16,035	4,902	181	10,952
Metals & Mining	**15,337**	**5,202**	**402**	**9,733**	15,359	5,370	488	9,501
Central Govt	**14,843**	**2,818**	**10,477**	**1,548**	18,456	3,867	12,869	1,720
Transportation	**13,917**	**4,804**	**715**	**8,398**	15,660	6,391	1,102	8,167
Insurance	**12,202**	**1,269**	**2,282**	**8,651**	12,639	1,356	2,569	8,714
Securities Firms	**7,335**	**752**	**4,507**	**2,076**	4,558	645	2,029	1,884
Financial Markets Infrastructure	**4,116**	**9**	**2,482**	**1,625**	7,484	18	5,941	1,525
All other[d]	**76,492**	**50,186**	**1,865**	**24,441**	68,284	45,197	1,627	21,460
Subtotal	**898,520**	**444,639**	**49,766**	**404,115**	881,188	439,162	54,213	387,813
Loans held-for-sale and loans at fair value	**11,166**	**11,166**	**–**	**–**	15,028	15,028	–	–
Receivables from customers and other[e]	**33,706**	**–**	**–**	**–**	30,063	–	–	–
Total wholesale-related	**943,392**	**455,805**	**49,766**	**404,115**	926,279	454,190	54,213	387,813
Total exposure[f][g]	**$2,149,488**	**$ 959,769**	**$ 49,766**	**$1,106,247**	$2,108,242	$ 984,554	$ 54,213	$1,039,258

(a) The industry rankings presented in the table as of December 31, 2018, are based on the industry rankings of the corresponding exposures at December 31, 2019, not actual rankings of such exposures at December 31, 2018.
(b) Individuals and Individual Entities predominantly consists of Wealth Management clients within AWM and includes exposure to personal investment companies and personal and testamentary trusts.
(c) In addition to the credit risk exposure to states and municipal governments (both U.S. and non-U.S.) at December 31, 2019 and 2018, noted above, the Firm held: $6.5 billion and $7.8 billion, respectively, of trading assets; $29.8 billion and $37.7 billion, respectively, of AFS securities; and $4.8 billion at both periods of held-to-maturity ("HTM") securities, issued by U.S. state and municipal governments. Refer to Note 2 and Note 10 for further information.
(d) All other includes: SPEs and Private education and civic organizations, representing approximately 92% and 8%, respectively, at both December 31, 2019 and 2018. Refer to Note 14 for more information on exposures to SPEs.
(e) Receivables from customers primarily represent held-for-investment margin loans to brokerage clients in CIB and AWM that are collateralized by assets maintained in the clients' brokerage accounts (e.g., cash on deposit, liquid and readily marketable debt or equity securities), as such no allowance is held against these receivables. To manage its credit risk the Firm establishes margin requirements and monitors the required margin levels on an ongoing basis, and requires clients to deposit additional cash or other collateral, or to reduce positions, when appropriate. These receivables are reported within accrued interest and accounts receivable on the Firm's Consolidated balance sheets.
(f) Excludes cash placed with banks of $254.0 billion and $268.1 billion, at December 31, 2019 and 2018, respectively, which is predominantly placed with various central banks, primarily Federal Reserve Banks.
(g) Credit exposure is net of risk participations and excludes the benefit of credit derivatives used in credit portfolio management activities held against derivative receivables or loans and liquid securities and other cash collateral held against derivative receivables.
(h) Represents lending-related financial instruments.

Note 5 – Derivative instruments

Derivative contracts derive their value from underlying asset prices, indices, reference rates, other inputs or a combination of these factors and may expose counterparties to risks and rewards of an underlying asset or liability without having to initially invest in, own or exchange the asset or liability. JPMorgan Chase makes markets in derivatives for clients and also uses derivatives to hedge or manage its own risk exposures. Predominantly all of the Firm's derivatives are entered into for market-making or risk management purposes.

Market-making derivatives

The majority of the Firm's derivatives are entered into for market-making purposes. Clients use derivatives to mitigate or modify interest rate, credit, foreign exchange, equity and commodity risks. The Firm actively manages the risks from its exposure to these derivatives by entering into other derivative contracts or by purchasing or selling other financial instruments that partially or fully offset the exposure from client derivatives.

Risk management derivatives

The Firm manages certain market and credit risk exposures using derivative instruments, including derivatives in hedge accounting relationships and other derivatives that are used to manage risks associated with specified assets and liabilities.

The Firm generally uses interest rate derivatives to manage the risk associated with changes in interest rates. Fixed-rate assets and liabilities appreciate or depreciate in market value as interest rates change. Similarly, interest income and expense increase or decrease as a result of variable-rate assets and liabilities resetting to current market rates, and as a result of the repayment and subsequent origination or issuance of fixed-rate assets and liabilities at current market rates. Gains and losses on the derivative instruments related to these assets and liabilities are expected to substantially offset this variability.

Foreign currency derivatives are used to manage the foreign exchange risk associated with certain foreign currency–denominated (i.e., non-U.S. dollar) assets and liabilities and forecasted transactions, as well as the Firm's net investments in certain non-U.S. subsidiaries or branches whose functional currencies are not the U.S. dollar. As a result of fluctuations in foreign currencies, the U.S. dollar-equivalent values of the foreign currency–denominated assets and liabilities or the forecasted revenues or expenses increase or decrease. Gains or losses on the derivative instruments related to these foreign currency–denominated assets or liabilities, or forecasted transactions, are expected to substantially offset this variability.

Commodities derivatives are used to manage the price risk of certain commodities inventories. Gains or losses on these derivative instruments are expected to substantially offset the depreciation or appreciation of the related inventory.

Credit derivatives are used to manage the counterparty credit risk associated with loans and lending-related commitments. Credit derivatives compensate the purchaser when the entity referenced in the contract experiences a credit event, such as bankruptcy or a failure to pay an obligation when due. Credit derivatives primarily consist of CDS. Refer to the discussion in the Credit derivatives section on pages 191–194 of this Note for a further discussion of credit derivatives.

Refer to the risk management derivatives gains and losses table on page 191 of this Note, and the hedge accounting gains and losses tables on pages 188–191 of this Note for more information about risk management derivatives.

Derivative counterparties and settlement types

The Firm enters into OTC derivatives, which are negotiated and settled bilaterally with the derivative counterparty. The Firm also enters into, as principal, certain ETD such as futures and options, and OTC-cleared derivative contracts with CCPs. ETD contracts are generally standardized contracts traded on an exchange and cleared by the CCP, which is the Firm's counterparty from the inception of the transactions. OTC-cleared derivatives are traded on a bilateral basis and then novated to the CCP for clearing.

Derivative clearing services

The Firm provides clearing services for clients in which the Firm acts as a clearing member at certain derivative exchanges and clearing houses. The Firm does not reflect the clients' derivative contracts in its Consolidated Financial Statements. Refer to Note 28 for further information on the Firm's clearing services.

Accounting for derivatives

All free-standing derivatives that the Firm executes for its own account are required to be recorded on the Consolidated balance sheets at fair value.

As permitted under U.S. GAAP, the Firm nets derivative assets and liabilities, and the related cash collateral receivables and payables, when a legally enforceable master netting agreement exists between the Firm and the derivative counterparty. Refer to Note 1 for further discussion of the offsetting of assets and liabilities. The accounting for changes in value of a derivative depends on whether or not the transaction has been designated and qualifies for hedge accounting. Derivatives that are not designated as hedges are reported and measured at fair value through earnings. The tabular disclosures on pages 184–191 of this Note provide additional information on the amount of, and reporting for, derivative assets, liabilities, gains and losses. Refer to Notes 2 and 3 for further discussion of derivatives embedded in structured notes.

Derivatives designated as hedges
The Firm applies hedge accounting to certain derivatives executed for risk management purposes – generally interest rate, foreign exchange and commodity derivatives. However, JPMorgan Chase does not seek to apply hedge accounting to all of the derivatives involved in the Firm's risk management activities. For example, the Firm does not apply hedge accounting to purchased CDS used to manage the credit risk of loans and lending-related commitments, because of the difficulties in qualifying such contracts as hedges. For the same reason, the Firm does not apply hedge accounting to certain interest rate, foreign exchange, and commodity derivatives used for risk management purposes.

To qualify for hedge accounting, a derivative must be highly effective at reducing the risk associated with the exposure being hedged. In addition, for a derivative to be designated as a hedge, the risk management objective and strategy must be documented. Hedge documentation must identify the derivative hedging instrument, the asset or liability or forecasted transaction and type of risk to be hedged, and how the effectiveness of the derivative is assessed prospectively and retrospectively. To assess effectiveness, the Firm uses statistical methods such as regression analysis, nonstatistical methods such as dollar-value comparisons of the change in the fair value of the derivative to the change in the fair value or cash flows of the hedged item, and qualitative comparisons of critical terms and the evaluation of any changes in those terms. The extent to which a derivative has been, and is expected to continue to be, highly effective at offsetting changes in the fair value or cash flows of the hedged item must be assessed and documented at least quarterly. If it is determined that a derivative is not highly effective at hedging the designated exposure, hedge accounting is discontinued.

There are three types of hedge accounting designations: fair value hedges, cash flow hedges and net investment hedges. JPMorgan Chase uses fair value hedges primarily to hedge fixed-rate long-term debt, AFS securities and certain commodities inventories. For qualifying fair value hedges, the changes in the fair value of the derivative, and in the value of the hedged item for the risk being hedged, are recognized in earnings. Certain amounts excluded from the assessment of effectiveness are recorded in OCI and recognized in earnings over the life of the derivative. If the hedge relationship is terminated, then the adjustment to the hedged item continues to be reported as part of the basis of the hedged item, and for benchmark interest rate hedges, is amortized to earnings as a yield adjustment. Derivative amounts affecting earnings are recognized consistent with the classification of the hedged item – primarily net interest income and principal transactions revenue.

JPMorgan Chase uses cash flow hedges primarily to hedge the exposure to variability in forecasted cash flows from floating-rate assets and liabilities and foreign currency–denominated revenue and expense. For qualifying cash flow hedges, changes in the fair value of the derivative are recorded in OCI and recognized in earnings as the hedged item affects earnings. Derivative amounts affecting earnings are recognized consistent with the classification of the hedged item – primarily noninterest revenue, net interest income and compensation expense. If the hedge relationship is terminated, then the change in value of the derivative recorded in AOCI is recognized in earnings when the cash flows that were hedged affect earnings. For hedge relationships that are discontinued because a forecasted transaction is not expected to occur according to the original hedge forecast, any related derivative values recorded in AOCI are immediately recognized in earnings.

JPMorgan Chase uses net investment hedges to protect the value of the Firm's net investments in certain non-U.S. subsidiaries or branches whose functional currencies are not the U.S. dollar. For qualifying net investment hedges, changes in the fair value of the derivatives due to changes in spot foreign exchange rates are recorded in OCI as translation adjustments. Amounts excluded from the assessment of effectiveness are recorded directly in earnings.

The following table outlines the Firm's primary uses of derivatives and the related hedge accounting designation or disclosure category.

Type of Derivative	Use of Derivative	Designation and disclosure	Affected segment or unit	Page reference
Manage specifically identified risk exposures in qualifying hedge accounting relationships:				
• Interest rate	Hedge fixed rate assets and liabilities	Fair value hedge	Corporate	188
• Interest rate	Hedge floating-rate assets and liabilities	Cash flow hedge	Corporate	190
• Foreign exchange	Hedge foreign currency-denominated assets and liabilities	Fair value hedge	Corporate	188
• Foreign exchange	Hedge foreign currency-denominated forecasted revenue and expense	Cash flow hedge	Corporate	190
• Foreign exchange	Hedge the value of the Firm's investments in non-U.S. dollar functional currency entities	Net investment hedge	Corporate	191
• Commodity	Hedge commodity inventory	Fair value hedge	CIB	188
Manage specifically identified risk exposures not designated in qualifying hedge accounting relationships:				
• Interest rate	Manage the risk associated with mortgage commitments, warehouse loans and MSRs	Specified risk management	CCB	191
• Credit	Manage the credit risk associated with wholesale lending exposures	Specified risk management	CIB	191
• Interest rate and foreign exchange	Manage the risk associated with certain other specified assets and liabilities	Specified risk management	Corporate	191
Market-making derivatives and other activities:				
• Various	Market-making and related risk management	Market-making and other	CIB	191
• Various	Other derivatives	Market-making and other	CIB, AWM, Corporate	191

Notional amount of derivative contracts

The following table summarizes the notional amount of derivative contracts outstanding as of December 31, 2019 and 2018.

	Notional amounts[b]	
December 31, (in billions)	**2019**	2018
Interest rate contracts		
Swaps	**$ 21,228**	$ 21,763
Futures and forwards	**3,152**	3,562
Written options	**3,938**	3,997
Purchased options	**4,361**	4,322
Total interest rate contracts	**32,679**	33,644
Credit derivatives[a]	**1,242**	1,501
Foreign exchange contracts		
Cross-currency swaps	**3,604**	3,548
Spot, futures and forwards	**5,577**	5,871
Written options	**700**	835
Purchased options	**718**	830
Total foreign exchange contracts	**10,599**	11,084
Equity contracts		
Swaps	**406**	346
Futures and forwards	**142**	101
Written options	**646**	528
Purchased options	**611**	490
Total equity contracts	**1,805**	1,465
Commodity contracts		
Swaps	**147**	134
Spot, futures and forwards	**211**	156
Written options	**135**	135
Purchased options	**124**	120
Total commodity contracts	**617**	545
Total derivative notional amounts	**$ 46,942**	$ 48,239

(a) Refer to the Credit derivatives discussion on pages 191-194 for more information on volumes and types of credit derivative contracts.
(b) Represents the sum of gross long and gross short third-party notional derivative contracts.

While the notional amounts disclosed above give an indication of the volume of the Firm's derivatives activity, the notional amounts significantly exceed, in the Firm's view, the possible losses that could arise from such transactions. For most derivative contracts, the notional amount is not exchanged; it is simply a reference amount used to calculate payments.

Impact of derivatives on the Consolidated balance sheets

The following table summarizes information on derivative receivables and payables (before and after netting adjustments) that are reflected on the Firm's Consolidated balance sheets as of December 31, 2019 and 2018, by accounting designation (e.g., whether the derivatives were designated in qualifying hedge accounting relationships or not) and contract type.

Free-standing derivative receivables and payables[(a)]

	Gross derivative receivables				Gross derivative payables			
December 31, 2019 (in millions)	Not designated as hedges	Designated as hedges	Total derivative receivables	Net derivative receivables[(b)]	Not designated as hedges	Designated as hedges	Total derivative payables	Net derivative payables[(b)]
Trading assets and liabilities								
Interest rate	**$ 312,451**	**$ 843**	**$ 313,294**	**$ 27,421**	**$ 279,272**	**$ 1**	**$ 279,273**	**$ 8,603**
Credit	**14,876**	**–**	**14,876**	**701**	**15,121**	**–**	**15,121**	**1,652**
Foreign exchange	**138,179**	**308**	**138,487**	**9,005**	**144,125**	**983**	**145,108**	**13,158**
Equity	**45,727**	**–**	**45,727**	**6,477**	**52,741**	**–**	**52,741**	**12,537**
Commodity	**16,914**	**328**	**17,242**	**6,162**	**19,736**	**149**	**19,885**	**7,758**
Total fair value of trading assets and liabilities	**$ 528,147**	**$ 1,479**	**$ 529,626**	**$ 49,766**	**$ 510,995**	**$ 1,133**	**$ 512,128**	**$ 43,708**

	Gross derivative receivables				Gross derivative payables			
December 31, 2018 (in millions)	Not designated as hedges	Designated as hedges	Total derivative receivables	Net derivative receivables[(b)]	Not designated as hedges	Designated as hedges	Total derivative payables	Net derivative payables[(b)]
Trading assets and liabilities								
Interest rate	$ 267,871	$ 833	$ 268,704	$ 23,214	$ 242,782	$ –	$ 242,782	$ 7,784
Credit	20,095	–	20,095	612	20,276	–	20,276	1,667
Foreign exchange	167,057	628	167,685	13,450	164,392	825	165,217	12,785
Equity	49,285	–	49,285	9,946	51,195	–	51,195	10,161
Commodity	20,223	247	20,470	6,991	22,297	121	22,418	9,372
Total fair value of trading assets and liabilities	$ 524,531	$ 1,708	$ 526,239	$ 54,213	$ 500,942	$ 946	$ 501,888	$ 41,769

(a) Balances exclude structured notes for which the fair value option has been elected. Refer to Note 3 for further information.
(b) As permitted under U.S. GAAP, the Firm has elected to net derivative receivables and derivative payables and the related cash collateral receivables and payables when a legally enforceable master netting agreement exists.

Derivatives netting

The following tables present, as of December 31, 2019 and 2018, gross and net derivative receivables and payables by contract and settlement type. Derivative receivables and payables, as well as the related cash collateral from the same counterparty, have been netted on the Consolidated balance sheets where the Firm has obtained an appropriate legal opinion with respect to the master netting agreement. Where such a legal opinion has not been either sought or obtained, amounts are not eligible for netting on the Consolidated balance sheets, and those derivative receivables and payables are shown separately in the tables below.

In addition to the cash collateral received and transferred that is presented on a net basis with derivative receivables and payables, the Firm receives and transfers additional collateral (financial instruments and cash). These amounts mitigate counterparty credit risk associated with the Firm's derivative instruments, but are not eligible for net presentation:

- collateral that consists of non-cash financial instruments (generally U.S. government and agency securities and other G7 government securities) and cash collateral held at third-party custodians, which are shown separately as "Collateral not nettable on the Consolidated balance sheets" in the tables below, up to the fair value exposure amount;
- the amount of collateral held or transferred that exceeds the fair value exposure at the individual counterparty level, as of the date presented, which is excluded from the tables below; and
- collateral held or transferred that relates to derivative receivables or payables where an appropriate legal opinion has not been either sought or obtained with respect to the master netting agreement, which is excluded from the tables below.

	2019			2018		
December 31, (in millions)	Gross derivative receivables	Amounts netted on the Consolidated balance sheets	Net derivative receivables	Gross derivative receivables	Amounts netted on the Consolidated balance sheets	Net derivative receivables
U.S. GAAP nettable derivative receivables						
Interest rate contracts:						
OTC	**$ 299,205**	**$ (276,255)**	**$ 22,950**	$ 258,227	$ (239,498)	$ 18,729
OTC-cleared	**9,442**	**(9,360)**	**82**	6,404	(5,856)	548
Exchange-traded[(a)]	**347**	**(258)**	**89**	322	(136)	186
Total interest rate contracts	**308,994**	**(285,873)**	**23,121**	264,953	(245,490)	19,463
Credit contracts:						
OTC	**10,743**	**(10,317)**	**426**	12,648	(12,261)	387
OTC-cleared	**3,864**	**(3,858)**	**6**	7,267	(7,222)	45
Total credit contracts	**14,607**	**(14,175)**	**432**	19,915	(19,483)	432
Foreign exchange contracts:						
OTC	**136,252**	**(129,324)**	**6,928**	163,862	(153,988)	9,874
OTC-cleared	**185**	**(152)**	**33**	235	(226)	9
Exchange-traded[(a)]	**10**	**(6)**	**4**	32	(21)	11
Total foreign exchange contracts	**136,447**	**(129,482)**	**6,965**	164,129	(154,235)	9,894
Equity contracts:						
OTC	**23,106**	**(20,820)**	**2,286**	26,178	(23,879)	2,299
Exchange-traded[(a)]	**19,654**	**(18,430)**	**1,224**	18,876	(15,460)	3,416
Total equity contracts	**42,760**	**(39,250)**	**3,510**	45,054	(39,339)	5,715
Commodity contracts:						
OTC	**7,093**	**(5,149)**	**1,944**	7,448	(5,261)	2,187
OTC-cleared	**28**	**(28)**	**—**	—	—	—
Exchange-traded[(a)]	**6,154**	**(5,903)**	**251**	8,815	(8,218)	597
Total commodity contracts	**13,275**	**(11,080)**	**2,195**	16,263	(13,479)	2,784
Derivative receivables with appropriate legal opinion	**516,083**	**(479,860)**	**36,223** [(d)]	510,314	(472,026)	38,288 [(d)]
Derivative receivables where an appropriate legal opinion has not been either sought or obtained	**13,543**		**13,543**	15,925		15,925
Total derivative receivables recognized on the Consolidated balance sheets	**$ 529,626**		**$ 49,766**	$ 526,239		$ 54,213
Collateral not nettable on the Consolidated balance sheets[(b)(c)]			**(14,226)**			(13,046)
Net amounts			**$ 35,540**			$ 41,167

December 31, (in millions)	2019 Gross derivative payables	2019 Amounts netted on the Consolidated balance sheets	2019 Net derivative payables	2018 Gross derivative payables	2018 Amounts netted on the Consolidated balance sheets	2018 Net derivative payables
U.S. GAAP nettable derivative payables						
Interest rate contracts:						
OTC	**$ 267,311**	**$ (260,229)**	**$ 7,082**	$ 233,404	$ (228,369)	$ 5,035
OTC-cleared	**10,217**	**(10,138)**	**79**	7,163	(6,494)	669
Exchange-traded[(a)]	**365**	**(303)**	**62**	210	(135)	75
Total interest rate contracts	**277,893**	**(270,670)**	**7,223**	240,777	(234,998)	5,779
Credit contracts:						
OTC	**11,570**	**(10,080)**	**1,490**	13,412	(11,895)	1,517
OTC-cleared	**3,390**	**(3,389)**	**1**	6,716	(6,714)	2
Total credit contracts	**14,960**	**(13,469)**	**1,491**	20,128	(18,609)	1,519
Foreign exchange contracts:						
OTC	**142,360**	**(131,792)**	**10,568**	160,930	(152,161)	8,769
OTC-cleared	**186**	**(152)**	**34**	274	(268)	6
Exchange-traded[(a)]	**12**	**(6)**	**6**	16	(3)	13
Total foreign exchange contracts	**142,558**	**(131,950)**	**10,608**	161,220	(152,432)	8,788
Equity contracts:						
OTC	**27,594**	**(21,778)**	**5,816**	29,437	(25,544)	3,893
Exchange-traded[(a)]	**20,216**	**(18,426)**	**1,790**	16,285	(15,490)	795
Total equity contracts	**47,810**	**(40,204)**	**7,606**	45,722	(41,034)	4,688
Commodity contracts:						
OTC	**8,714**	**(6,235)**	**2,479**	8,930	(4,838)	4,092
OTC-cleared	**30**	**(30)**	**—**	—	—	—
Exchange-traded[(a)]	**6,012**	**(5,862)**	**150**	8,259	(8,208)	51
Total commodity contracts	**14,756**	**(12,127)**	**2,629**	17,189	(13,046)	4,143
Derivative payables with appropriate legal opinion	**497,977**	**(468,420)**	**29,557** [(d)]	485,036	(460,119)	24,917 [(d)]
Derivative payables where an appropriate legal opinion has not been either sought or obtained	**14,151**		**14,151**	16,852		16,852
Total derivative payables recognized on the Consolidated balance sheets	**$ 512,128**		**$ 43,708**	$ 501,888		$ 41,769
Collateral not nettable on the Consolidated balance sheets[(b)(c)]			**(7,896)**			(4,449)
Net amounts			**$ 35,812**			$ 37,320

(a) Exchange-traded derivative balances that relate to futures contracts are settled daily.

(b) Represents liquid security collateral as well as cash collateral held at third-party custodians related to derivative instruments where an appropriate legal opinion has been obtained. For some counterparties, the collateral amounts of financial instruments may exceed the derivative receivables and derivative payables balances. Where this is the case, the total amount reported is limited to the net derivative receivables and net derivative payables balances with that counterparty.

(c) Derivative collateral relates only to OTC and OTC-cleared derivative instruments.

(d) Net derivatives receivable included cash collateral netted of $65.9 billion and $55.2 billion at December 31, 2019 and 2018, respectively. Net derivatives payable included cash collateral netted of $54.4 billion and $43.3 billion at December 31, 2019 and 2018, respectively. Derivative cash collateral relates to OTC and OTC-cleared derivative instruments.

Liquidity risk and credit-related contingent features
In addition to the specific market risks introduced by each derivative contract type, derivatives expose JPMorgan Chase to credit risk — the risk that derivative counterparties may fail to meet their payment obligations under the derivative contracts and the collateral, if any, held by the Firm proves to be of insufficient value to cover the payment obligation. It is the policy of JPMorgan Chase to actively pursue, where possible, the use of legally enforceable master netting arrangements and collateral agreements to mitigate derivative counterparty credit risk inherent in derivative receivables.

While derivative receivables expose the Firm to credit risk, derivative payables expose the Firm to liquidity risk, as the derivative contracts typically require the Firm to post cash or securities collateral with counterparties as the fair value of the contracts moves in the counterparties' favor or upon specified downgrades in the Firm's and its subsidiaries' respective credit ratings. Certain derivative contracts also provide for termination of the contract, generally upon a downgrade of either the Firm or the counterparty, at the fair value of the derivative contracts. The following table shows the aggregate fair value of net derivative payables related to OTC and OTC-cleared derivatives that contain contingent collateral or termination features that may be triggered upon a ratings downgrade, and the associated collateral the Firm has posted in the normal course of business, at December 31, 2019 and 2018.

OTC and OTC-cleared derivative payables containing downgrade triggers

December 31, (in millions)	**2019**	2018
Aggregate fair value of net derivative payables	**$ 14,819**	$ 9,396
Collateral posted	**13,329**	8,907

The following table shows the impact of a single-notch and two-notch downgrade of the long-term issuer ratings of JPMorgan Chase & Co. and its subsidiaries, predominantly JPMorgan Chase Bank, N.A., at December 31, 2019 and 2018, related to OTC and OTC-cleared derivative contracts with contingent collateral or termination features that may be triggered upon a ratings downgrade. Derivatives contracts generally require additional collateral to be posted or terminations to be triggered when the predefined threshold rating is breached. A downgrade by a single rating agency that does not result in a rating lower than a preexisting corresponding rating provided by another major rating agency will generally not result in additional collateral (except in certain instances in which additional initial margin may be required upon a ratings downgrade), nor in termination payments requirements. The liquidity impact in the table is calculated based upon a downgrade below the lowest current rating of the rating agencies referred to in the derivative contract.

Liquidity impact of downgrade triggers on OTC and OTC-cleared derivatives

	2019		2018	
December 31, (in millions)	Single-notch downgrade	Two-notch downgrade	Single-notch downgrade	Two-notch downgrade
Amount of additional collateral to be posted upon downgrade[(a)]	**$ 189**	**$ 1,467**	$ 76	$ 947
Amount required to settle contracts with termination triggers upon downgrade[(b)]	**104**	**1,398**	172	764

(a) Includes the additional collateral to be posted for initial margin.
(b) Amounts represent fair values of derivative payables, and do not reflect collateral posted.

Derivatives executed in contemplation of a sale of the underlying financial asset
In certain instances the Firm enters into transactions in which it transfers financial assets but maintains the economic exposure to the transferred assets by entering into a derivative with the same counterparty in contemplation of the initial transfer. The Firm generally accounts for such transfers as collateralized financing transactions as described in Note 11, but in limited circumstances they may qualify to be accounted for as a sale and a derivative under U.S. GAAP. The amount of such transfers accounted for as a sale where the associated derivative was outstanding was not material at both December 31, 2019 and 2018.

Impact of derivatives on the Consolidated statements of income

The following tables provide information related to gains and losses recorded on derivatives based on their hedge accounting designation or purpose.

Fair value hedge gains and losses

The following tables present derivative instruments, by contract type, used in fair value hedge accounting relationships, as well as pre-tax gains/(losses) recorded on such derivatives and the related hedged items for the years ended December 31, 2019, 2018 and 2017, respectively. The Firm includes gains/(losses) on the hedging derivative in the same line item in the Consolidated statements of income as the related hedged item.

	Gains/(losses) recorded in income			Income statement impact of excluded components[f]		OCI impact
Year ended December 31, 2019 (in millions)	Derivatives	Hedged items	Income statement impact	Amortization approach	Changes in fair value	Derivatives - Gains/(losses) recorded in OCI[g]
Contract type						
Interest rate[a][b]	**$ 3,204**	**$ (2,373)**	**$ 831**	**$ –**	**$ 828**	**$ –**
Foreign exchange[c]	**154**	**328**	**482**	**(866)**	**482**	**39**
Commodity[d]	**(77)**	**148**	**71**	**–**	**63**	**–**
Total	**$ 3,281**	**$ (1,897)**	**$ 1,384**	**$ (866)**	**$ 1,373**	**$ 39**

	Gains/(losses) recorded in income			Income statement impact of excluded components[f]		OCI impact
Year ended December 31, 2018 (in millions)	Derivatives	Hedged items	Income statement impact	Amortization approach	Changes in fair value	Derivatives - Gains/(losses) recorded in OCI[g]
Contract type						
Interest rate[a][b]	$ (1,145)	$ 1,782	$ 637	$ –	$ 623	$ –
Foreign exchange[c]	1,092	(616)	476	(566)	476	(140)
Commodity[d]	789	(754)	35	–	26	–
Total	$ 736	$ 412	$ 1,148	$ (566)	$ 1,125	$ (140)

	Gains/(losses) recorded in income			Income statement impact due to:	
Year ended December 31, 2017 (in millions)	Derivatives	Hedged items	Income statement impact	Hedge ineffectiveness[e]	Excluded components[f]
Contract type					
Interest rate[a][b]	$ (481)	$ 1,359	$ 878	$ (18)	$ 896
Foreign exchange[c]	(3,509)	3,507	(2)	–	(2)
Commodity[d]	(1,275)	1,348	73	29	44
Total	$ (5,265)	$ 6,214	$ 949	$ 11	$ 938

(a) Primarily consists of hedges of the benchmark (e.g., London Interbank Offered Rate ("LIBOR")) interest rate risk of fixed-rate long-term debt and AFS securities. Gains and losses were recorded in net interest income.
(b) Excludes the amortization expense associated with the inception hedge accounting adjustment applied to the hedged item. This expense is recorded in net interest income and substantially offsets the income statement impact of the excluded components. Also excludes the accrual of interest on interest rate swaps and the related hedged items.
(c) Primarily consists of hedges of the foreign currency risk of long-term debt and AFS securities for changes in spot foreign currency rates. Gains and losses related to the derivatives and the hedged items due to changes in foreign currency rates and the income statement impact of excluded components were recorded primarily in principal transactions revenue and net interest income.
(d) Consists of overall fair value hedges of physical commodities inventories that are generally carried at the lower of cost or net realizable value (net realizable value approximates fair value). Gains and losses were recorded in principal transactions revenue.
(e) Hedge ineffectiveness is the amount by which the gain or loss on the designated derivative instrument does not exactly offset the gain or loss on the hedged item attributable to the hedged risk.
(f) The assessment of hedge effectiveness excludes certain components of the changes in fair values of the derivatives and hedged items such as forward points on foreign exchange forward contracts, time values and cross-currency basis spreads. Excluded components may impact earnings either through amortization of the initial amount over the life of the derivative or through fair value changes recognized in the current period.
(g) Represents the change in value of amounts excluded from the assessment of effectiveness under the amortization approach, predominantly cross-currency basis spreads. The amount excluded at inception of the hedge is recognized in earnings over the life of the derivative.

As of December 31, 2019, the following amounts were recorded on the Consolidated balance sheets related to certain cumulative fair value hedge basis adjustments that are expected to reverse through the income statement in future periods as an adjustment to yield.

December 31, 2019 (in millions)	Carrying amount of the hedged items[a][b]	Cumulative amount of fair value hedging adjustments included in the carrying amount of hedged items: Active hedging relationships	Discontinued hedging relationships[d]	Total
Assets				
Investment securities - AFS	$ 125,860 [c]	$ 2,110	$ 278	$ 2,388
Liabilities				
Long-term debt	$ 157,545	$ 6,719	$ 161	$ 6,880
Beneficial interests issued by consolidated VIEs	2,365	–	(8)	(8)

December 31, 2018 (in millions)	Carrying amount of the hedged items[a][b]	Cumulative amount of fair value hedging adjustments included in the carrying amount of hedged items: Active hedging relationships	Discontinued hedging relationships[d]	Total
Assets				
Investment securities - AFS	$ 55,313 [c]	$ (1,105)	$ 381	$ (724)
Liabilities				
Long-term debt	$ 139,915	$ 141	$ 8	$ 149
Beneficial interests issued by consolidated VIEs	6,987	–	(33)	(33)

(a) Excludes physical commodities with a carrying value of $6.5 billion and $6.8 billion at December 31, 2019 and 2018, respectively, to which the Firm applies fair value hedge accounting. As a result of the application of hedge accounting, these inventories are carried at fair value, thus recognizing unrealized gains and losses in current periods. Since the Firm exits these positions at fair value, there is no incremental impact to net income in future periods.

(b) Excludes hedged items where only foreign currency risk is the designated hedged risk, as basis adjustments related to foreign currency hedges will not reverse through the income statement in future periods. At December 31, 2019 and 2018, the carrying amount excluded for available-for-sale securities is $14.9 billion and $14.6 billion, respectively, and for long-term debt is $2.8 billion and $7.3 billion, respectively.

(c) Carrying amount represents the amortized cost.

(d) Represents hedged items no longer designated in qualifying fair value hedging relationships for which an associated basis adjustment exists at the balance sheet date.

Cash flow hedge gains and losses

The following tables present derivative instruments, by contract type, used in cash flow hedge accounting relationships, and the pre-tax gains/(losses) recorded on such derivatives, for the years ended December 31, 2019, 2018 and 2017, respectively. The Firm includes the gain/(loss) on the hedging derivative in the same line item in the Consolidated statements of income as the change in cash flows on the related hedged item.

Year ended December 31, 2019 (in millions)	Derivatives gains/(losses) recorded in income and other comprehensive income/(loss)		
	Amounts reclassified from AOCI to income	Amounts recorded in OCI	Total change in OCI for period
Contract type			
Interest rate[(a)]	**$ (28)**	**$ (3)**	**$ 25**
Foreign exchange[(b)]	**(75)**	**125**	**200**
Total	**$ (103)**	**$ 122**	**$ 225**

Year ended December 31, 2018 (in millions)	Derivatives gains/(losses) recorded in income and other comprehensive income/(loss)		
	Amounts reclassified from AOCI to income	Amounts recorded in OCI	Total change in OCI for period
Contract type			
Interest rate[(a)]	$ 44	$ (44)	$ (88)
Foreign exchange[(b)]	(26)	(201)	(175)
Total	$ 18	$ (245)	$ (263)

Year ended December 31, 2017 (in millions)	Derivatives gains/(losses) recorded in income and other comprehensive income/(loss)		
	Amounts reclassified from AOCI to income	Amounts recorded in OCI[(c)]	Total change in OCI for period
Contract type			
Interest rate[(a)]	$ (17)	$ 12	$ 29
Foreign exchange[(b)]	(117)	135	252
Total	$ (134)	$ 147	$ 281

(a) Primarily consists of hedges of LIBOR-indexed floating-rate assets and floating-rate liabilities. Gains and losses were recorded in net interest income.
(b) Primarily consists of hedges of the foreign currency risk of non-U.S. dollar-denominated revenue and expense. The income statement classification of gains and losses follows the hedged item – primarily noninterest revenue and compensation expense.
(c) Represents the effective portion of changes in value of the related hedging derivative. Hedge ineffectiveness is the amount by which the cumulative gain or loss on the designated derivative instrument exceeds the present value of the cumulative expected change in cash flows on the hedged item attributable to the hedged risk. The Firm did not recognize any ineffectiveness on cash flow hedges during 2017.

The Firm did not experience any forecasted transactions that failed to occur for the years ended 2019, 2018 and 2017.

Over the next 12 months, the Firm expects that approximately $(8) million (after-tax) of net losses recorded in AOCI at December 31, 2019, related to cash flow hedges will be recognized in income. For cash flow hedges that have been terminated, the maximum length of time over which the derivative results recorded in AOCI will be recognized in earnings is approximately five years, corresponding to the timing of the originally hedged forecasted cash flows. For open cash flow hedges, the maximum length of time over which forecasted transactions are hedged is approximately seven years. The Firm's longer-dated forecasted transactions relate to core lending and borrowing activities.

Net investment hedge gains and losses

The following table presents hedging instruments, by contract type, that were used in net investment hedge accounting relationships, and the pre-tax gains/(losses) recorded on such instruments for the years ended December 31, 2019, 2018 and 2017.

Year ended December 31, (in millions)	2019		2018		2017	
	Amounts recorded in income[(a)(b)]	Amounts recorded in OCI	Amounts recorded in income[(a)(b)]	Amounts recorded in OCI	Amounts recorded in income[(a)(b)]	Amounts recorded in OCI[(c)]
Foreign exchange derivatives	**$72**	**$64**	$11	$1,219	$(152)	$(1,244)

(a) Certain components of hedging derivatives are permitted to be excluded from the assessment of hedge effectiveness, such as forward points on foreign exchange forward contracts. The Firm elects to record changes in fair value of these amounts directly in other income.
(b) Excludes amounts reclassified from AOCI to income on the sale or liquidation of hedged entities. The Firm reclassified net pre-tax gains/(losses) of $18 million to other income, $(17) million and $50 million to other expense related to the liquidation of certain legal entities during the years ended December 31, 2019, 2018 and 2017, respectively. Refer to Note 24 for further information.
(c) Represents the effective portion of changes in value of the related hedging derivative. The Firm did not recognize any ineffectiveness on net investment hedges directly in income during 2017.

Gains and losses on derivatives used for specified risk management purposes

The following table presents pre-tax gains/(losses) recorded on a limited number of derivatives, not designated in hedge accounting relationships, that are used to manage risks associated with certain specified assets and liabilities, including certain risks arising from mortgage commitments, warehouse loans, MSRs, wholesale lending exposures, and foreign currency denominated assets and liabilities.

Year ended December 31, (in millions)	Derivatives gains/(losses) recorded in income		
	2019	2018	2017
Contract type			
Interest rate[(a)]	**$ 1,491**	$ 79	$ 331
Credit[(b)]	**(30)**	(21)	(74)
Foreign exchange[(c)]	**(5)**	117	(107)
Total	**$ 1,456**	$ 175	$ 150

(a) Primarily represents interest rate derivatives used to hedge the interest rate risk inherent in mortgage commitments, warehouse loans and MSRs, as well as written commitments to originate warehouse loans. Gains and losses were recorded predominantly in mortgage fees and related income.
(b) Relates to credit derivatives used to mitigate credit risk associated with lending exposures in the Firm's wholesale businesses. These derivatives do not include credit derivatives used to mitigate counterparty credit risk arising from derivative receivables, which is included in gains and losses on derivatives related to market-making activities and other derivatives. Gains and losses were recorded in principal transactions revenue.
(c) Primarily relates to derivatives used to mitigate foreign exchange risk of specified foreign currency-denominated assets and liabilities. Gains and losses were recorded in principal transactions revenue.

Gains and losses on derivatives related to market-making activities and other derivatives

The Firm makes markets in derivatives in order to meet the needs of customers and uses derivatives to manage certain risks associated with net open risk positions from its market-making activities, including the counterparty credit risk arising from derivative receivables. All derivatives not included in the hedge accounting or specified risk management categories above are included in this category. Gains and losses on these derivatives are primarily recorded in principal transactions revenue. Refer to Note 6 for information on principal transactions revenue.

Credit derivatives

Credit derivatives are financial instruments whose value is derived from the credit risk associated with the debt of a third-party issuer (the reference entity) and which allow one party (the protection purchaser) to transfer that risk to another party (the protection seller). Credit derivatives expose the protection purchaser to the creditworthiness of the protection seller, as the protection seller is required to make payments under the contract when the reference entity experiences a credit event, such as a bankruptcy, a failure to pay its obligation or a restructuring. The seller of credit protection receives a premium for providing protection but has the risk that the underlying instrument referenced in the contract will be subject to a credit event.

The Firm is both a purchaser and seller of protection in the credit derivatives market and uses these derivatives for two primary purposes. First, in its capacity as a market-maker, the Firm actively manages a portfolio of credit derivatives by purchasing and selling credit protection, predominantly on corporate debt obligations, to meet the needs of customers. Second, as an end-user, the Firm uses credit derivatives to manage credit risk associated with lending exposures (loans and unfunded commitments) and derivatives counterparty exposures in the Firm's wholesale businesses, and to manage the credit risk arising from certain financial instruments in the Firm's market-making businesses. Following is a summary of various types of credit derivatives.

Credit default swaps

Credit derivatives may reference the credit of either a single reference entity ("single-name") or a broad-based index. The Firm purchases and sells protection on both single-name and index-reference obligations. Single-name CDS and index CDS contracts are either OTC or OTC-cleared derivative contracts. Single-name CDS are used to manage the default risk of a single reference entity, while index CDS contracts are used to manage the credit risk associated with the broader credit markets or credit market segments. Like the S&P 500 and other market indices, a CDS index consists of a portfolio of CDS across many reference entities. New series of CDS indices are periodically established with a new underlying portfolio of reference entities to reflect changes in the credit markets. If one of the reference entities in the index experiences a credit event, then the reference entity that defaulted is removed from the index. CDS can also be referenced against specific portfolios of reference names or against customized exposure levels based on specific client demands: for example, to provide protection against the first $1 million of realized credit losses in a $10 million portfolio of exposure. Such structures are commonly known as tranche CDS.

For both single-name CDS contracts and index CDS contracts, upon the occurrence of a credit event, under the terms of a CDS contract neither party to the CDS contract has recourse to the reference entity. The protection purchaser has recourse to the protection seller for the difference between the face value of the CDS contract and the fair value of the reference obligation at settlement of the credit derivative contract, also known as the recovery value. The protection purchaser does not need to hold the debt instrument of the underlying reference entity in order to receive amounts due under the CDS contract when a credit event occurs.

Credit-related notes

A credit-related note is a funded credit derivative where the issuer of the credit-related note purchases from the note investor credit protection on a reference entity or an index. Under the contract, the investor pays the issuer the par value of the note at the inception of the transaction, and in return, the issuer pays periodic payments to the investor, based on the credit risk of the referenced entity. The issuer also repays the investor the par value of the note at maturity unless the reference entity (or one of the entities that makes up a reference index) experiences a specified credit event. If a credit event occurs, the issuer is not obligated to repay the par value of the note, but rather, the issuer pays the investor the difference between the par value of the note and the fair value of the defaulted reference obligation at the time of settlement. Neither party to the credit-related note has recourse to the defaulting reference entity.

The following tables present a summary of the notional amounts of credit derivatives and credit-related notes the Firm sold and purchased as of December 31, 2019 and 2018. Upon a credit event, the Firm as a seller of protection would typically pay out only a percentage of the full notional amount of net protection sold, as the amount actually required to be paid on the contracts takes into account the recovery value of the reference obligation at the time of settlement. The Firm manages the credit risk on contracts to sell protection by purchasing protection with identical or similar underlying reference entities. Other purchased protection referenced in the following tables includes credit derivatives bought on related, but not identical, reference positions (including indices, portfolio coverage and other reference points) as well as protection purchased through credit-related notes.

The Firm does not use notional amounts of credit derivatives as the primary measure of risk management for such derivatives, because the notional amount does not take into account the probability of the occurrence of a credit event, the recovery value of the reference obligation, or related cash instruments and economic hedges, each of which reduces, in the Firm's view, the risks associated with such derivatives.

Total credit derivatives and credit-related notes

	Maximum payout/Notional amount			
December 31, 2019 (in millions)	Protection sold	Protection purchased with identical underlyings[(b)]	Net protection (sold)/ purchased[(c)]	Other protection purchased[(d)]
Credit derivatives				
Credit default swaps	**$ (562,338)**	**$ 571,892**	**$ 9,554**	**$ 3,936**
Other credit derivatives[(a)]	**(44,929)**	**52,007**	**7,078**	**7,364**
Total credit derivatives	**(607,267)**	**623,899**	**16,632**	**11,300**
Credit-related notes	**–**	**–**	**–**	**9,606**
Total	**$ (607,267)**	**$ 623,899**	**$ 16,632**	**$ 20,906**

	Maximum payout/Notional amount			
December 31, 2018 (in millions)	Protection sold	Protection purchased with identical underlyings[(b)]	Net protection (sold)/ purchased[(c)]	Other protection purchased[(d)]
Credit derivatives				
Credit default swaps	$ (697,220)	$ 707,282	$ 10,062	$ 4,053
Other credit derivatives[(a)]	(41,244)	42,484	1,240	8,488
Total credit derivatives	(738,464)	749,766	11,302	12,541
Credit-related notes	–	–	–	8,425
Total	$ (738,464)	$ 749,766	$ 11,302	$ 20,966

(a) Other credit derivatives predominantly consist of credit swap options and total return swaps.
(b) Represents the total notional amount of protection purchased where the underlying reference instrument is identical to the reference instrument on protection sold; the notional amount of protection purchased for each individual identical underlying reference instrument may be greater or lower than the notional amount of protection sold.
(c) Does not take into account the fair value of the reference obligation at the time of settlement, which would generally reduce the amount the seller of protection pays to the buyer of protection in determining settlement value.
(d) Represents protection purchased by the Firm on referenced instruments (single-name, portfolio or index) where the Firm has not sold any protection on the identical reference instrument.

The following tables summarize the notional amounts by the ratings, maturity profile, and total fair value, of credit derivatives and credit-related notes as of December 31, 2019 and 2018, where JPMorgan Chase is the seller of protection. The maturity profile is based on the remaining contractual maturity of the credit derivative contracts. The ratings profile is based on the rating of the reference entity on which the credit derivative contract is based. The ratings and maturity profile of credit derivatives and credit-related notes where JPMorgan Chase is the purchaser of protection are comparable to the profile reflected below.

Protection sold – credit derivatives and credit-related notes ratings[(a)]/maturity profile

December 31, 2019 (in millions)	<1 year	1–5 years	>5 years	Total notional amount	Fair value of receivables[(b)]	Fair value of payables[(b)]	Net fair value
Risk rating of reference entity							
Investment-grade	**$ (114,460)**	**$ (311,407)**	**$ (42,129)**	**$ (467,996)**	**$ 6,153**	**$ (911)**	**$ 5,242**
Noninvestment-grade	**(41,661)**	**(87,769)**	**(9,841)**	**(139,271)**	**4,281**	**(2,882)**	**1,399**
Total	**$ (156,121)**	**$ (399,176)**	**$ (51,970)**	**$ (607,267)**	**$ 10,434**	**$ (3,793)**	**$ 6,641**

December 31, 2018 (in millions)	<1 year	1–5 years	>5 years	Total notional amount	Fair value of receivables[(b)]	Fair value of payables[(b)]	Net fair value
Risk rating of reference entity							
Investment-grade	$ (115,443)	$ (402,325)	$ (43,611)	$ (561,379)	$ 5,720	$ (2,791)	$ 2,929
Noninvestment-grade	(45,897)	(119,348)	(11,840)	(177,085)	4,719	(5,660)	(941)
Total	$ (161,340)	$ (521,673)	$ (55,451)	$ (738,464)	$ 10,439	$ (8,451)	$ 1,988

(a) The ratings scale is primarily based on external credit ratings defined by S&P and Moody's.
(b) Amounts are shown on a gross basis, before the benefit of legally enforceable master netting agreements and cash collateral received by the Firm.

Note 6 – Noninterest revenue and noninterest expense

Noninterest revenue

The Firm records noninterest revenue from certain contracts with customers in investment banking fees, deposit-related fees, asset management, administration, and commissions, and components of card income. The related contracts are often terminable on demand and the Firm has no remaining obligation to deliver future services. For arrangements with a fixed term, the Firm may commit to deliver services in the future. Revenue associated with these remaining performance obligations typically depends on the occurrence of future events or underlying asset values, and is not recognized until the outcome of those events or values are known.

Investment banking fees

This revenue category includes debt and equity underwriting and advisory fees. As an underwriter, the Firm helps clients raise capital via public offering and private placement of various types of debt and equity instruments. Underwriting fees are primarily based on the issuance price and quantity of the underlying instruments, and are recognized as revenue typically upon execution of the client's transaction. The Firm also manages and syndicates loan arrangements. Credit arrangement and syndication fees, included within debt underwriting fees, are recorded as revenue after satisfying certain retention, timing and yield criteria.

The Firm also provides advisory services, by assisting its clients with mergers and acquisitions, divestitures, restructuring and other complex transactions. Advisory fees are recognized as revenue typically upon execution of the client's transaction.

The following table presents the components of investment banking fees.

Year ended December 31, (in millions)	2019	2018	2017
Underwriting			
Equity	**$ 1,648**	$ 1,684	$ 1,466
Debt	**3,513**	3,347	3,802
Total underwriting	**5,161**	5,031	5,268
Advisory	**2,340**	2,519	2,144
Total investment banking fees	**$ 7,501**	$ 7,550	$ 7,412

Investment banking fees are earned primarily by CIB. Refer to Note 32 for segment results.

Principal transactions

Principal transactions revenue is driven by many factors, including:

- the bid-offer spread, which is the difference between the price at which a market participant is willing and able to sell an instrument to the Firm and the price at which another market participant is willing and able to buy it from the Firm, and vice versa; and
- realized and unrealized gains and losses on financial instruments and commodities transactions, including those accounted for under the fair value option, primarily used in client-driven market-making activities, and on private equity investments.
  - Realized gains and losses result from the sale of instruments, closing out or termination of transactions, or interim cash payments.
  - Unrealized gains and losses result from changes in valuation.

In connection with its client-driven market-making activities, the Firm transacts in debt and equity instruments, derivatives and commodities, including physical commodities inventories and financial instruments that reference commodities.

Principal transactions revenue also includes realized and unrealized gains and losses related to:

- derivatives designated in qualifying hedge accounting relationships, primarily fair value hedges of commodity and foreign exchange risk;
- derivatives used for specific risk management purposes, primarily to mitigate credit risk and foreign exchange risk.

Refer to Note 5 for further information on the income statement classification of gains and losses from derivatives activities.

In the financial commodity markets, the Firm transacts in OTC derivatives (e.g., swaps, forwards, options) and ETD that reference a wide range of underlying commodities. In the physical commodity markets, the Firm primarily purchases and sells precious and base metals and may hold other commodities inventories under financing and other arrangements with clients.

The following table presents all realized and unrealized gains and losses recorded in principal transactions revenue. This table excludes interest income and interest expense on trading assets and liabilities, which are an integral part of the overall performance of the Firm's client-driven market-making activities in CIB and cash deployment activities in Treasury and CIO. Refer to Note 7 for further information on interest income and interest expense.

Trading revenue is presented primarily by instrument type. The Firm's client-driven market-making businesses generally utilize a variety of instrument types in connection with their market-making and related risk-management activities; accordingly, the trading revenue presented in the table below is not representative of the total revenue of any individual LOB.

Year ended December 31, (in millions)	2019	2018	2017
Trading revenue by instrument type			
Interest rate	**$ 2,552**	$ 1,961	$ 2,479
Credit	**1,611**	1,395	1,329
Foreign exchange	**3,171**	3,222	2,746
Equity	**5,812**	4,924	3,873
Commodity	**1,122**	906	661
Total trading revenue	**14,268**	12,408	11,088
Private equity gains/(losses)	**(250)**	(349)	259
Principal transactions	**$ 14,018**	$ 12,059	$ 11,347

Principal transactions revenue is earned primarily by CIB. Refer to Note 32 for segment results.

Lending- and deposit-related fees

Lending-related fees include fees earned from loan commitments, standby letters of credit, financial guarantees, and other loan-servicing activities. Deposit-related fees include fees earned in lieu of compensating balances, and fees earned from performing cash management activities and other deposit account services. Lending- and deposit-related fees in this revenue category are recognized over the period in which the related service is provided.

The following table presents the components of lending- and deposit-related fees.

Year ended December 31, (in millions)	2019	2018	2017
Lending-related fees	**$ 1,184**	$ 1,117	$ 1,110
Deposit-related fees	**5,185**	4,935	4,823
Total lending- and deposit-related fees	**$ 6,369**	$ 6,052	$ 5,933

Lending- and deposit-related fees are earned by CCB, CIB, CB, and AWM. Refer to Note 32 for segment results.

Asset management, administration and commissions

This revenue category includes fees from investment management and related services, custody, brokerage services and other products. The Firm manages assets on behalf of its clients, including investors in Firm-sponsored funds and owners of separately managed investment accounts. Management fees are typically based on the value of assets under management and are collected and recognized at the end of each period over which the management services are provided and the value of the managed assets is known. The Firm also receives performance-based management fees, which are earned based on exceeding certain benchmarks or other performance targets and are accrued and recognized when the probability of reversal is remote, typically at the end of the related billing period. The Firm has contractual arrangements with third parties to provide distribution and other services in connection with its asset management activities. Amounts paid to these third-party service providers are generally recorded in professional and outside services expense.

The following table presents the components of Firmwide asset management, administration and commissions.

Year ended December 31, (in millions)	2019	2018	2017
Asset management fees			
Investment management fees[(a)]	**$ 10,865**	$ 10,768	$ 10,434
All other asset management fees[(b)]	**315**	270	296
Total asset management fees	**11,180**	11,038	10,730
Total administration fees[(c)]	**2,197**	2,179	2,029
Commissions and other fees			
Brokerage commissions[(d)]	**2,439**	2,505	2,239
All other commissions and fees	**1,349**	1,396	1,289
Total commissions and fees	**3,788**	3,901	3,528
Total asset management, administration and commissions	**$ 17,165**	$ 17,118	$ 16,287

(a) Represents fees earned from managing assets on behalf of the Firm's clients, including investors in Firm-sponsored funds and owners of separately managed investment accounts.
(b) Represents fees for services that are ancillary to investment management services, such as commissions earned on the sales or distribution of mutual funds to clients. These fees are recorded as revenue at the time the service is rendered or, in the case of certain distribution fees based on the underlying fund's asset value and/or investor redemption, recorded over time as the investor remains in the fund or upon investor redemption.
(c) Predominantly includes fees for custody, securities lending, funds services and securities clearance. These fees are recorded as revenue over the period in which the related service is provided.
(d) Represents commissions earned when the Firm acts as a broker, by facilitating its clients' purchases and sales of securities and other financial instruments. Brokerage commissions are collected and recognized as revenue upon occurrence of the client transaction. The Firm reports certain costs paid to third-party clearing houses and exchanges net against commission revenue.

Asset management, administration and commissions are earned primarily by AWM, CIB, CCB, and CB. Refer to Note 32 for segment results.

Mortgage fees and related income

This revenue category primarily reflects CCB's Home Lending net production and net mortgage servicing revenue.

Net production revenue includes fees and income recognized as earned on mortgage loans originated with the intent to sell, and the impact of risk management activities associated with the mortgage pipeline and warehouse loans. Net production revenue also includes gains and losses on sales and lower of cost or fair value adjustments on mortgage loans held-for-sale (excluding certain repurchased loans insured by U.S. government agencies), and changes in the fair value of financial instruments measured under the fair value option.

Net mortgage servicing revenue includes operating revenue earned from servicing third-party mortgage loans, which is recognized over the period in which the service is provided; changes in the fair value of MSRs; the impact of risk management activities associated with MSRs; and gains and losses on securitization of excess mortgage servicing. Net mortgage servicing revenue also includes gains and losses on sales and lower of cost or fair value adjustments of certain repurchased loans insured by U.S. government agencies.

Refer to Note 15 for further information on risk management activities and MSRs.

Net interest income from mortgage loans is recorded in interest income.

Card income

This revenue category includes interchange and other income from credit and debit card transactions, and fees earned from processing card transactions for merchants, both of which are recognized when purchases are made by a cardholder and presented net of certain transaction-related costs. Card income also includes account origination costs and annual fees, which are deferred and recognized on a straight-line basis over a 12-month period.

Certain Chase credit card products offer the cardholder the ability to earn points based on account activity, which the cardholder can choose to redeem for cash and non-cash rewards. The cost to the Firm related to these proprietary rewards programs varies based on multiple factors including the terms and conditions of the rewards programs, cardholder activity, cardholder reward redemption rates and cardholder reward selections. The Firm maintains a liability for its obligations under its rewards programs and reports the current-period cost as a reduction of card income.

Credit card revenue sharing agreements

The Firm has contractual agreements with numerous co-brand partners that grant the Firm exclusive rights to issue co-branded credit card products and market them to the customers of such partners. These partners endorse the co-brand credit card programs and provide their customer or member lists to the Firm. The partners may also conduct marketing activities and provide rewards redeemable under their own loyalty programs that the Firm will grant to co-brand credit cardholders based on account activity. The terms of these agreements generally range from five to ten years.

The Firm typically makes payments to the co-brand credit card partners based on the cost of partners' marketing activities and loyalty program rewards provided to credit cardholders, new account originations and sales volumes. Payments to partners based on marketing efforts undertaken by the partners are expensed by the Firm as incurred and reported as marketing expense. Payments for partner loyalty program rewards are reported as a reduction of card income when incurred. Payments to partners based on new credit card account originations are accounted for as direct loan origination costs and are deferred and recognized as a reduction of card income on a straight-line basis over a 12-month period. Payments to partners based on sales volumes are reported as a reduction of card income when the related interchange income is earned.

The following table presents the components of card income:

Year ended December 31, (in millions)	2019	2018	2017
Interchange and merchant processing income	**$ 20,370**	$ 18,808	$ 17,080
Reward costs and partner payments	**(14,312)**	(13,074) [(b)]	(10,820)
Other card income[(a)]	**(754)**	(745)	(1,827)
Total card income	**$ 5,304**	$ 4,989	$ 4,433

(a) Predominantly represents account origination costs and annual fees, which are deferred and recognized on a straight-line basis over a 12-month period.

(b) Includes an adjustment to the credit card rewards liability of approximately $330 million, recorded in the second quarter of 2018.

Card income is earned primarily by CCB and CB. Refer to Note 32 for segment results.

Refer to Note 18 for information on operating lease income included within other income.

Noninterest expense

Other expense

Other expense on the Firm's Consolidated statements of income included the following:

Year ended December 31, (in millions)	2019	2018	2017
Legal expense/(benefit)	**$ 239**	$ 72	$ (35)
FDIC-related expense	**457**	1,239	1,492

Note 7 – Interest income and Interest expense

Interest income and interest expense are recorded in the Consolidated statements of income and classified based on the nature of the underlying asset or liability.

The following table presents the components of interest income and interest expense:

Year ended December 31, (in millions)	2019	2018	2017
Interest income			
Loans[(a)]	**$ 50,375**	$ 47,620	$ 41,008
Taxable securities	**7,962**	5,653	5,534
Non-taxable securities[(b)]	**1,329**	1,595	1,848
Total investment securities[(a)]	**9,291**	7,248	7,382
Trading assets - debt instruments	**10,800**	8,703	7,610
Federal funds sold and securities purchased under resale agreements	**6,146**	3,819	2,327
Securities borrowed[(c)]	**1,574**	913	94
Deposits with banks	**3,887**	5,907	4,238
All other interest-earning assets[(c)(d)]	**1,967**	1,890	1,312
Total interest income[(c)]	**$ 84,040**	$ 76,100	$ 63,971
Interest expense			
Interest bearing deposits	**$ 8,957**	$ 5,973	$ 2,857
Federal funds purchased and securities loaned or sold under repurchase agreements	**4,630**	3,066	1,611
Short-term borrowings[(e)]	**1,248**	1,144	481
Trading liabilities - debt and all other interest-bearing liabilities[(c)(f)]	**2,585**	2,387	1,669
Long-term debt	**8,807**	7,978	6,753
Beneficial interest issued by consolidated VIEs	**568**	493	503
Total interest expense[(c)]	**$ 26,795**	$ 21,041	$ 13,874
Net interest income	**$ 57,245**	$ 55,059	$ 50,097
Provision for credit losses	**5,585**	4,871	5,290
Net interest income after provision for credit losses	**$ 51,660**	$ 50,188	$ 44,807

(a) Includes the amortization/accretion of unearned income (e.g., purchase premiums/discounts, net deferred fees/costs, etc.).
(b) Represents securities that are tax-exempt for U.S. federal income tax purposes.
(c) In the second quarter of 2019, the Firm implemented certain presentation changes that impacted interest income and interest expense, but had no effect on net interest income. These changes were made to align the accounting treatment between the balance sheet and the related interest income or expense, primarily by offsetting interest income and expense for certain prime brokerage-related held-for-investment customer receivables and payables that are currently presented as a single margin account on the balance sheet. These changes were applied retrospectively and, accordingly, prior period amounts were revised to conform with the current presentation.
(d) Includes interest earned on prime brokerage-related held-for-investment customer receivables, which are classified in accrued interest and accounts receivable, and all other interest-earning assets, which are classified in other assets on the Consolidated balance sheets.
(e) Includes commercial paper.
(f) Other interest-bearing liabilities includes interest expense on prime brokerage-related customer payables.

Interest income and interest expense includes the current-period interest accruals for financial instruments measured at fair value, except for derivatives and financial instruments containing embedded derivatives that would be separately accounted for in accordance with U.S. GAAP, absent the fair value option election; for those instruments, all changes in fair value including any interest elements, are reported in principal transactions revenue. For financial instruments that are not measured at fair value, the related interest is included within interest income or interest expense, as applicable. Refer to Notes 12, 10, 11 and 20, for further information on accounting for interest income and interest expense related to loans, investment securities, securities financing activities (i.e., securities purchased or sold under resale or repurchase agreements; securities borrowed; and securities loaned) and long-term debt, respectively.

Note 8 – Pension and other postretirement employee benefit plans

The Firm has various defined benefit pension plans and OPEB plans that provide benefits to its employees in the U.S. and certain non-U.S. locations. The Firm also provides a qualified defined contribution plan in the U.S. and maintains other similar arrangements in certain non-U.S. locations.

The principal defined benefit pension plan in the U.S. is a qualified noncontributory plan that provides benefits to substantially all U.S. employees. In connection with changes to the U.S. Retirement Savings Program during the fourth quarter of 2018, the Firm announced that it will freeze the U.S. defined benefit pension plan (the "Plan Freeze"). Commencing on January 1, 2020 (and January 1, 2019 for new hires), new pay credits are directed to the U.S. defined contribution plan. Interest credits on the U.S. defined benefit pension plan will continue to accrue. As a result, a curtailment was triggered and a remeasurement of the U.S. defined benefit pension obligation and plan assets occurred as of November 30, 2018. The plan design change did not have a material impact on the U.S. defined benefit pension plan or the Firm's Consolidated Financial Statements.

The Firm also has defined benefit pension plans that are offered in certain non-U.S. locations based on factors such as eligible compensation, age and/or years of service. It is the Firm's policy to fund the pension plans in amounts sufficient to meet the requirements under applicable laws. The Firm does not anticipate at this time making any contribution to the U.S. defined benefit pension plan in 2020. The 2020 contributions to the non-U.S. defined benefit pension plans are expected to be $49 million, of which $34 million are contractually required.

The Firm also has a number of nonqualified noncontributory defined benefit pension plans that are unfunded. These plans provide supplemental defined pension benefits to certain employees.

The Firm offers postretirement medical and life insurance benefits to certain U.S. retirees and postretirement medical benefits to certain qualifying U.S. and U.K. employees.

The Firm partially defrays the cost of its U.S. OPEB obligation through corporate-owned life insurance ("COLI") purchased on the lives of eligible employees and retirees. While the Firm owns the COLI policies, certain COLI proceeds (death benefits, withdrawals and other distributions) may be used only to reimburse the Firm for its net postretirement benefit claim payments and related administrative expense. The Firm has prefunded its U.S. postretirement benefit obligations. The U.K. OPEB plan is unfunded.

Pension and OPEB accounting guidance generally requires that the difference between plan assets at fair value and the benefit obligation be measured and recorded on the balance sheet. Plans that are overfunded (excess of plan assets over benefit obligation) are recorded in other assets and plans that are underfunded (excess benefit obligation over plan assets) are recorded in other liabilities. Gains or losses resulting from changes in the benefit obligation and the value of plan assets are recorded in OCI and recognized as part of the net periodic benefit cost over subsequent periods as discussed in the Gains and losses section of this Note. Additionally, benefits earned during the year are reported in compensation expense; all other components of net periodic defined benefit costs are reported in other expense in the Consolidated statements of income.

The following table presents the changes in benefit obligations, plan assets, the net funded status, and the pretax pension and OPEB amounts recorded in AOCI on the Consolidated balance sheets for the Firm's defined benefit pension and OPEB plans, and the weighted-average actuarial annualized assumptions for the projected and accumulated postretirement benefit obligations.

As of or for the year ended December 31,	Defined benefit pension plans		OPEB plans	
(in millions)	**2019**	2018	**2019**	2018
Change in benefit obligation				
Benefit obligation, beginning of year	**$ (15,512)**	$ (16,700)	**$ (612)**	$ (684)
Benefits earned during the year	**(356)**	(354)	**–**	–
Interest cost on benefit obligations	**(596)**	(556)	**(24)**	(24)
Plan amendments	**(5)**	(29)	**–**	–
Plan curtailment	**–**	123	**–**	–
Employee contributions	**(8)**	(7)	**(14)**	(15)
Net gain/(loss)	**(1,296)** (g)	938 (g)	**(51)**	40
Benefits paid	**820**	873	**67**	69
Plan settlements	**–**	15	**–**	–
Foreign exchange impact and other	**(116)**	185	**(2)**	2
Benefit obligation, end of year[(a)]	**$ (17,069)**	$ (15,512)	**$ (636)**	$ (612)
Change in plan assets				
Fair value of plan assets, beginning of year	**$ 18,052**	$ 19,603	**$ 2,633**	$ 2,757
Actual return on plan assets	**2,932**	(548)	**454**	(28)
Firm contributions	**80**	75	**2**	2
Employee contributions	**8**	7	**14**	15
Benefits paid	**(820)**	(873)	**(110)**	(113)
Plan settlements	**–**	(15)	**–**	–
Foreign exchange impact and other	**121**	(197)	**–**	–
Fair value of plan assets, end of year [(a)(b)]	**$ 20,373**	$ 18,052	**$ 2,993**	$ 2,633
Net funded status [(c)(d)]	**$ 3,304**	$ 2,540	**$ 2,357**	$ 2,021
Accumulated benefit obligation, end of year	**$ (17,047)**	$ (15,494)	**NA**	NA
Pretax pension and OPEB amounts recorded in AOCI				
Net gain/(loss)	**$ (2,260)**	$ (3,134)	**$ 470**	$ 184
Prior service credit/(cost)	**(26)**	(23)	**–**	–
Accumulated other comprehensive income/(loss), pretax, end of year	**$ (2,286)**	$ (3,157)	**$ 470**	$ 184
Weighted-average actuarial assumptions used to determine benefit obligations				
Discount rate [(e)]	**0.20 - 3.30%**	0.60 - 4.30 %	**3.20%**	4.20%
Rate of compensation increase [(e)]	**2.25 - 3.00**	2.25 - 3.00	**NA**	NA
Interest crediting rate[(e)]	**1.78 - 4.65%**	1.81 - 4.90%	**NA**	NA
Health care cost trend rate[(f)]				
Assumed for next year	**NA**	NA	**5.00**	5.00
Ultimate	**NA**	NA	**5.00**	5.00
Year when rate will reach ultimate	**NA**	NA	**2020**	2019

(a) At December 31, 2019 and 2018, included non-U.S. benefit obligations of $(3.8) billion and $(3.3) billion, and plan assets of $4.0 billion and $3.5 billion, respectively, predominantly in the U.K.
(b) At December 31, 2019 and 2018, defined benefit pension plan amounts that were not measured at fair value included $1.3 billion and $340 million, respectively, of accrued receivables, and $1.7 billion and $503 million, respectively, of accrued liabilities.
(c) Represents plans with an aggregate overfunded balance of $6.3 billion and $5.1 billion at December 31, 2019 and 2018, respectively, and plans with an aggregate underfunded balance of $618 million and $547 million at December 31, 2019 and 2018, respectively.
(d) For pension plans with a projected benefit obligation exceeding plan assets, the projected benefit obligation and fair value of plan assets was $1.5 billion and $885 million at December 31, 2019, respectively and $1.3 billion and $762 million at December 31, 2018, respectively. For pension plans with an accumulated benefit obligation exceeding plan assets, the accumulated benefit obligation and fair value of plan assets was $1.4 billion and $885 million at December 31, 2019, respectively, and $1.3 billion and $762 million at December 31, 2018, respectively. For OPEB plans with a projected benefit obligation exceeding plan assets, the projected benefit obligation was $43 million and $26 million at December 31, 2019 and 2018, respectively, and they had no plan assets.
(e) For the U.S. defined benefit pension plans, the discount rate assumption was 3.30% and 4.30%, and the interest crediting rate was 4.65% and 4.90%, for 2019 and 2018, respectively. The rate of compensation increase was not applicable to the U.S. plan in 2019 due to the Plan Freeze, and was 2.30% in 2018. The rate of compensation increase presented in the table for 2019 applies to the non-U.S. plans.
(f) Excludes participants whose benefits under the plan are capped.
(g) At December 31, 2019 and 2018, the gain/(loss) was primarily attributable to the change in the discount rate.

Gains and losses

For the Firm's defined benefit pension plans, fair value is used to determine the expected return on plan assets. Amortization of net gains and losses is included in annual net periodic benefit cost if, as of the beginning of the year, the net gain or loss exceeds 10% of the greater of the projected benefit obligation or the fair value of the plan assets. Any excess is amortized over the average future service period of defined benefit pension plan participants, which for the U.S. defined benefit pension plan is currently eight years and for the non-U.S. defined benefit pension plans is the period appropriate for the affected plan. As a result of the Plan Freeze, beginning in 2020, any excess for the U.S. defined benefit pension plan will be amortized over the average expected lifetime of plan participants which is currently 38 years. In addition, prior service costs are amortized over the average remaining service period of active employees expected to receive benefits under the plan when the prior service cost is first recognized.

For the Firm's OPEB plans, a calculated value that recognizes changes in fair value over a five-year period is used to determine the expected return on plan assets. This value is referred to as the market-related value of assets. Amortization of net gains and losses, adjusted for gains and losses not yet recognized, is included in annual net periodic benefit cost if, as of the beginning of the year, the net gain or loss exceeds 10% of the greater of the accumulated postretirement benefit obligation or the market-related value of assets. Any excess is amortized over the average expected lifetime of retired participants, which is currently eleven years.

The following table presents the components of net periodic benefit costs reported in the Consolidated statements of income for the Firm's U.S. and non-U.S. defined benefit pension, defined contribution and OPEB plans, and in other comprehensive income for the defined benefit pension and OPEB plans, and the weighted-average annualized actuarial assumptions for the net periodic benefit cost.

	Pension plans			OPEB plans		
Year ended December 31, (in millions)	**2019**	2018	2017	**2019**	2018	2017
Components of net periodic benefit cost						
Benefits earned during the year	**$ 356**	$ 354	$ 330	**$ –**	$ –	$ –
Interest cost on benefit obligations	**596**	556	598	**24**	24	28
Expected return on plan assets	**(915)**	(981)	(968)	**(112)**	(103)	(97)
Amortization:						
Net (gain)/loss	**167**	103	250	**–**	–	–
Prior service (credit)/cost	**3**	(23)	(36)	**–**	–	–
Curtailment (gain)/loss	**–**	21	–	**–**	–	–
Settlement (gain)/loss	**–**	2	2	**–**	–	–
Net periodic defined benefit cost[a]	**$ 207**	$ 32	$ 176	**$ (88)**	$ (79)	$ (69)
Other defined benefit pension plans[b]	**25**	20	24	**NA**	NA	NA
Total defined benefit plans	**$ 232**	$ 52	$ 200	**$ (88)**	$ (79)	$ (69)
Total defined contribution plans	**952**	872	814	**NA**	NA	NA
Total pension and OPEB cost included in noninterest expense	**$ 1,184**	$ 924	$ 1,014	**$ (88)**	$ (79)	$ (69)
Changes in plan assets and benefit obligations recognized in other comprehensive income						
Prior service (credit)/cost arising during the year	**5**	29	–	**–**	–	–
Net (gain)/loss arising during the year	**(719)**	467	(669)	**(286)**	91	(133)
Amortization of net loss	**(167)**	(103)	(250)	**–**	–	–
Amortization of prior service (cost)/credit	**(3)**	23	36	**–**	–	–
Curtailment gain/(loss)	**–**	(21)	–	**–**	–	–
Settlement gain/(loss)	**–**	(2)	(2)	**–**	–	–
Foreign exchange impact and other	**13**	(30)	54	**–**	(4)	–
Total recognized in other comprehensive income	**$ (871)**	$ 363	$ (831)	**$ (286)**	$ 87	$ (133)
Total recognized in net periodic benefit cost and other comprehensive income	**$ (664)**	$ 395	$ (655)	**$ (374)**	$ 8	$ (202)
Weighted-average assumptions used to determine net periodic benefit costs						
Discount rate[c]	**0.60 - 4.30%**	0.60 - 4.50 %	0.60 - 4.30 %	**4.20%**	3.70%	4.20%
Expected long-term rate of return on plan assets [c]	**0.00 - 5.50**	0.70 - 5.50	0.70 - 6.00	**4.30**	4.00	5.00
Rate of compensation increase [c]	**2.25 - 3.00**	2.25 - 3.00	2.25 - 3.00	**NA**	NA	NA
Interest crediting rate[c]	**1.81 - 4.90%**	1.81- 4.90%	1.81- 4.90%	**NA**	NA	NA
Health care cost trend rate[d]						
Assumed for next year	**NA**	NA	NA	**5.00**	5.00	5.00
Ultimate	**NA**	NA	NA	**5.00**	5.00	5.00
Year when rate will reach ultimate	**NA**	NA	NA	**2019**	2018	2017

(a) Benefits earned during the year are reported in compensation expense; all other components of net periodic defined benefit costs are reported within other expense in the Consolidated statements of income.
(b) Includes various defined benefit pension plans which are individually immaterial.
(c) The rate assumptions for the U.S. defined benefit pension plans are at the upper end of the range, except for the rate of compensation increase, which was 2.30% for 2019, 2018 and 2017, respectively.
(d) Excludes participants whose benefits under the plan are capped.

Plan assumptions

The Firm's expected long-term rate of return for defined benefit pension and OPEB plan assets is a blended weighted average, by asset allocation of the projected long-term returns for the various asset classes, taking into consideration local market conditions and the specific allocation of plan assets. Returns on asset classes are developed using a forward-looking approach and are not strictly based on historical returns. Consideration is also given to current market conditions and the short-term portfolio mix of each plan.

The discount rate used in determining the benefit obligation under the U.S. defined benefit pension and OPEB plans was provided by the Firm's actuaries. This rate was selected by reference to the yields on portfolios of bonds with maturity dates and coupons that closely match each of the plan's projected cash flows. The discount rate for the U.K. defined benefit pension plan represents a rate of appropriate duration from the analysis of yield curves provided by the Firm's actuaries.

At December 31, 2019, the Firm decreased the discount rates used to determine its benefit obligations for the U.S.

defined benefit pension and OPEB plans in light of current market interest rates, which is expected to decrease expense by approximately $69 million in 2020. The 2020 expected long-term rate of return on U.S. defined benefit pension plan assets and U.S. OPEB plan assets are 4.00% and 4.11%, respectively.

The following table represents the effect of a 25-basis point decline in the two listed rates below on estimated 2020 defined benefit pension and OPEB plan expense, as well as the effect on the postretirement benefit obligations.

(in millions)	Defined benefit pension and OPEB plan expense	Benefit obligation
Expected long-term rate of return	$ 57	NA
Discount rate	$ 6	$ 544

Investment strategy and asset allocation

The assets of the Firm's defined benefit pension plans are held in various trusts and are invested in well-diversified portfolios of equity and fixed income securities, cash and cash equivalents, and alternative investments. The trust-owned assets of the Firm's U.S. OPEB plan are invested primarily in fixed income securities. COLI policies used to partially defray the cost of the Firm's U.S. OPEB plan are invested in separate accounts of an insurance company and are allocated to investments intended to replicate equity and fixed income indices.

The investment policies for the assets of the Firm's defined benefit pension plans are to optimize the risk-return relationship as appropriate to the needs and goals of each plan using a global portfolio of various asset classes diversified by market segment, economic sector, and issuer. Assets are managed by a combination of internal and external investment managers. The Firm regularly reviews the asset allocations and asset managers, as well as other factors that impact the portfolios, which are rebalanced when deemed necessary.

Investments held by the plans include financial instruments which are exposed to various risks such as interest rate, market and credit risks. Exposure to a concentration of credit risk is mitigated by the broad diversification of both U.S. and non-U.S. investments. Additionally, the investments in each of the collective investment funds and/or registered investment companies are further diversified into various financial instruments. As of December 31, 2019, assets held by the Firm's defined benefit pension and OPEB plans do not include securities issued by JPMorgan Chase or its affiliates, except through indirect exposures through investments in ETFs, mutual funds and collective investment funds managed by third-parties. The plans hold investments that are sponsored or managed by affiliates of JPMorgan Chase in the amount of $3.1 billion and $3.7 billion, as of December 31, 2019 and 2018, respectively.

The following table presents the weighted-average asset allocation of the fair values of total plan assets at December 31 for the years indicated, as well as the respective approved asset allocation ranges by asset class.

	Defined benefit pension plans[(a)]			OPEB plan[(d)]		
	Asset	% of plan assets		Asset	% of plan assets	
December 31,	Allocation	**2019**	2018	Allocation	**2019**	2018
Asset class						
Debt securities[(b)]	42-100%	**74%**	48%	30-70%	**60%**	61%
Equity securities	0-40	**16**	37	30-70	**40**	39
Real estate	0-6	**1**	2	–	**–**	–
Alternatives [(c)]	0-24	**9**	13	–	**–**	–
Total	100%	**100%**	100%	100%	**100%**	100%

(a) Represents the U.S. defined benefit pension plan only, as that is the most significant plan.
(b) Debt securities primarily includes cash and cash equivalents, corporate debt, U.S. federal, state, local and non-U.S. government, asset-backed and mortgage-backed securities.
(c) Alternatives primarily include limited partnerships.
(d) Represents the U.S. OPEB plan only, as the U.K. OPEB plan is unfunded.

Fair value measurement of the plans' assets and liabilities

Refer to Note 2 for information on fair value measurements, including descriptions of level 1, 2, and 3 of the fair value hierarchy and the valuation methods employed by the Firm.

Pension and OPEB plan assets and liabilities measured at fair value

	Defined benefit pension plans							
	2019				2018			
December 31, (in millions)	Level 1	Level 2	Level 3	Total fair value	Level 1	Level 2	Level 3	Total fair value
Cash and cash equivalents	**$ 157**	**$ 1**	**$ –**	**$ 158**	$ 343	$ 1	$ –	$ 344
Equity securities	**3,240**	**184**	**2**	**3,426**	5,342	162	2	5,506
Collective investment funds[(a)]	**265**	**–**	**–**	**265**	161	–	–	161
Limited partnerships[(b)]	**187**	**–**	**–**	**187**	40	–	–	40
Corporate debt securities[(c)]	**–**	**7,090**	**2**	**7,092**	–	3,540	3	3,543
U.S. federal, state, local and non-U.S. government debt securities	**1,790**	**1,054**	**–**	**2,844**	1,191	743	–	1,934
Mortgage-backed securities	**314**	**701**	**4**	**1,019**	82	272	3	357
Derivative receivables	**–**	**337**	**–**	**337**	–	143	–	143
Other[(d)]	**785**	**132**	**250**	**1,167**	885	80	302	1,267
Total assets measured at fair value[(e)]	**$ 6,738**	**$ 9,499**	**$ 258**	**$ 16,495**	$ 8,044	$ 4,941	$ 310	$ 13,295
Derivative payables	**$ –**	**$ (118)**	**$ –**	**$ (118)**	$ –	$ (96)	$ –	$ (96)
Total liabilities measured at fair value[(e)]	**$ –**	**$ (118)**	**$ –**	**$ (118)**	$ –	$ (96)	$ –	$ (96)

(a) At December 31, 2019 and 2018, collective investment funds primarily included a mix of short-term investment funds, U.S. and non-U.S. equity investments (including index) and real estate funds.
(b) Unfunded commitments to purchase limited partnership investments for the plans were $451 million and $521 million for 2019 and 2018, respectively.
(c) Corporate debt securities include debt securities of U.S. and non-U.S. corporations.
(d) Other consists primarily of mutual funds, money market funds and participating annuity contracts. Mutual funds and money market funds are primarily classified within level 1 of the fair value hierarchy given they are valued using market observable prices. Participating annuity contracts are classified within level 3 of the fair value hierarchy due to a lack of market mechanisms for transferring each policy and surrender restrictions.
(e) At December 31, 2019 and 2018, excludes $4.4 billion and $5.0 billion of certain investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient, which are not required to be classified in the fair value hierarchy, $1.3 billion and $340 million of defined benefit pension plan receivables for investments sold and dividends and interest receivables, $1.7 billion and $479 million of defined benefit pension plan payables for investments purchased, and $25 million and $24 million of other liabilities, respectively.

At December 31, 2019 and 2018, the assets of the U.S. OPEB plan consisted of $562 million and $561 million, respectively, in cash and cash equivalents, corporate debt securities, U.S. federal, state, local and non-U.S. government debt securities and other assets classified in level 1 and level 2 of the valuation hierarchy and $2.4 billion and $2.1 billion, respectively, of COLI policies classified in level 3 of the valuation hierarchy.

Changes in level 3 fair value measurements using significant unobservable inputs

(in millions)	Fair value, Beginning balance	Actual return on plan assets: Realized gains/(losses)	Actual return on plan assets: Unrealized gains/(losses)[b]	Purchases, sales and settlements, net[b]	Transfers in and/or out of level 3	Fair value, Ending balance
Year ended December 31, 2019						
U.S. defined benefit pension plan						
Annuity contracts and other [a]	**$ 310**	**$ –**	**$ 31**	**$ (85)**	**$ 2**	**$ 258**
U.S. OPEB plan						
COLI policies	**$ 2,072**	**$ –**	**$ 401**	**$ (42)**	**$ –**	**$ 2,431**
Year ended December 31, 2018						
U.S. defined benefit pension plan						
Annuity contracts and other [a]	$ 310	$ –	$ –	$ (1)	$ 1	$ 310
U.S. OPEB plan						
COLI policies	$ 2,157	$ –	$ (42)	$ (43)	$ –	$ 2,072

(a) Substantially all are participating annuity contracts.
(b) The prior period amounts have been revised to conform with the current period presentation.

Estimated future benefit payments

The following table presents benefit payments expected to be paid, which include the effect of expected future service, for the years indicated. The OPEB medical and life insurance payments are net of expected retiree contributions.

Year ended December 31, (in millions)	Defined benefit pension plans	OPEB before Medicare Part D subsidy	Medicare Part D subsidy
2020	$ 1,030	$ 59	$ 1
2021	1,020	57	1
2022	1,020	54	–
2023	980	52	–
2024	970	50	–
Years 2025-2029	4,613	211	1

Note 9 – Employee share-based incentives

Employee share-based awards

In 2019, 2018 and 2017, JPMorgan Chase granted long-term share-based awards to certain employees under its LTIP, as amended and restated effective May 15, 2018. Under the terms of the LTIP, as of December 31, 2019, 75 million shares of common stock were available for issuance through May 2022. The LTIP is the only active plan under which the Firm is currently granting share-based incentive awards. In the following discussion, the LTIP, plus prior Firm plans and plans assumed as the result of acquisitions, are referred to collectively as the "LTI Plans," and such plans constitute the Firm's share-based incentive plans.

RSUs are awarded at no cost to the recipient upon their grant. Generally, RSUs are granted annually and vest at a rate of 50% after two years and 50% after three years and are converted into shares of common stock as of the vesting date. In addition, RSUs typically include full-career eligibility provisions, which allow employees to continue to vest upon voluntary termination based on age or service-related requirements, subject to post-employment and other restrictions. All RSU awards are subject to forfeiture until vested and contain clawback provisions that may result in cancellation under certain specified circumstances. Predominantly all RSUs entitle the recipient to receive cash payments equivalent to any dividends paid on the underlying common stock during the period the RSUs are outstanding.

Performance share units ("PSUs") are granted annually, and approved by the Firm's Board of Directors, to members of the Firm's Operating Committee under the variable compensation program. PSUs are subject to the Firm's achievement of specified performance criteria over a three-year period. The number of awards that vest can range from zero to 150% of the grant amount. In addition, dividends that accrue during the vesting period are reinvested in dividend equivalent share units. PSUs and the related dividend equivalent share units are converted into shares of common stock after vesting.

Once the PSUs and dividend equivalent share units have vested, the shares of common stock that are delivered, after applicable tax withholding, must be held for an additional two-year period, for a total combined vesting and holding period of approximately five to eight years from the grant date depending on regulations in certain countries.

Under the LTI Plans, stock appreciation rights ("SARs") and stock options have generally been granted with an exercise price equal to the fair value of JPMorgan Chase's common stock on the grant date. SARs and stock options generally expire ten years after the grant date. There were no material grants of employee SARs or stock options in 2019, 2018 and 2017.

The Firm separately recognizes compensation expense for each tranche of each award, net of estimated forfeitures, as if it were a separate award with its own vesting date. Generally, for each tranche granted, compensation expense is recognized on a straight-line basis from the grant date until the vesting date of the respective tranche, provided that the employees will not become full-career eligible during the vesting period. For awards with full-career eligibility provisions and awards granted with no future substantive service requirement, the Firm accrues the estimated value of awards expected to be awarded to employees as of the grant date without giving consideration to the impact of post-employment restrictions. For each tranche granted to employees who will become full-career eligible during the vesting period, compensation expense is recognized on a straight-line basis from the grant date until the earlier of the employee's full-career eligibility date or the vesting date of the respective tranche.

The Firm's policy for issuing shares upon settlement of employee share-based incentive awards is to issue either new shares of common stock or treasury shares. During 2019, 2018 and 2017, the Firm settled all of its employee share-based awards by issuing treasury shares.

Refer to Note 23 for further information on the classification of share-based awards for purposes of calculating earnings per share.

RSUs, PSUs, employee SARs and stock options activity

Generally, compensation expense for RSUs and PSUs is measured based on the number of units granted multiplied by the stock price at the grant date, and for employee SARs and stock options, is measured at the grant date using the Black-Scholes valuation model. Compensation expense for these awards is recognized in net income as described previously. The following table summarizes JPMorgan Chase's RSUs, PSUs, employee SARs and stock options activity for 2019.

Year ended December 31, 2019 (in thousands, except weighted-average data, and where otherwise stated)	RSUs/PSUs Number of units	RSUs/PSUs Weighted-average grant date fair value	SARs/Options Number of awards	SARs/Options Weighted-average exercise price	SARs/Options Weighted-average remaining contractual life (in years)	SARs/Options Aggregate intrinsic value
Outstanding, January 1	**58,809**	**$ 85.04**	**12,463**	**$ 41.46**		
Granted	**23,811**	**99.79**	**18**	**111.01**		
Exercised or vested	**(28,754)**	**69.98**	**(6,923)**	**41.50**		
Forfeited	**(1,627)**	**98.58**	**—**	**—**		
Canceled	**NA**	**NA**	**(31)**	**89.71**		
Outstanding, December 31	**52,239**	**$ 99.62**	**5,527**	**$ 41.36**	**1.9**	**$ 539,071**
Exercisable, December 31	**NA**	**NA**	**5,522**	**41.29**	**1.9**	**538,971**

The total fair value of RSUs that vested during the years ended December 31, 2019, 2018 and 2017, was $2.9 billion, $3.6 billion and $2.9 billion, respectively. The total intrinsic value of options exercised during the years ended December 31, 2019, 2018 and 2017, was $503 million, $370 million and $651 million, respectively.

Compensation expense

The Firm recognized the following noncash compensation expense related to its various employee share-based incentive plans in its Consolidated statements of income.

Year ended December 31, (in millions)	**2019**	2018	2017
Cost of prior grants of RSUs, PSUs, SARs and employee stock options that are amortized over their applicable vesting periods	**$ 1,141**	$ 1,241	$ 1,125
Accrual of estimated costs of share-based awards to be granted in future periods including those to full-career eligible employees	**1,115**	1,081	945
Total noncash compensation expense related to employee share-based incentive plans	**$ 2,256**	$ 2,322	$ 2,070

At December 31, 2019, approximately $693 million (pretax) of compensation expense related to unvested awards had not yet been charged to net income. That cost is expected to be amortized into compensation expense over a weighted-average period of 1.6 years. The Firm does not capitalize any compensation expense related to share-based compensation awards to employees.

Tax benefits

Excess tax benefits (including tax benefits from dividends or dividend equivalents) on share-based payment awards are recognized within income tax expense in the Consolidated statements of income. Income tax benefits related to share-based incentive arrangements recognized in the Firm's Consolidated statements of income for the years ended December 31, 2019, 2018 and 2017, were $895 million, $1.1 billion and $1.0 billion, respectively.

Note 10 – Investment securities

Investment securities consist of debt securities that are classified as AFS or HTM. Debt securities classified as trading assets are discussed in Note 2. Predominantly all of the Firm's AFS and HTM securities are held by Treasury and CIO in connection with its asset-liability management activities. At December 31, 2019, the investment securities portfolio consisted of debt securities with an average credit rating of AA+ (based upon external ratings where available, and where not available, based primarily upon internal ratings). The Firm's internal risk ratings generally align with the qualitative characteristics (e.g., borrower capacity to meet financial commitments and vulnerability to changes in the economic environment) defined by S&P and Moody's, however the quantitative characteristics (e.g., PDs and LGDs) may differ as they reflect internal historical experiences and assumptions.

AFS securities are carried at fair value on the Consolidated balance sheets. Unrealized gains and losses, after any applicable hedge accounting adjustments, are reported as net increases or decreases to AOCI. The specific identification method is used to determine realized gains and losses on AFS securities, which are included in securities gains/(losses) on the Consolidated statements of income. HTM debt securities, which the Firm has the intent and ability to hold until maturity, are carried at amortized cost on the Consolidated balance sheets.

For both AFS and HTM debt securities, purchase discounts or premiums are generally amortized into interest income on a level-yield basis over the contractual life of the security. However, premiums on certain callable debt securities are amortized to the earliest call date.

During the fourth quarter of 2019, the Firm transferred $6.2 billion of collateralized loan obligations from AFS to HTM for capital management purposes. These securities were transferred at fair value in a non-cash transaction.

The amortized costs and estimated fair values of the investment securities portfolio were as follows for the dates indicated.

December 31, (in millions)	2019 Amortized cost	2019 Gross unrealized gains	2019 Gross unrealized losses	2019 Fair value	2018 Amortized cost	2018 Gross unrealized gains	2018 Gross unrealized losses	2018 Fair value
Available-for-sale securities								
Mortgage-backed securities:								
U.S. GSEs and government agencies[(a)]	**$ 107,811**	**$ 2,395**	**$ 89**	**$ 110,117**	$ 69,026	$ 594	$ 974	$ 68,646
Residential:								
U.S	**10,223**	**233**	**6**	**10,450**	5,877	79	31	5,925
Non-U.S.	**2,477**	**64**	**1**	**2,540**	2,529	72	6	2,595
Commercial	**5,137**	**64**	**13**	**5,188**	6,758	43	147	6,654
Total mortgage-backed securities	**125,648**	**2,756**	**109**	**128,295**	84,190	788	1,158	83,820
U.S. Treasury and government agencies	**139,162**	**449**	**175**	**139,436**	55,771	366	78	56,059
Obligations of U.S. states and municipalities	**27,693**	**2,118**	**1**	**29,810**	36,221	1,582	80	37,723
Certificates of deposit	**77**	**—**	**—**	**77**	75	—	—	75
Non-U.S. government debt securities	**21,427**	**377**	**17**	**21,787**	23,771	351	20	24,102
Corporate debt securities	**823**	**22**	**—**	**845**	1,904	23	9	1,918
Asset-backed securities:								
Collateralized loan obligations	**25,038**	**9**	**56**	**24,991**	19,612	1	176	19,437
Other	**5,438**	**40**	**20**	**5,458**	7,225	57	22	7,260
Total available-for-sale securities	**345,306**	**5,771**	**378**	**350,699**	228,769	3,168	1,543	230,394
Held-to-maturity securities								
Mortgage-backed securities:								
U.S. GSEs and government agencies[(a)]	**36,523**	**1,165**	**62**	**37,626**	26,610	134	200	26,544
Total mortgage-backed securities	**36,523**	**1,165**	**62**	**37,626**	26,610	134	200	26,544
U.S. Treasury and government agencies	**51**	**—**	**1**	**50**	—	—	—	—
Obligations of U.S. states and municipalities	**4,797**	**299**	**—**	**5,096**	4,824	105	15	4,914
Asset-backed securities:								
Collateralized loan obligations	**6,169**	**—**	**—**	**6,169**	—	—	—	—
Total held-to-maturity securities	**47,540**	**1,464**	**63**	**48,941**	31,434	239	215	31,458
Total investment securities	**$ 392,846**	**$ 7,235**	**$ 441**	**$ 399,640**	$ 260,203	$ 3,407	$ 1,758	$ 261,852

(a) Includes AFS U.S. GSE obligations with fair values of $78.5 billion and $50.7 billion, and HTM U.S. GSE obligations with amortized cost of $31.6 billion and $20.9 billion, at December 31, 2019 and 2018, respectively. As of December 31, 2019, mortgage-backed securities issued by Fannie Mae and Freddie Mac each exceeded 10% of JPMorgan Chase's total stockholders' equity; the amortized cost and fair value of such securities were $69.4 billion and $71.4 billion, and $38.7 billion and $39.6 billion, respectively.

Investment securities impairment

The following tables present the fair value and gross unrealized losses for investment securities by aging category at December 31, 2019 and 2018.

	Investment securities with gross unrealized losses					
	Less than 12 months		12 months or more			
December 31, 2019 (in millions)	Fair value	Gross unrealized losses	Fair value	Gross unrealized losses	Total fair value	Total gross unrealized losses
Available-for-sale securities						
Mortgage-backed securities:						
U.S. GSEs and government agencies	$ 16,966	$ 53	$ 3,058	$ 36	$ 20,024	$ 89
Residential:						
U.S	1,072	3	423	3	1,495	6
Non-U.S.	13	–	420	1	433	1
Commercial	1,287	12	199	1	1,486	13
Total mortgage-backed securities	19,338	68	4,100	41	23,438	109
U.S. Treasury and government agencies	23,003	145	5,695	30	28,698	175
Obligations of U.S. states and municipalities	186	1	–	–	186	1
Certificates of deposit	77	–	–	–	77	–
Non-U.S. government debt securities	3,970	13	1,406	4	5,376	17
Corporate debt securities	–	–	–	–	–	–
Asset-backed securities:						
Collateralized loan obligations	10,364	11	7,756	45	18,120	56
Other	1,639	9	753	11	2,392	20
Total available-for-sale securities	58,577	247	19,710	131	78,287	378
Held-to-maturity securities						
Mortgage-backed securities:						
U.S. GSEs and government agencies	5,186	62	81	–	5,267	62
Total mortgage-backed securities	5,186	62	81	–	5,267	62
U.S. Treasury and government agencies	50	1	–	–	50	1
Obligations of U.S. states and municipalities	–	–	–	–	–	–
Asset-backed securities:						
Collateralized loan obligations	3,421	–	1,375	–	4,796	–
Total held-to-maturity securities	8,657	63	1,456	–	10,113	63
Total investment securities with gross unrealized losses	$ 67,234	$ 310	$ 21,166	$ 131	$ 88,400	$ 441

December 31, 2018 (in millions)	Investment securities with gross unrealized losses: Less than 12 months: Fair value	Less than 12 months: Gross unrealized losses	12 months or more: Fair value	12 months or more: Gross unrealized losses	Total fair value	Total gross unrealized losses
Available-for-sale securities						
Mortgage-backed securities:						
U.S. GSEs and government agencies	17,656	318	22,728	656	40,384	974
Residential:						
U.S.	623	4	1,445	27	2,068	31
Non-U.S.	907	5	165	1	1,072	6
Commercial	974	6	3,172	141	4,146	147
Total mortgage-backed securities	20,160	333	27,510	825	47,670	1,158
U.S. Treasury and government agencies	4,792	7	2,391	71	7,183	78
Obligations of U.S. states and municipalities	1,808	15	2,477	65	4,285	80
Certificates of deposit	75	–	–	–	75	–
Non-U.S. government debt securities	3,123	5	1,937	15	5,060	20
Corporate debt securities	478	8	37	1	515	9
Asset-backed securities:						
Collateralized loan obligations	18,681	176	–	–	18,681	176
Other	1,208	6	2,354	16	3,562	22
Total available-for-sale securities	50,325	550	36,706	993	87,031	1,543
Held-to-maturity securities						
Mortgage-backed securities:						
U.S. GSEs and government agencies	4,385	23	7,082	177	11,467	200
Total mortgage-backed securities	4,385	23	7,082	177	11,467	200
Obligations of U.S. states and municipalities	12	–	1,114	15	1,126	15
Total held-to-maturity securities	4,397	23	8,196	192	12,593	215
Total investment securities with gross unrealized losses	54,722	573	44,902	1,185	99,624	1,758

Other-than-temporary impairment

AFS and HTM debt securities in unrealized loss positions are analyzed as part of the Firm's ongoing assessment of OTTI. The Firm considers a decline in fair value to be other-than-temporary when the Firm does not expect to recover the entire amortized cost basis of the security.

For AFS debt securities, the Firm recognizes OTTI losses in earnings if the Firm has the intent to sell the debt security, or if it is more likely than not that the Firm will be required to sell the debt security before recovery of its amortized cost basis. In these circumstances the impairment loss is equal to the full difference between the amortized cost basis and the fair value of the securities.

For debt securities in an unrealized loss position that the Firm has the intent and ability to hold, the securities are evaluated to determine if a credit loss exists. In the event of a credit loss, only the amount of impairment associated with the credit loss is recognized in income. Amounts relating to factors other than credit losses are recorded in OCI.

Factors considered in evaluating potential OTTI include adverse conditions specifically related to the industry, geographic area or financial condition of the issuer or underlying collateral of a security; payment structure of the security; changes to the rating of the security by a rating agency; the volatility of the fair value changes; and the Firm's intent and ability to hold the security until recovery.

The Firm's cash flow evaluations take into account the factors noted above and expectations of relevant market and economic data as of the end of the reporting period. When assessing securities issued in a securitization for OTTI, the Firm estimates cash flows considering underlying loan-level data and structural features of the securitization, such as subordination, excess spread, overcollateralization or other forms of credit enhancement, and compares the losses projected for the underlying collateral ("pool losses") against the level of credit enhancement in the securitization structure to determine whether these features are sufficient to absorb the pool losses, or whether a credit loss exists. The Firm also performs other analyses to support its cash flow projections, such as first-loss analyses or stress scenarios.

For beneficial interests in securitizations that are rated below "AA" at their acquisition, or that can be contractually prepaid or otherwise settled in such a way that the Firm would not recover substantially all of its recorded investment, the Firm considers an impairment to be other-than-temporary when there is an adverse change in expected cash flows.

The Firm recognizes unrealized losses on investment securities that it intends to sell as OTTI. The Firm does not intend to sell any of the remaining investment securities with an unrealized loss in AOCI as of December 31, 2019, and it is not likely that the Firm will be required to sell these securities before recovery of their amortized cost basis. Further, the Firm did not recognize any credit-related OTTI losses during the year ended December 31, 2019. Based on its assessment, the Firm believes that the investment securities with an unrealized loss in AOCI as of December 31, 2019, are not other-than-temporarily impaired.

Investment securities gains and losses

The following table presents realized gains and losses and OTTI from AFS securities that were recognized in income.

Year ended December 31, (in millions)	**2019**	2018	2017
Realized gains	**$ 650**	$ 211	$ 1,013
Realized losses	**(392)**	(606)	(1,072)
OTTI losses[(a)]	**–**	–	(7)
Net investment securities gains/ (losses)	**258**	(395)	(66)

(a) Represents OTTI losses recognized in income on investment securities the Firm intends to sell. Excludes realized losses on securities sold of $22 million and $6 million for the years ended December 31, 2018 and 2017, respectively, that had been previously reported as an OTTI loss due to the intention to sell the securities.

Changes in the credit loss component of credit-impaired debt securities

The cumulative credit loss component, including any changes therein, of OTTI losses that have been recognized in income related to AFS securities was not material as of and during the years ended December 31, 2019, 2018 and 2017.

Contractual maturities and yields

The following table presents the amortized cost and estimated fair value at December 31, 2019, of JPMorgan Chase's investment securities portfolio by contractual maturity.

By remaining maturity December 31, 2019 (in millions)	Due in one year or less	Due after one year through five years	Due after five years through 10 years	Due after 10 years[(b)]	Total
Available-for-sale securities					
Mortgage-backed securities					
Amortized cost	$ 1	$ 58	$ 11,073	$ 114,516	$ 125,648
Fair value	1	58	11,251	116,985	128,295
Average yield[(a)]	1.99%	2.78%	2.76%	3.40%	3.34%
U.S. Treasury and government agencies					
Amortized cost	$ 10,687	$ 92,805	$ 26,353	$ 9,317	$ 139,162
Fair value	10,700	93,039	26,446	9,251	139,436
Average yield[(a)]	1.82%	1.84%	1.90%	1.98%	1.86%
Obligations of U.S. states and municipalities					
Amortized cost	$ 123	$ 193	$ 825	$ 26,552	$ 27,693
Fair value	124	202	883	28,601	29,810
Average yield[(a)]	4.13%	4.68%	5.28%	4.86%	4.87%
Certificates of deposit					
Amortized cost	$ 77	$ —	$ —	$ —	$ 77
Fair value	77	—	—	—	77
Average yield[(a)]	0.50%	—%	—%	—%	0.50%
Non-U.S. government debt securities					
Amortized cost	$ 6,672	$ 11,544	$ 2,898	$ 313	$ 21,427
Fair value	6,682	11,791	3,001	313	21,787
Average yield[(a)]	2.17%	1.84%	1.29%	1.67%	1.87%
Corporate debt securities					
Amortized cost	$ 205	$ 206	$ 412	$ —	$ 823
Fair value	207	212	426	—	845
Average yield[(a)]	4.49%	4.14%	3.50%	—%	3.91%
Asset-backed securities					
Amortized cost	$ 17	$ 2,352	$ 7,184	$ 20,923	$ 30,476
Fair value	17	2,353	7,177	20,902	30,449
Average yield[(a)]	0.62%	2.78%	2.86%	2.77%	2.79%
Total available-for-sale securities					
Amortized cost	$ 17,782	$ 107,158	$ 48,745	$ 171,621	$ 345,306
Fair value	17,808	107,655	49,184	176,052	350,699
Average yield[(a)]	1.99%	1.87%	2.27%	3.47%	2.73%
Held-to-maturity securities					
Mortgage-backed securities					
Amortized Cost	$ —	$ —	$ 5,850	$ 30,673	$ 36,523
Fair value	—	—	6,114	31,512	37,626
Average yield[(a)]	—%	—%	3.06%	3.10%	3.10%
U.S. Treasury and government agencies					
Amortized cost	$ —	$ 51	$ —	$ —	$ 51
Fair value	—	50	—	—	50
Average yield[(a)]	—%	1.47%	—%	—%	1.47%
Obligations of U.S. states and municipalities					
Amortized cost	$ —	$ —	$ 99	$ 4,698	$ 4,797
Fair value	—	—	106	4,990	5,096
Average yield[(a)]	—%	—%	3.91%	4.04%	4.04%
Asset-backed securities					
Amortized cost	$ —	$ —	$ 5,296	$ 873	$ 6,169
Fair value	—	—	5,296	873	6,169
Average yield[(a)]	—%	—%	3.19%	3.11%	3.18%
Total held-to-maturity securities					
Amortized cost	$ —	$ 51	$ 11,245	$ 36,244	$ 47,540
Fair value	—	50	11,516	37,375	48,941
Average yield[(a)]	—%	1.47%	3.13%	3.23%	3.20%

(a) Average yield is computed using the effective yield of each security owned at the end of the period, weighted based on the amortized cost of each security. The effective yield considers the contractual coupon, amortization of premiums and accretion of discounts, and the effect of related hedging derivatives. Taxable-equivalent amounts are used where applicable. The effective yield excludes unscheduled principal prepayments; and accordingly, actual maturities of securities may differ from their contractual or expected maturities as certain securities may be prepaid.

(b) Substantially all of the Firm's U.S. residential MBS and collateralized mortgage obligations are due in 10 years or more, based on contractual maturity. The estimated weighted-average life, which reflects anticipated future prepayments, is approximately 6 years for agency residential MBS, 3 years for agency residential collateralized mortgage obligations and 3 years for nonagency residential collateralized mortgage obligations.

Note 11 – Securities financing activities

JPMorgan Chase enters into resale, repurchase, securities borrowed and securities loaned agreements (collectively, “securities financing agreements”) primarily to finance the Firm’s inventory positions, acquire securities to cover short sales, accommodate customers’ financing needs, settle other securities obligations and to deploy the Firm’s excess cash.

Securities financing agreements are treated as collateralized financings on the Firm’s Consolidated balance sheets. Resale and repurchase agreements are generally carried at the amounts at which the securities will be subsequently sold or repurchased. Securities borrowed and securities loaned agreements are generally carried at the amount of cash collateral advanced or received. Where appropriate under applicable accounting guidance, securities financing agreements with the same counterparty are reported on a net basis. Refer to Note 1 for further discussion of the offsetting of assets and liabilities. Fees received and paid in connection with securities financing agreements are recorded over the life of the agreement in interest income and interest expense on the Consolidated statements of income.

The Firm has elected the fair value option for certain securities financing agreements. Refer to Note 3 for further information regarding the fair value option. The securities financing agreements for which the fair value option has been elected are reported within securities purchased under resale agreements, securities loaned or sold under repurchase agreements, and securities borrowed on the Consolidated balance sheets. Generally, for agreements carried at fair value, current-period interest accruals are recorded within interest income and interest expense, with changes in fair value reported in principal transactions revenue. However, for financial instruments containing embedded derivatives that would be separately accounted for in accordance with accounting guidance for hybrid instruments, all changes in fair value, including any interest elements, are reported in principal transactions revenue.

Securities financing agreements expose the Firm primarily to credit and liquidity risk. To manage these risks, the Firm monitors the value of the underlying securities (predominantly high-quality securities collateral, including government-issued debt and U.S. GSEs and government agencies MBS) that it has received from or provided to its counterparties compared to the value of cash proceeds and exchanged collateral, and either requests additional collateral or returns securities or collateral when appropriate. Margin levels are initially established based upon the counterparty, the type of underlying securities, and the permissible collateral, and are monitored on an ongoing basis.

In resale and securities borrowed agreements, the Firm is exposed to credit risk to the extent that the value of the securities received is less than initial cash principal advanced and any collateral amounts exchanged. In repurchase and securities loaned agreements, credit risk exposure arises to the extent that the value of underlying securities advanced exceeds the value of the initial cash principal received, and any collateral amounts exchanged.

Additionally, the Firm typically enters into master netting agreements and other similar arrangements with its counterparties, which provide for the right to liquidate the underlying securities and any collateral amounts exchanged in the event of a counterparty default. It is also the Firm’s policy to take possession, where possible, of the securities underlying resale and securities borrowed agreements. Refer to Note 29 for further information regarding assets pledged and collateral received in securities financing agreements.

As a result of the Firm’s credit risk mitigation practices with respect to resale and securities borrowed agreements as described above, the Firm did not hold any reserves for credit impairment with respect to these agreements as of December 31, 2019 and 2018.

The table below summarizes the gross and net amounts of the Firm's securities financing agreements, as of December 31, 2019 and 2018. When the Firm has obtained an appropriate legal opinion with respect to a master netting agreement with a counterparty and where other relevant netting criteria under U.S. GAAP are met, the Firm nets, on the Consolidated balance sheets, the balances outstanding under its securities financing agreements with the same counterparty. In addition, the Firm exchanges securities and/or cash collateral with its counterparty to reduce the economic exposure with the counterparty, but such collateral is not eligible for net Consolidated balance sheet presentation. Where the Firm has obtained an appropriate legal opinion with respect to the counterparty master netting agreement, such collateral, along with securities financing balances that do not meet all these relevant netting criteria under U.S. GAAP, is presented in the table below as "Amounts not nettable on the Consolidated balance sheets," and reduces the "Net amounts" presented. Where a legal opinion has not been either sought or obtained, the securities financing balances are presented gross in the "Net amounts" below.

	2019				
December 31, (in millions)	Gross amounts	Amounts netted on the Consolidated balance sheets	Amounts presented on the Consolidated balance sheets	Amounts not nettable on the Consolidated balance sheets[b]	Net amounts[c]
Assets					
Securities purchased under resale agreements	**$ 628,609**	**$ (379,463)**	**$ 249,146**	**$ (233,818)**	**$ 15,328**
Securities borrowed	**166,718**	**(26,960)**	**139,758**	**(104,990)**	**34,768**
Liabilities					
Securities sold under repurchase agreements	**$ 555,172**	**$ (379,463)**	**$ 175,709**	**$ (151,566)**	**$ 24,143**
Securities loaned and other[a]	**36,649**	**(26,960)**	**9,689**	**(9,654)**	**35**

	2018				
December 31, (in millions)	Gross amounts	Amounts netted on the Consolidated balance sheets	Amounts presented on the Consolidated balance sheets	Amounts not nettable on the Consolidated balance sheets[b]	Net amounts[c]
Assets					
Securities purchased under resale agreements	$ 691,116	$ (369,612)	$ 321,504	$ (308,854)	$ 12,650
Securities borrowed	132,955	(20,960)	111,995	(79,747)	32,248
Liabilities					
Securities sold under repurchase agreements	$ 541,587	$ (369,612)	$ 171,975	$ (149,125)	$ 22,850
Securities loaned and other[a]	33,700	(20,960)	12,740	(12,358)	382

(a) Includes securities-for-securities lending agreements of $3.7 billion and $3.3 billion at December 31, 2019 and 2018, respectively, accounted for at fair value, where the Firm is acting as lender. In the Consolidated balance sheets, the Firm recognizes the securities received at fair value within other assets and the obligation to return those securities within accounts payable and other liabilities.
(b) In some cases, collateral exchanged with a counterparty exceeds the net asset or liability balance with that counterparty. In such cases, the amounts reported in this column are limited to the related net asset or liability with that counterparty.
(c) Includes securities financing agreements that provide collateral rights, but where an appropriate legal opinion with respect to the master netting agreement has not been either sought or obtained. At December 31, 2019 and 2018, included $11.0 billion and $7.9 billion, respectively, of securities purchased under resale agreements; $31.9 billion and $30.3 billion, respectively, of securities borrowed; $22.7 billion and $21.5 billion, respectively, of securities sold under repurchase agreements; and $7 million and $25 million, respectively, of securities loaned and other.

The tables below present as of December 31, 2019 and 2018 the types of financial assets pledged in securities financing agreements and the remaining contractual maturity of the securities financing agreements.

	Gross liability balance			
	2019		2018	
December 31, (in millions)	Securities sold under repurchase agreements	Securities loaned and other	Securities sold under repurchase agreements	Securities loaned and other
Mortgage-backed securities:				
U.S. GSEs and government agencies	**$ 34,119**	**$ –**	$ 34,311 (a)	$ –
Residential - nonagency	**1,239**	**–**	2,165	–
Commercial - nonagency	**1,612**	**–**	1,390	–
U.S. Treasury, GSEs and government agencies	**334,398**	**29**	317,578 (a)	69
Obligations of U.S. states and municipalities	**1,181**	**–**	1,150	–
Non-U.S. government debt	**145,548**	**1,528**	154,900	4,313
Corporate debt securities	**13,826**	**1,580**	13,898	428
Asset-backed securities	**1,794**	**–**	3,867	–
Equity securities	**21,455**	**33,512**	12,328	28,890
Total	**$ 555,172**	**$ 36,649**	$ 541,587	$ 33,700

(a) The prior period amounts have been revised to conform with the current period presentation.

	Remaining contractual maturity of the agreements				
2019 (in millions)	Overnight and continuous	Up to 30 days	30 – 90 days	Greater than 90 days	Total
Total securities sold under repurchase agreements	**$ 225,134**	**$ 199,870**	**$ 57,305**	**$ 72,863**	**$ 555,172**
Total securities loaned and other	**32,028**	**1,706**	**937**	**1,978**	**36,649**

	Remaining contractual maturity of the agreements				
2018 (in millions)	Overnight and continuous	Up to 30 days	30 – 90 days	Greater than 90 days	Total
Total securities sold under repurchase agreements	$ 247,579	$ 174,971	$ 71,637	$ 47,400	$ 541,587
Total securities loaned and other	28,402	997	2,132	2,169	33,700

Transfers not qualifying for sale accounting

At December 31, 2019 and 2018, the Firm held $743 million and $2.1 billion, respectively, of financial assets for which the rights have been transferred to third parties; however, the transfers did not qualify as a sale in accordance with U.S. GAAP. These transfers have been recognized as collateralized financing transactions. The transferred assets are recorded in trading assets and loans, and the corresponding liabilities are recorded predominantly in short-term borrowings on the Consolidated balance sheets. The prior period amount has been revised to conform with the current period presentation.

Note 12 – Loans

Loan accounting framework

The accounting for a loan depends on management's strategy for the loan, and on whether the loan was credit-impaired at the date of acquisition. The Firm accounts for loans based on the following categories:

- Originated or purchased loans held-for-investment (i.e., "retained"), other than PCI loans
- Loans held-for-sale
- Loans at fair value
- PCI loans held-for-investment

The following provides a detailed accounting discussion of these loan categories:

Loans held-for-investment (other than PCI loans)

Originated or purchased loans held-for-investment, other than PCI loans, are recorded at the principal amount outstanding, net of the following: charge-offs; interest applied to principal (for loans accounted for on the cost recovery method); unamortized discounts and premiums; and net deferred loan fees or costs. Credit card loans also include billed finance charges and fees net of an allowance for uncollectible amounts.

Interest income

Interest income on performing loans held-for-investment, other than PCI loans, is accrued and recognized as interest income at the contractual rate of interest. Purchase price discounts or premiums, as well as net deferred loan fees or costs, are amortized into interest income over the contractual life of the loan as an adjustment of yield.

Nonaccrual loans

Nonaccrual loans are those on which the accrual of interest has been suspended. Loans (other than credit card loans and certain consumer loans insured by U.S. government agencies) are placed on nonaccrual status and considered nonperforming when full payment of principal and interest is not expected, regardless of delinquency status, or when principal and interest has been in default for a period of 90 days or more, unless the loan is both well-secured and in the process of collection. A loan is determined to be past due when the minimum payment is not received from the borrower by the contractually specified due date or for certain loans (e.g., residential real estate loans), when a monthly payment is due and unpaid for 30 days or more. Finally, collateral-dependent loans are typically maintained on nonaccrual status.

On the date a loan is placed on nonaccrual status, all interest accrued but not collected is reversed against interest income. In addition, the amortization of deferred amounts is suspended. Interest income on nonaccrual loans may be recognized as cash interest payments are received (i.e., on a cash basis) if the recorded loan balance is deemed fully collectible; however, if there is doubt regarding the ultimate collectibility of the recorded loan balance, all interest cash receipts are applied to reduce the carrying value of the loan (the cost recovery method). For consumer loans, application of this policy typically results in the Firm recognizing interest income on nonaccrual consumer loans on a cash basis.

A loan may be returned to accrual status when repayment is reasonably assured and there has been demonstrated performance under the terms of the loan or, if applicable, the terms of the restructured loan.

As permitted by regulatory guidance, credit card loans are generally exempt from being placed on nonaccrual status; accordingly, interest and fees related to credit card loans continue to accrue until the loan is charged off or paid in full. The Firm separately establishes an allowance, which reduces loans and is charged to interest income, for the estimated uncollectible portion of accrued and billed interest and fee income on credit card loans.

Allowance for loan losses

The allowance for loan losses represents the estimated probable credit losses inherent in the held-for-investment loan portfolio at the balance sheet date and is recognized on the balance sheet as a contra asset, which brings the recorded investment to the net carrying value. Changes in the allowance for loan losses are recorded in the provision for credit losses on the Firm's Consolidated statements of income. Refer to Note 13 for further information on the Firm's accounting policies for the allowance for loan losses.

Charge-offs

Consumer loans, other than risk-rated business banking and auto loans, and PCI loans, are generally charged off or charged down to the net realizable value of the underlying collateral (i.e., fair value less costs to sell), with an offset to the allowance for loan losses, upon reaching specified stages of delinquency in accordance with standards established by the FFIEC. Residential real estate loans and non-modified credit card loans are generally charged off no later than 180 days past due. Scored auto and modified credit card loans are charged off no later than 120 days past due.

Certain consumer loans will be charged off or charged down to their net realizable value earlier than the FFIEC charge-off standards in certain circumstances as follows:

- Loans modified in a TDR that are determined to be collateral-dependent.
- Loans to borrowers who have experienced an event that suggests a loss is either known or highly certain are subject to accelerated charge-off standards (e.g., residential real estate and auto loans are charged off within 60 days of receiving notification of a bankruptcy filing).
- Auto loans upon repossession of the automobile.

Other than in certain limited circumstances, the Firm typically does not recognize charge-offs on government-guaranteed loans.

Wholesale loans, risk-rated business banking loans and risk-rated auto loans are charged off when it is highly certain that a loss has been realized, including situations where a loan is determined to be both impaired and collateral-dependent. The determination of whether to recognize a charge-off includes many factors, including the prioritization of the Firm's claim in bankruptcy, expectations of the workout/restructuring of the loan and valuation of the borrower's equity or the loan collateral.

When a loan is charged down to the estimated net realizable value, the determination of the fair value of the collateral depends on the type of collateral (e.g., securities, real estate). In cases where the collateral is in the form of liquid securities, the fair value is based on quoted market prices or broker quotes. For illiquid securities or other financial assets, the fair value of the collateral is generally estimated using a discounted cash flow model.

For residential real estate loans, collateral values are based upon external valuation sources. When it becomes likely that a borrower is either unable or unwilling to pay, the Firm utilizes a broker's price opinion, appraisal and/or an automated valuation model of the home based on an exterior-only valuation ("exterior opinions"), which is then updated at least every twelve months, or more frequently depending on various market factors. As soon as practicable after the Firm receives the property in satisfaction of a debt (e.g., by taking legal title or physical possession), the Firm generally obtains an appraisal based on an inspection that includes the interior of the home ("interior appraisals"). Exterior opinions and interior appraisals are discounted based upon the Firm's experience with actual liquidation values as compared with the estimated values provided by exterior opinions and interior appraisals, considering state-specific factors.

For commercial real estate loans, collateral values are generally based on appraisals from internal and external valuation sources. Collateral values are typically updated every six to twelve months, either by obtaining a new appraisal or by performing an internal analysis, in accordance with the Firm's policies. The Firm also considers both borrower- and market-specific factors, which may result in obtaining appraisal updates or broker price opinions at more frequent intervals.

Loans held-for-sale

Loans held-for-sale are measured at the lower of cost or fair value, with valuation changes recorded in noninterest revenue. For consumer loans, the valuation is performed on a portfolio basis. For wholesale loans, the valuation is performed on an individual loan basis.

Interest income on loans held-for-sale is accrued and recognized based on the contractual rate of interest.

Loan origination fees or costs and purchase price discounts or premiums are deferred in a contra loan account until the related loan is sold. The deferred fees or costs and discounts or premiums are an adjustment to the basis of the loan and therefore are included in the periodic determination of the lower of cost or fair value adjustments and/or the gain or loss recognized at the time of sale.

Because these loans are recognized at the lower of cost or fair value, the Firm's allowance for loan losses and charge-off policies do not apply to these loans. However, loans held-for-sale are subject to the nonaccrual policies described above.

Loans at fair value

Loans used in a market-making strategy or risk managed on a fair value basis are measured at fair value, with changes in fair value recorded in noninterest revenue.

Interest income on these loans is accrued and recognized based on the contractual rate of interest. Changes in fair value are recognized in noninterest revenue. Loan origination fees are recognized upfront in noninterest revenue. Loan origination costs are recognized in the associated expense category as incurred.

Because these loans are recognized at fair value, the Firm's allowance for loan losses and charge-off policies do not apply to these loans. However, loans at fair value are subject to the nonaccrual policies described above.

Refer to Note 3 for further information on the Firm's elections of fair value accounting under the fair value option. Refer to Note 2 and Note 3 for further information on loans carried at fair value and classified as trading assets.

PCI loans

PCI loans held-for-investment are initially measured at fair value. PCI loans have evidence of credit deterioration since the loan's origination date and therefore it is probable, at acquisition, that all contractually required payments will not be collected. Because PCI loans are initially measured at fair value, which includes an estimate of future credit losses, no allowance for loan losses related to PCI loans is recorded at the acquisition date. Refer to page 229 of this Note for information on accounting for PCI loans subsequent to their acquisition.

Loan classification changes

Loans in the held-for-investment portfolio that management decides to sell are transferred to the held-for-sale portfolio at the lower of cost or fair value on the date of transfer. Credit-related losses are charged against the allowance for loan losses; non-credit related losses such as those due to changes in interest rates or foreign currency exchange rates are recognized in noninterest revenue.

In the event that management decides to retain a loan in the held-for-sale portfolio, the loan is transferred to the held-for-investment portfolio at the lower of cost or fair value on the date of transfer. These loans are subsequently assessed for impairment based on the Firm's allowance methodology. Refer to Note 13 for a further discussion of the methodologies used in establishing the Firm's allowance for loan losses.

Loan modifications

The Firm seeks to modify certain loans in conjunction with its loss-mitigation activities. Through the modification, JPMorgan Chase grants one or more concessions to a borrower who is experiencing financial difficulty in order to minimize the Firm's economic loss and avoid foreclosure or repossession of the collateral, and to ultimately maximize payments received by the Firm from the borrower. The concessions granted vary by program and by borrower-specific characteristics, and may include interest rate reductions, term extensions, payment deferrals, principal forgiveness, or the acceptance of equity or other assets in lieu of payments.

Such modifications are accounted for and reported as TDRs. A loan that has been modified in a TDR is generally considered to be impaired until it matures, is repaid, or is otherwise liquidated, regardless of whether the borrower performs under the modified terms. In certain limited cases, the effective interest rate applicable to the modified loan is at or above the current market rate at the time of the restructuring. In such circumstances, and assuming that the loan subsequently performs under its modified terms and the Firm expects to collect all contractual principal and interest cash flows, the loan is disclosed as impaired and as a TDR only during the year of the modification; in subsequent years, the loan is not disclosed as an impaired loan or as a TDR so long as repayment of the restructured loan under its modified terms is reasonably assured.

Loans, except for credit card loans, modified in a TDR are generally placed on nonaccrual status, although in many cases such loans were already on nonaccrual status prior to modification. These loans may be returned to performing status (the accrual of interest is resumed) if the following criteria are met: (i) the borrower has performed under the modified terms for a minimum of six months and/or six payments, and (ii) the Firm has an expectation that repayment of the modified loan is reasonably assured based on, for example, the borrower's debt capacity and level of future earnings, collateral values, LTV ratios, and other current market considerations. In certain limited and well-defined circumstances in which the loan is current at the modification date, such loans are not placed on nonaccrual status at the time of modification.

Because loans modified in TDRs are considered to be impaired, these loans are measured for impairment using the Firm's established asset-specific allowance methodology, which considers the expected re-default rates for the modified loans. A loan modified in a TDR generally remains subject to the asset-specific allowance methodology throughout its remaining life, regardless of whether the loan is performing and has been returned to accrual status and/or the loan has been removed from the impaired loans disclosures (i.e., loans restructured at market rates). Refer to Note 13 for further discussion of the methodology used to estimate the Firm's asset-specific allowance.

Foreclosed property

The Firm acquires property from borrowers through loan restructurings, workouts, and foreclosures. Property acquired may include real property (e.g., residential real estate, land, and buildings) and commercial and personal property (e.g., automobiles, aircraft, railcars, and ships).

The Firm recognizes foreclosed property upon receiving assets in satisfaction of a loan (e.g., by taking legal title or physical possession). For loans collateralized by real property, the Firm generally recognizes the asset received at foreclosure sale or upon the execution of a deed in lieu of foreclosure transaction with the borrower. Foreclosed assets are reported in other assets on the Consolidated balance sheets and initially recognized at fair value less costs to sell. Each quarter the fair value of the acquired property is reviewed and adjusted, if necessary, to the lower of cost or fair value. Subsequent adjustments to fair value are charged/credited to noninterest revenue. Operating expense, such as real estate taxes and maintenance, are charged to other expense.

Loan portfolio

The Firm's loan portfolio is divided into three portfolio segments, which are the same segments used by the Firm to determine the allowance for loan losses: Consumer, excluding credit card; Credit card; and Wholesale. Within each portfolio segment the Firm monitors and assesses the credit risk in the following classes of loans, based on the risk characteristics of each loan class.

Consumer, excluding credit card[(a)]	Credit card	Wholesale[(f)]
Residential real estate – excluding PCI • Residential mortgage[(b)] • Home equity[(c)] Other consumer loans[(d)] • Auto • Consumer & Business Banking[(e)] Residential real estate – PCI • Home equity • Prime mortgage • Subprime mortgage • Option ARMs	• Credit card loans	• Commercial and industrial • Real estate • Financial institutions • Governments & Agencies • Other[(g)]

(a) Includes loans held in CCB, scored prime mortgage and scored home equity loans held in AWM and scored prime mortgage loans held in Corporate.
(b) Predominantly includes prime loans (including option ARMs).
(c) Includes senior and junior lien home equity loans.
(d) Includes certain business banking and auto dealer risk-rated loans for which the wholesale methodology is applied for determining the allowance for loan losses; these loans are managed by CCB, and therefore, for consistency in presentation, are included with the other consumer loan classes.
(e) Predominantly includes Business Banking loans.
(f) Includes loans held in CIB, CB, AWM and Corporate. Excludes scored prime mortgage and scored home equity loans held in AWM and scored prime mortgage loans held in Corporate. Classes are internally defined and may not align with regulatory definitions.
(g) Includes loans to: individuals and individual entities (predominantly consists of Wealth Management clients within AWM and includes loans to personal investment companies and personal and testamentary trusts), SPEs and Private education and civic organizations. Refer to Note 14 for more information on SPEs.

The following tables summarize the Firm's loan balances by portfolio segment.

December 31, 2019 (in millions)	Consumer, excluding credit card	Credit card[(a)]	Wholesale	Total	
Retained	**$ 332,038**	**$ 168,924**	**$ 444,639**	**$ 945,601**	(b)
Held-for-sale	**3,002**	**–**	**4,062**	**7,064**	
At fair value	**–**	**–**	**7,104**	**7,104**	
Total	**$ 335,040**	**$ 168,924**	**$ 455,805**	**$ 959,769**	

December 31, 2018 (in millions)	Consumer, excluding credit card	Credit card[(a)]	Wholesale	Total	
Retained	$ 373,637	$ 156,616	$ 439,162	$ 969,415	(b)
Held-for-sale	95	16	11,877	11,988	
At fair value	–	–	3,151	3,151	
Total	$ 373,732	$ 156,632	$ 454,190	$ 984,554	

(a) Includes accrued interest and fees net of an allowance for the uncollectible portion of accrued interest and fee income.
(b) Loans (other than PCI loans and those for which the fair value option has been elected) are presented net of unamortized discounts and premiums and net deferred loan fees or costs. These amounts were not material as of December 31, 2019 and 2018.

The following tables provide information about the carrying value of retained loans purchased, sold and reclassified to held-for-sale during the periods indicated. Reclassifications of loans to held-for sale are non-cash transactions. The Firm manages its exposure to credit risk on an ongoing basis. Selling loans is one way that the Firm reduces its credit exposures. Loans that were reclassified to held-for-sale and sold in a subsequent period are excluded from the sales line of this table.

	2019			
Year ended December 31, (in millions)	Consumer, excluding credit card	Credit card	Wholesale	Total
Purchases	**$ 1,282** (a)(b)	**$ –**	**$ 1,291**	**$ 2,573**
Sales	**30,484**	**–**	**23,435**	**53,919**
Retained loans reclassified to held-for-sale	**9,188**	**–**	**2,371**	**11,559**

	2018			
Year ended December 31, (in millions)	Consumer, excluding credit card	Credit card	Wholesale	Total
Purchases	$ 2,543 (a)(b)	$ –	$ 2,354	$ 4,897
Sales	9,984	–	16,741	26,725
Retained loans reclassified to held-for-sale	36	–	2,276	2,312

	2017			
Year ended December 31, (in millions)	Consumer, excluding credit card	Credit card	Wholesale	Total
Purchases	$ 3,461 (a)(b)	$ –	$ 1,799	$ 5,260
Sales	3,405	–	11,063	14,468
Retained loans reclassified to held-for-sale	6,340 (c)	–	1,229	7,569

(a) Purchases predominantly represent the Firm's voluntary repurchase of certain delinquent loans from loan pools as permitted by Government National Mortgage Association ("Ginnie Mae") guidelines. The Firm typically elects to repurchase these delinquent loans as it continues to service them and/or manage the foreclosure process in accordance with applicable requirements of Ginnie Mae, FHA, RHS, and/or VA.
(b) Excludes purchases of retained loans sourced through the correspondent origination channel and underwritten in accordance with the Firm's standards. Such purchases were $16.6 billion, $18.6 billion and $23.5 billion for the years ended December 31, 2019, 2018 and 2017, respectively.
(c) Includes the Firm's student loan portfolio which was sold in 2017.

Gains and losses on sales of loans

Net gains on sales of loans (including adjustments to record loans held-for-sale at the lower of cost or fair value) recognized in noninterest revenue was $394 million for the year ended December 31, 2019. Gains and losses on sales of loans were not material for the years ended December 31, 2018 and 2017. In addition, the sale of loans may also result in write downs, recoveries or changes in the allowance recognized in the provision for credit losses.

Consumer, excluding credit card, loan portfolio

Consumer loans, excluding credit card loans, consist primarily of residential mortgages, home equity loans and lines of credit, auto loans and consumer and business banking loans, with a focus on serving the prime consumer credit market. The portfolio also includes home equity loans secured by junior liens, prime mortgage loans with an interest-only payment period, and certain payment-option loans that may result in negative amortization.

The following table provides information about retained consumer loans, excluding credit card, by class.

December 31, (in millions)	2019	2018
Residential real estate – excluding PCI		
Residential mortgage	**$ 199,037**	$ 231,078
Home equity	**23,917**	28,340
Other consumer loans		
Auto	**61,522**	63,573
Consumer & Business Banking	**27,199**	26,612
Residential real estate – PCI		
Home equity	**7,377**	8,963
Prime mortgage	**3,965**	4,690
Subprime mortgage	**1,740**	1,945
Option ARMs	**7,281**	8,436
Total retained loans	**$ 332,038**	$ 373,637

Delinquency rates are a primary credit quality indicator for consumer loans. Loans that are more than 30 days past due provide an early warning of borrowers who may be experiencing financial difficulties and/or who may be unable or unwilling to repay the loan. As the loan continues to age, it becomes more clear whether the borrower is likely either unable or unwilling to pay. In the case of residential real estate loans, late-stage delinquencies (greater than 150 days past due) are a strong indicator of loans that will ultimately result in a foreclosure or similar liquidation transaction. In addition to delinquency rates, other credit quality indicators for consumer loans vary based on the class of loan, as follows:

- For residential real estate loans, including both non-PCI and PCI portfolios, the current estimated LTV ratio, or the combined LTV ratio in the case of junior lien loans, is an indicator of the potential loss severity in the event of default. Additionally, LTV or combined LTV ratios can provide insight into a borrower's continued willingness to pay, as the delinquency rate of high-LTV loans tends to be greater than that for loans where the borrower has equity in the collateral. The geographic distribution of the loan collateral also provides insight as to the credit quality of the portfolio, as factors such as the regional economy, home price changes and specific events such as natural disasters, will affect credit quality. The borrower's current or "refreshed" FICO score is a secondary credit quality indicator for certain loans, as FICO scores are an indication of the borrower's credit payment history. Thus, a loan to a borrower with a low FICO score (less than 660) is considered to be of higher risk than a loan to a borrower with a higher FICO score. Further, a loan to a borrower with a high LTV ratio and a low FICO score is at greater risk of default than a loan to a borrower that has both a high LTV ratio and a high FICO score.
- For scored auto and scored business banking loans, geographic distribution is an indicator of the credit performance of the portfolio. Similar to residential real estate loans, geographic distribution provides insights into the portfolio performance based on regional economic activity and events.
- Risk-rated business banking and auto loans are similar to wholesale loans in that the primary credit quality indicators are the internal risk ratings that are assigned to the loan and whether the loans are considered to be criticized and/or nonaccrual. Risk ratings are reviewed on a regular and ongoing basis by Credit Risk Management and are adjusted as necessary for updated information about borrowers' ability to fulfill their obligations. Refer to page 234 of this Note for further information about risk-rated wholesale loan credit quality indicators.

Residential real estate – excluding PCI loans

The following table provides information by class for retained residential real estate – excluding PCI loans.

Residential real estate – excluding PCI loans

December 31, (in millions, except ratios)	Residential mortgage		Home equity		Total residential real estate – excluding PCI	
	2019	2018	**2019**	2018	**2019**	2018
Loan delinquency[(a)]						
Current	**$ 198,024**	$ 225,899	**$ 23,385**	$ 27,611	**$ 221,409**	$ 253,510
30–149 days past due	**604**	2,763	**336**	453	**940**	3,216
150 or more days past due	**409**	2,416	**196**	276	**605**	2,692
Total retained loans	**$ 199,037**	$ 231,078	**$ 23,917**	$ 28,340	**$ 222,954**	$ 259,418
% of 30+ days past due to total retained loans[(b)]	**0.49%**	0.48%	**2.22%**	2.57%	**0.67%**	0.71%
90 or more days past due and government guaranteed[(c)]	**$ 38**	$ 2,541	**—**	—	**$ 38**	$ 2,541
Nonaccrual loans	**1,618**	1,765	**1,162**	1,323	**2,780**	3,088
Current estimated LTV ratios[(d)(e)]						
Greater than 125% and refreshed FICO scores:						
Equal to or greater than 660	**$ 18**	$ 25	**$ 4**	$ 6	**$ 22**	$ 31
Less than 660	**8**	13	**1**	1	**9**	14
101% to 125% and refreshed FICO scores:						
Equal to or greater than 660	**31**	37	**56**	111	**87**	148
Less than 660	**35**	53	**19**	38	**54**	91
80% to 100% and refreshed FICO scores:						
Equal to or greater than 660	**5,013**	3,977	**606**	986	**5,619**	4,963
Less than 660	**207**	281	**191**	326	**398**	607
Less than 80% and refreshed FICO scores:						
Equal to or greater than 660	**186,972**	212,505	**19,597**	22,632	**206,569**	235,137
Less than 660	**6,001**	6,457	**2,776**	3,355	**8,777**	9,812
No FICO/LTV available	**689**	813	**667**	885	**1,356**	1,698
U.S. government-guaranteed	**63**	6,917	**—**	—	**63**	6,917
Total retained loans	**$ 199,037**	$ 231,078	**$ 23,917**	$ 28,340	**$ 222,954**	$ 259,418
Geographic region[(f)]						
California	**$ 66,278**	$ 74,759	**$ 4,831**	$ 5,695	**$ 71,109**	$ 80,454
New York	**25,706**	28,847	**4,885**	5,769	**30,591**	34,616
Illinois	**13,204**	15,249	**1,788**	2,131	**14,992**	17,380
Texas	**12,601**	13,769	**1,599**	1,819	**14,200**	15,588
Florida	**10,454**	10,704	**1,325**	1,575	**11,779**	12,279
Washington	**7,708**	8,304	**720**	869	**8,428**	9,173
Colorado	**7,777**	8,140	**444**	521	**8,221**	8,661
New Jersey	**5,792**	7,302	**1,394**	1,642	**7,186**	8,944
Massachusetts	**5,596**	6,574	**202**	236	**5,798**	6,810
Arizona	**3,929**	4,434	**932**	1,158	**4,861**	5,592
All other[(g)]	**39,992**	52,996	**5,797**	6,925	**45,789**	59,921
Total retained loans	**$ 199,037**	$ 231,078	**$ 23,917**	$ 28,340	**$ 222,954**	$ 259,418

(a) Individual delinquency classifications include mortgage loans insured by U.S. government agencies as follows: current included $17 million and $2.8 billion; 30–149 days past due included $20 million and $2.1 billion; and 150 or more days past due included $26 million and $2.0 billion at December 31, 2019 and 2018, respectively.

(b) At December 31, 2019 and 2018, residential mortgage loans excluded mortgage loans insured by U.S. government agencies of $46 million and $4.1 billion, respectively, that are 30 or more days past due. These amounts have been excluded based upon the government guarantee.

(c) These balances are excluded from nonaccrual loans as the loans are guaranteed by U.S government agencies. Typically the principal balance of the loans is insured and interest is guaranteed at a specified reimbursement rate subject to meeting agreed-upon servicing guidelines. At December 31, 2019 and 2018, these balances included $34 million and $999 million, respectively, of loans that are no longer accruing interest based on the agreed-upon servicing guidelines. For the remaining balance, interest is being accrued at the guaranteed reimbursement rate. There were no loans that were not guaranteed by U.S. government agencies that are 90 or more days past due and still accruing interest at December 31, 2019 and 2018.

(d) Represents the aggregate unpaid principal balance of loans divided by the estimated current property value. Current property values are estimated, at a minimum, quarterly, based on home valuation models using nationally recognized home price index valuation estimates incorporating actual data to the extent available and forecasted data where actual data is not available. These property values do not represent actual appraised loan level collateral values; as such, the resulting ratios are necessarily imprecise and should be viewed as estimates. Current estimated combined LTV for junior lien home equity loans considers all available lien positions, as well as unused lines, related to the property.

(e) Refreshed FICO scores represent each borrower's most recent credit score, which is obtained by the Firm on at least a quarterly basis.

(f) The geographic regions presented in the table are ordered based on the magnitude of the corresponding loan balances at December 31, 2019.

(g) At December 31, 2019 and 2018, included mortgage loans insured by U.S. government agencies of $63 million and $6.9 billion, respectively. These amounts have been excluded from the geographic regions presented based upon the government guarantee.

Approximately 37% of the home equity portfolio are senior lien loans; the remaining balance are junior lien HELOANs or HELOCs. The following table provides the Firm's delinquency statistics for junior lien home equity loans and lines as of December 31, 2019 and 2018.

	Total loans		Total 30+ day delinquency rate	
December 31, (in millions except ratios)	**2019**	2018	**2019**	2018
HELOCs:[(a)]				
Within the revolving period[(b)]	**$ 5,488**	$ 5,608	**0.35%**	0.25%
Beyond the revolving period	**8,724**	11,286	**2.48**	2.80
HELOANs	**754**	1,030	**2.52**	2.82
Total	**$ 14,966**	$ 17,924	**1.70%**	2.00%

(a) These HELOCs are predominantly revolving loans for a 10-year period, after which time the HELOC converts to a loan with a 20-year amortization period, but also include HELOCs that allow interest-only payments beyond the revolving period.
(b) The Firm manages the risk of HELOCs during their revolving period by closing or reducing the undrawn line to the extent permitted by law when borrowers are experiencing financial difficulty.

HELOCs beyond the revolving period and HELOANs have higher delinquency rates than HELOCs within the revolving period. That is primarily because the fully-amortizing payment that is generally required for those products is higher than the minimum payment options available for HELOCs within the revolving period. The higher delinquency rates associated with amortizing HELOCs and HELOANs are factored into the Firm's allowance for loan losses.

Impaired loans

The table below provides information about the Firm's residential real estate impaired loans, excluding PCI loans. These loans are considered to be impaired as they have been modified in a TDR. All impaired loans are evaluated for an asset-specific allowance as described in Note 13.

December 31, (in millions)	Residential mortgage		Home equity		Total residential real estate – excluding PCI	
	2019	2018	**2019**	2018	**2019**	2018
Impaired loans						
With an allowance	**$ 2,851**	$ 3,381	**$ 1,042**	$ 1,151	**$ 3,893**	$ 4,532
Without an allowance[(a)]	**1,154**	1,184	**879**	907	**2,033**	2,091
Total impaired loans[(b)(c)]	**$ 4,005**	$ 4,565	**$ 1,921**	$ 2,058	**$ 5,926**	$ 6,623
Allowance for loan losses related to impaired loans	**$ 52**	$ 88	**$ 13**	$ 45	**$ 65**	$ 133
Unpaid principal balance of impaired loans[(d)]	**5,438**	6,207	**3,301**	3,531	**8,739**	9,738
Impaired loans on nonaccrual status[(e)]	**1,367**	1,459	**965**	963	**2,332**	2,422

(a) Represents collateral-dependent residential real estate loans that are charged off to the fair value of the underlying collateral less costs to sell. The Firm reports, in accordance with regulatory guidance, residential real estate loans that have been discharged under Chapter 7 bankruptcy and not reaffirmed by the borrower ("Chapter 7 loans") as collateral-dependent nonaccrual TDRs, regardless of their delinquency status. At December 31, 2019, Chapter 7 residential real estate loans included approximately 9% of residential mortgages and approximately 7% of home equity that were 30 days or more past due.
(b) At December 31, 2019 and 2018, $14 million and $4.1 billion, respectively, of loans modified subsequent to repurchase from Ginnie Mae in accordance with the standards of the appropriate government agency (i.e., FHA, VA, RHS) are not included in the table above. When such loans perform subsequent to modification in accordance with Ginnie Mae guidelines, they are generally sold back into Ginnie Mae loan pools. Modified loans that do not re-perform become subject to foreclosure.
(c) Predominantly all impaired loans in the table above are in the U.S.
(d) Represents the contractual amount of principal owed at December 31, 2019 and 2018. The unpaid principal balance differs from the impaired loan balances due to various factors including charge-offs, net deferred loan fees or costs, and unamortized discounts or premiums on purchased loans.
(e) As of December 31, 2019 and 2018, nonaccrual loans included $1.9 billion and $2.0 billion, respectively, of TDRs for which the borrowers were less than 90 days past due. Refer to the Loan accounting framework on pages 217–219 of this Note for additional information about loans modified in a TDR that are on nonaccrual status.

The following table presents average impaired loans and the related interest income reported by the Firm.

Year ended December 31, (in millions)	Average impaired loans			Interest income on impaired loans[(a)]			Interest income on impaired loans on a cash basis[(a)]		
	2019	2018	2017	**2019**	2018	2017	**2019**	2018	2017
Residential mortgage	**$ 4,307**	$ 5,082	$ 5,797	**$ 224**	$ 257	$ 287	**$ 68**	$ 75	$ 75
Home equity	**2,007**	2,123	2,222	**132**	131	127	**83**	84	80
Total residential real estate – excluding PCI	**$ 6,314**	$ 7,205	$ 8,019	**$ 356**	$ 388	$ 414	**$ 151**	$ 159	$ 155

(a) Generally, interest income on loans modified in TDRs is recognized on a cash basis until the borrower has made a minimum of six payments under the new terms, unless the loan is deemed to be collateral-dependent.

Loan modifications

Modifications of residential real estate loans, excluding PCI loans, are generally accounted for and reported as TDRs. There were no additional commitments to lend to borrowers whose residential real estate loans, excluding PCI loans, have been modified in TDRs.

The following table presents new TDRs reported by the Firm.

Year ended December 31, (in millions)	**2019**	2018	2017
Residential mortgage	**$ 234**	$ 401	$ 373
Home equity	**256**	335	383
Total residential real estate – excluding PCI	**$ 490**	$ 736	$ 756

Nature and extent of modifications

The Firm's proprietary modification programs as well as government programs, including U.S. GSEs, generally provide various concessions to financially troubled borrowers including, but not limited to, interest rate reductions, term or payment extensions and deferral of principal and/or interest payments that would otherwise have been required under the terms of the original agreement.

The following table provides information about how residential real estate loans, excluding PCI loans, were modified under the Firm's loss mitigation programs described above during the periods presented. This table excludes Chapter 7 loans where the sole concession granted is the discharge of debt.

	Residential mortgage			Home equity			Total residential real estate – excluding PCI		
Year ended December 31,	**2019**	2018	2017	**2019**	2018	2017	**2019**	2018	2017
Number of loans approved for a trial modification	**2,105**	2,570	1,283	**3,767**	4,605 (c)	5,765 (c)	**5,872**	7,175 (c)	7,048 (c)
Number of loans permanently modified	**1,448**	2,907	2,628	**3,470**	4,946	5,624	**4,918**	7,853	8,252
Concession granted:[(a)]									
Interest rate reduction	**66%**	40%	63%	**81%**	62%	59%	**77%**	54%	60%
Term or payment extension	**90**	55	72	**64**	66	69	**71**	62	70
Principal and/or interest deferred	**26**	44	15	**7**	20	10	**13**	29	12
Principal forgiveness	**6**	8	16	**5**	7	13	**5**	7	14
Other[(b)]	**45**	38	33	**70**	58	31	**63**	51	32

(a) Represents concessions granted in permanent modifications as a percentage of the number of loans permanently modified. The sum of the percentages exceeds 100% because predominantly all of the modifications include more than one type of concession. Concessions offered on trial modifications are generally consistent with those granted on permanent modifications.

(b) Includes variable interest rate to fixed interest rate modifications for the years ended December 31, 2019, 2018 and 2017. Also includes forbearances that meet the definition of a TDR for the years ended December 31, 2019 and 2018. Forbearances suspend or reduce monthly payments for a specific period of time to address a temporary hardship.

(c) The prior period amounts have been revised to conform with the current period presentation. This revision also impacted home equity impaired loans and new TDRs in this note, as well as loans by impairment methodology in Note 13.

Financial effects of modifications and redefaults

The following table provides information about the financial effects of the various concessions granted in modifications of residential real estate loans, excluding PCI, under the loss mitigation programs described above and about redefaults of certain loans modified in TDRs for the periods presented. The following table presents only the financial effects of permanent modifications and does not include temporary concessions offered through trial modifications. This table also excludes Chapter 7 loans where the sole concession granted is the discharge of debt.

Year ended December 31, (in millions, except weighted-average data)	Residential mortgage			Home equity			Total residential real estate – excluding PCI		
	2019	2018	2017	**2019**	2018	2017	**2019**	2018	2017
Weighted-average interest rate of loans with interest rate reductions – before TDR	**5.88%**	5.65%	5.15%	**5.53%**	5.39%	4.94%	**5.68%**	5.50%	5.06%
Weighted-average interest rate of loans with interest rate reductions – after TDR	**4.21**	3.80	2.99	**3.53**	3.46	2.64	**3.81**	3.60	2.83
Weighted-average remaining contractual term (in years) of loans with term or payment extensions – before TDR	**21**	24	24	**19**	19	21	**20**	21	23
Weighted-average remaining contractual term (in years) of loans with term or payment extensions – after TDR	**39**	38	38	**40**	39	39	**39**	38	38
Charge-offs recognized upon permanent modification	**$ 1**	$ 1	$ 2	**$ —**	$ 1	$ 1	**$ 1**	$ 2	$ 3
Principal deferred	**15**	21	12	**4**	9	10	**19**	30	22
Principal forgiven	**4**	10	20	**3**	7	13	**7**	17	33
Balance of loans that redefaulted within one year of permanent modification[(a)]	**$ 107**	$ 97	$ 124	**$ 59**	$ 64	$ 56	**$ 166**	$ 161	$ 180

(a) Represents loans permanently modified in TDRs that experienced a payment default in the periods presented, and for which the payment default occurred within one year of the modification. The dollar amounts presented represent the balance of such loans at the end of the reporting period in which such loans defaulted. For residential real estate loans modified in TDRs, payment default is deemed to occur when the loan becomes two contractual payments past due. In the event that a modified loan redefaults, it is probable that the loan will ultimately be liquidated through foreclosure or another similar type of liquidation transaction. Redefaults of loans modified within the last 12 months may not be representative of ultimate redefault levels.

At December 31, 2019, the weighted-average estimated remaining lives of residential real estate loans, excluding PCI loans, permanently modified in TDRs were 9 years for residential mortgage and 8 years for home equity. The estimated remaining lives of these loans reflect estimated prepayments, both voluntary and involuntary (i.e., foreclosures and other forced liquidations).

Active and suspended foreclosure

At December 31, 2019 and 2018, the Firm had non-PCI residential real estate loans, excluding those insured by U.S. government agencies, with a carrying value of $529 million and $653 million, respectively, that were not included in REO, but were in the process of active or suspended foreclosure.

Other consumer loans

The table below provides information for other consumer retained loan classes, including auto and business banking loans.

December 31, (in millions, except ratios)	Auto		Consumer & Business Banking		Total other consumer	
	2019	2018	**2019**	2018	**2019**	2018
Loan delinquency						
Current	**$ 60,944**	$ 62,984	**$ 26,842**	$ 26,249	**$ 87,786**	$ 89,233
30–119 days past due	**578**	589	**240**	252	**818**	841
120 or more days past due	**—**	—	**117**	111	**117**	111
Total retained loans	**$ 61,522**	$ 63,573	**$ 27,199**	$ 26,612	**$ 88,721**	$ 90,185
% of 30+ days past due to total retained loans	**0.94%**	0.93%	**1.31%**	1.36%	**1.05%**	1.06%
Nonaccrual loans[(a)]	**113**	128	**247**	245	**360**	373
Geographic region[(b)]						
California	**$ 8,081**	$ 8,330	**$ 5,902**	$ 5,520	**$ 13,983**	$ 13,850
Texas	**6,804**	6,531	**3,110**	2,993	**9,914**	9,524
New York	**3,639**	3,863	**4,432**	4,381	**8,071**	8,244
Illinois	**3,360**	3,716	**1,745**	2,046	**5,105**	5,762
Florida	**3,262**	3,256	**1,609**	1,502	**4,871**	4,758
Arizona	**2,024**	2,084	**1,276**	1,491	**3,300**	3,575
Ohio	**1,986**	1,973	**1,139**	1,305	**3,125**	3,278
New Jersey	**1,905**	1,981	**798**	723	**2,703**	2,704
Michigan	**1,215**	1,357	**1,253**	1,329	**2,468**	2,686
Louisiana	**1,617**	1,587	**741**	860	**2,358**	2,447
All other	**27,629**	28,895	**5,194**	4,462	**32,823**	33,357
Total retained loans	**$ 61,522**	$ 63,573	**$ 27,199**	$ 26,612	**$ 88,721**	$ 90,185
Loans by risk ratings[(c)]						
Noncriticized	**$ 14,178**	$ 15,749	**$ 19,156**	$ 18,743	**$ 33,334**	$ 34,492
Criticized performing	**360**	273	**727**	751	**1,087**	1,024
Criticized nonaccrual	**—**	—	**198**	191	**198**	191

(a) There were no loans that were 90 or more days past due and still accruing interest at December 31, 2019 and December 31, 2018.
(b) The geographic regions presented in the table are ordered based on the magnitude of the corresponding loan balances at December 31, 2019.
(c) For risk-rated business banking and auto loans, the primary credit quality indicator is the internal risk rating of the loan, including whether the loans are considered to be criticized and/or nonaccrual.

Other consumer impaired loans and loan modifications

The following table provides information about the Firm's other consumer impaired loans, including risk-rated business banking and auto loans that have been placed on nonaccrual status, and loans that have been modified in TDRs.

December 31, (in millions)	2019	2018
Impaired loans		
With an allowance	$ 227	$ 222
Without an allowance[a]	19	29
Total impaired loans[b][c]	$ 246	$ 251
Allowance for loan losses related to impaired loans	$ 71	$ 63
Unpaid principal balance of impaired loans[d]	342	355
Impaired loans on nonaccrual status	224	229

(a) When discounted cash flows, collateral value or market price equals or exceeds the recorded investment in the loan, the loan does not require an allowance. This typically occurs when the impaired loans have been partially charged off and/or there have been interest payments received and applied to the loan balance.
(b) Predominantly all other consumer impaired loans are in the U.S.
(c) Other consumer average impaired loans were $246 million, $275 million and $427 million for the years ended December 31, 2019, 2018 and 2017, respectively. The related interest income on impaired loans, including those on a cash basis, was not material for the years ended December 31, 2019, 2018 and 2017.
(d) Represents the contractual amount of principal owed at December 31, 2019 and 2018. The unpaid principal balance differs from the impaired loan balances due to various factors, including charge-offs, interest payments received and applied to the principal balance, net deferred loan fees or costs and unamortized discounts or premiums on purchased loans.

Loan modifications

Certain other consumer loan modifications are considered to be TDRs as they provide various concessions to borrowers who are experiencing financial difficulty. All of these TDRs are reported as impaired loans. At December 31, 2019 and 2018, other consumer loans modified in TDRs were $76 million and $79 million, respectively. The impact of these modifications, as well as new TDRs, were not material to the Firm for the years ended December 31, 2019, 2018 and 2017. Additional commitments to lend to borrowers whose loans have been modified in TDRs as of December 31, 2019 and 2018 were not material. TDRs on nonaccrual status were $54 million and $57 million at December 31, 2019 and 2018, respectively.

Purchased credit-impaired loans

PCI loans are initially recorded at fair value at acquisition. PCI loans acquired in the same fiscal quarter may be aggregated into one or more pools, provided that the loans have common risk characteristics. A pool is then accounted for as a single asset with a single composite interest rate and an aggregate expectation of cash flows. All of the Firm's residential real estate PCI loans were acquired in the same fiscal quarter and aggregated into pools of loans with common risk characteristics.

On a quarterly basis, the Firm estimates the total cash flows (both principal and interest) expected to be collected over the remaining life of each pool. These estimates incorporate assumptions regarding default rates, loss severities, the amounts and timing of prepayments and other factors that reflect then-current market conditions. Probable decreases in expected cash flows (i.e., increased credit losses) trigger the recognition of impairment, which is then measured as the present value of the expected principal loss plus any related forgone interest cash flows, discounted at the pool's effective interest rate. Impairments are recognized through the provision for credit losses and an increase in the allowance for loan losses. Probable and significant increases in expected cash flows (e.g., decreased credit losses, the net benefit of modifications) would first reverse any previously recorded allowance for loan losses with any remaining increases recognized prospectively as a yield adjustment over the remaining estimated lives of the underlying loans. The impacts of (i) prepayments, (ii) changes in variable interest rates, and (iii) any other changes in the timing of expected cash flows are generally recognized prospectively as adjustments to interest income.

The Firm continues to modify certain PCI loans. The impact of these modifications is incorporated into the Firm's quarterly assessment of whether a probable and significant change in expected cash flows has occurred, and the loans continue to be accounted for and reported as PCI loans. In evaluating the effect of modifications on expected cash flows, the Firm incorporates the effect of any forgone interest and also considers the potential for redefault. The Firm develops product-specific probability of default estimates, which are used to compute expected credit losses. In developing these probabilities of default, the Firm considers the relationship between the credit quality characteristics of the underlying loans and certain assumptions about home prices and unemployment based upon industry-wide data. The Firm also considers its own historical loss experience to-date based on actual redefaulted modified PCI loans.

The excess of cash flows expected to be collected over the carrying value of the underlying loans is referred to as the accretable yield. This amount is not reported on the Firm's Consolidated balance sheets but is accreted into interest income at a level rate of return over the remaining estimated lives of the underlying pools of loans.

Since the timing and amounts of expected cash flows for the Firm's PCI consumer loan pools are reasonably estimable, interest is being accreted and the loan pools are being reported as performing loans. No interest would be accreted and the PCI loan pools would be reported as nonaccrual loans if the timing and/or amounts of expected cash flows on the loan pools were determined not to be reasonably estimable.

The liquidation of PCI loans, which may include sales of loans, receipt of payment in full from the borrower, or foreclosure, results in removal of the loans from the underlying PCI pool. When the amount of the liquidation proceeds (e.g., cash, real estate), if any, is less than the unpaid principal balance of the loan, the difference is first applied against the PCI pool's nonaccretable difference for principal losses (i.e., the lifetime credit loss estimate established as a purchase accounting adjustment at the acquisition date). When the nonaccretable difference for a particular loan pool has been fully depleted, any excess of the unpaid principal balance of the loan over the liquidation proceeds is written off against the PCI pool's allowance for loan losses. Write-offs of PCI loans also include other adjustments, primarily related to principal forgiveness modifications. Because the Firm's PCI loans are accounted for at a pool level, the Firm does not recognize charge-offs of PCI loans when they reach specified stages of delinquency (i.e., unlike non-PCI consumer loans, these loans are not charged off based on FFIEC standards).

The PCI portfolio affects the Firm's results of operations primarily through: (i) contribution to net interest margin; (ii) expense related to defaults and servicing resulting from the liquidation of the loans; and (iii) any provision for loan losses.

Residential real estate – PCI loans

The table below provides information about the Firm's consumer, excluding credit card, PCI loans.

December 31, (in millions, except ratios)	Home equity 2019	Home equity 2018	Prime mortgage 2019	Prime mortgage 2018	Subprime mortgage 2019	Subprime mortgage 2018	Option ARMs 2019	Option ARMs 2018	Total PCI 2019	Total PCI 2018
Carrying value[(a)]	**$ 7,377**	$ 8,963	**$ 3,965**	$ 4,690	**$ 1,740**	$ 1,945	**$ 7,281**	$ 8,436	**$ 20,363**	$ 24,034
Loan delinquency (based on unpaid principal balance)										
Current	**$ 7,203**	$ 8,624	**$ 3,593**	$ 4,226	**$ 1,864**	$ 2,033	**$ 6,606**	$ 7,592	**$ 19,266**	$ 22,475
30–149 days past due	**217**	278	**219**	259	**230**	286	**356**	398	**1,022**	1,221
150 or more days past due	**148**	242	**172**	223	**101**	123	**333**	457	**754**	1,045
Total loans	**$ 7,568**	$ 9,144	**$ 3,984**	$ 4,708	**$ 2,195**	$ 2,442	**$ 7,295**	$ 8,447	**$ 21,042**	$ 24,741
% of 30+ days past due to total loans	**4.82%**	5.69%	**9.81%**	10.24%	**15.08%**	16.75%	**9.44%**	10.12%	**8.44%**	9.16%
Current estimated LTV ratios (based on unpaid principal balance)[(b)(c)]										
Greater than 125% and refreshed FICO scores:										
Equal to or greater than 660	**$ 12**	$ 17	**$ 2**	$ 1	**$ —**	$ —	**$ 1**	$ 3	**$ 15**	$ 21
Less than 660	**9**	13	**6**	7	**7**	9	**7**	7	**29**	36
101% to 125% and refreshed FICO scores:										
Equal to or greater than 660	**86**	135	**3**	6	**6**	4	**14**	17	**109**	162
Less than 660	**39**	65	**17**	22	**20**	35	**18**	33	**94**	155
80% to 100% and refreshed FICO scores:										
Equal to or greater than 660	**588**	805	**47**	75	**47**	54	**85**	119	**767**	1,053
Less than 660	**261**	388	**65**	112	**100**	161	**113**	190	**539**	851
Lower than 80% and refreshed FICO scores:										
Equal to or greater than 660	**4,803**	5,548	**2,429**	2,689	**784**	739	**4,710**	5,111	**12,726**	14,087
Less than 660	**1,562**	1,908	**1,250**	1,568	**1,136**	1,327	**2,093**	2,622	**6,041**	7,425
No FICO/LTV available	**208**	265	**165**	228	**95**	113	**254**	345	**722**	951
Total unpaid principal balance	**$ 7,568**	$ 9,144	**$ 3,984**	$ 4,708	**$ 2,195**	$ 2,442	**$ 7,295**	$ 8,447	**$ 21,042**	$ 24,741
Geographic region (based on unpaid principal balance)[(d)]										
California	**$ 4,475**	$ 5,420	**$ 2,166**	$ 2,578	**$ 531**	$ 593	**$ 4,189**	$ 4,798	**$ 11,361**	$ 13,389
Florida	**833**	976	**288**	332	**212**	234	**604**	713	**1,937**	2,255
New York	**451**	525	**324**	365	**245**	268	**441**	502	**1,461**	1,660
Illinois	**200**	233	**134**	154	**113**	123	**175**	199	**622**	709
Washington	**326**	419	**80**	98	**37**	44	**143**	177	**586**	738
New Jersey	**174**	210	**112**	134	**78**	88	**219**	258	**583**	690
Massachusetts	**53**	65	**97**	113	**67**	73	**206**	240	**423**	491
Maryland	**40**	48	**86**	95	**87**	96	**157**	178	**370**	417
Virginia	**44**	54	**77**	91	**33**	37	**180**	211	**334**	393
Arizona	**130**	165	**57**	69	**37**	43	**93**	112	**317**	389
All other	**842**	1,029	**563**	679	**755**	843	**888**	1,059	**3,048**	3,610
Total unpaid principal balance	**$ 7,568**	$ 9,144	**$ 3,984**	$ 4,708	**$ 2,195**	$ 2,442	**$ 7,295**	$ 8,447	**$ 21,042**	$ 24,741

(a) Carrying value includes the effect of fair value adjustments that were applied to the consumer PCI portfolio at the date of acquisition.
(b) Represents the aggregate unpaid principal balance of loans divided by the estimated current property value. Current property values are estimated, at a minimum, quarterly, based on home valuation models using nationally recognized home price index valuation estimates incorporating actual data to the extent available and forecasted data where actual data is not available. These property values do not represent actual appraised loan level collateral values; as such, the resulting ratios are necessarily imprecise and should be viewed as estimates. Current estimated combined LTV for junior lien home equity loans considers all available lien positions, as well as unused lines, related to the property.
(c) Refreshed FICO scores represent each borrower's most recent credit score, which is obtained by the Firm on at least a quarterly basis.
(d) The geographic regions presented in the table are ordered based on the magnitude of the corresponding loan balances at December 31, 2019.

Approximately 27% of the PCI home equity portfolio are senior lien loans; the remaining balance are junior lien HELOANs or HELOCs. The following table provides delinquency statistics for PCI junior lien home equity loans and lines of credit based on the unpaid principal balance as of December 31, 2019 and 2018.

December 31, (in millions, except ratios)	Total loans		Total 30+ day delinquency rate	
	2019	2018	**2019**	2018
HELOCs:[(a)(b)]	**$ 5,337**	$ 6,531	**3.52%**	4.00%
HELOANs	**220**	280	**3.64**	3.57
Total	**$ 5,557**	$ 6,811	**3.53%**	3.98%

(a) In general, these HELOCs are revolving loans for a 10-year period, after which time the HELOC converts to an interest-only loan with a balloon payment at the end of the loan's term. Substantially all HELOCs are beyond the revolving period.
(b) Includes loans modified into fixed rate amortizing loans.

The table below presents the accretable yield activity for the Firm's PCI consumer loans for the years ended December 31, 2019, 2018 and 2017, and represents the Firm's estimate of gross interest income expected to be earned over the remaining life of the PCI loan portfolios. The table excludes the cost to fund the PCI portfolios, and therefore the accretable yield does not represent net interest income expected to be earned on these portfolios.

Year ended December 31, (in millions, except ratios)	Total PCI		
	2019	2018	2017
Beginning balance	**$ 8,422**	$ 11,159	$ 11,768
Accretion into interest income	**(1,093)**	(1,249)	(1,396)
Changes in interest rates on variable-rate loans	**(575)**	(109)	503
Other changes in expected cash flows[(a)]	**(589)**	(1,379)	284
Balance at December 31	**$ 6,165**	$ 8,422	$ 11,159
Accretable yield percentage	**5.28%**	4.92%	4.53%

(a) Other changes in expected cash flows may vary from period to period as the Firm continues to refine its cash flow model, for example cash flows expected to be collected due to the impact of modifications and changes in prepayment assumptions.

Active and suspended foreclosure

At December 31, 2019 and 2018, the Firm had PCI residential real estate loans with an unpaid principal balance of $721 million and $964 million, respectively, that were not included in REO, but were in the process of active or suspended foreclosure.

Credit card loan portfolio

The credit card portfolio segment includes credit card loans originated and purchased by the Firm. Delinquency rates are the primary credit quality indicator for credit card loans as they provide an early warning that borrowers may be experiencing difficulties (30 days past due); information on those borrowers that have been delinquent for a longer period of time (90 days past due) is also considered. In addition to delinquency rates, the geographic distribution of the loans provides insight as to the credit quality of the portfolio based on the regional economy.

While the borrower's credit score is another general indicator of credit quality, the Firm does not view credit scores as a primary indicator of credit quality because the borrower's credit score tends to be a lagging indicator. The distribution of such scores provides a general indicator of credit quality trends within the portfolio; however, the score does not capture all factors that would be predictive of future credit performance. Refreshed FICO score information, which is obtained at least quarterly, for a statistically significant random sample of the credit card portfolio is indicated in the following table. FICO is considered to be the industry benchmark for credit scores.

The Firm generally originates new card accounts to prime consumer borrowers. However, certain cardholders' FICO scores may decrease over time, depending on the performance of the cardholder and changes in the credit score calculation.

The table below provides information about the Firm's credit card loans.

As of or for the year ended December 31, (in millions, except ratios)	2019	2018
Net charge-offs	**$ 4,848**	$ 4,518
Net charge-off rate	**3.10%**	3.10%
Loan delinquency		
Current and less than 30 days past due and still accruing	**$ 165,767**	$ 153,746
30–89 days past due and still accruing	**1,550**	1,426
90 or more days past due and still accruing	**1,607**	1,444
Total retained loans	**$ 168,924**	$ 156,616
Loan delinquency ratios		
% of 30+ days past due to total retained loans	**1.87%**	1.83%
% of 90+ days past due to total retained loans	**0.95**	0.92
Geographic region[(a)]		
California	**$ 25,783**	$ 23,757
Texas	**16,728**	15,085
New York	**14,544**	13,601
Florida	**10,830**	9,770
Illinois	**9,579**	8,938
New Jersey	**7,165**	6,739
Ohio	**5,406**	5,094
Pennsylvania	**5,245**	4,996
Colorado	**4,763**	4,309
Michigan	**4,164**	3,912
All other	**64,717**	60,415
Total retained loans	**$ 168,924**	$ 156,616
Percentage of portfolio based on carrying value with estimated refreshed FICO scores		
Equal to or greater than 660	**84.0%**	84.2%
Less than 660	**15.4**	15.0
No FICO available	**0.6**	0.8

(a) The geographic regions presented in the table are ordered based on the magnitude of the corresponding loan balances at December 31, 2019.

Credit card impaired loans and loan modifications

The table below provides information about the Firm's impaired credit card loans. All of these loans are considered to be impaired as they have been modified in TDRs.

December 31, (in millions)	2019	2018
Impaired credit card loans with an allowance[(a)(b)(c)]	**$ 1,452**	$ 1,319
Allowance for loan losses related to impaired credit card loans	**477**	440

(a) The carrying value and the unpaid principal balance are the same for credit card impaired loans.
(b) There were no impaired loans without an allowance.
(c) Predominantly all impaired credit card loans are in the U.S.

The following table presents average balances of impaired credit card loans and interest income recognized on those loans.

Year ended December 31, (in millions)	2019	2018	2017
Average impaired credit card loans	**$ 1,389**	$ 1,260	$ 1,214
Interest income on impaired credit card loans	**72**	65	59

Loan modifications

The Firm may offer one of a number of loan modification programs to credit card borrowers who are experiencing financial difficulty. Most of the credit card loans have been modified under long-term programs for borrowers who are experiencing financial difficulties. These modifications involve placing the customer on a fixed payment plan, generally for 60 months, and typically include reducing the interest rate on the credit card. Substantially all modifications are considered to be TDRs.

If the cardholder does not comply with the modified payment terms, then the credit card loan continues to age and will ultimately be charged-off in accordance with the Firm's standard charge-off policy. In most cases, the Firm does not reinstate the borrower's line of credit.

New enrollments in these loan modification programs for the years ended December 31, 2019, 2018 and 2017, were $961 million, $866 million and $756 million, respectively. For all periods disclosed, new enrollments were less than 1% of total retained credit card loans.

Financial effects of modifications and redefaults

The following table provides information about the financial effects of the concessions granted on credit card loans modified in TDRs and redefaults for the periods presented.

Year ended December 31, (in millions, except weighted-average data)	2019	2018	2017
Weighted-average interest rate of loans – before TDR	**19.07%**	17.98%	16.58%
Weighted-average interest rate of loans – after TDR	**4.70**	5.16	4.88
Loans that redefaulted within one year of modification[(a)]	**$ 148**	$ 116	$ 93

(a) Represents loans modified in TDRs that experienced a payment default in the periods presented, and for which the payment default occurred within one year of the modification. The amounts presented represent the balance of such loans as of the end of the quarter in which they defaulted.

For credit card loans modified in TDRs, payment default is deemed to have occurred when the borrower misses two consecutive contractual payments. A substantial portion of these loans are expected to be charged-off in accordance with the Firm's standard charge-off policy. Based on historical experience, the estimated weighted-average default rate for modified credit card loans was expected to be 32.89%, 33.38% and 31.54% as of December 31, 2019, 2018 and 2017, respectively.

Wholesale loan portfolio

Wholesale loans include loans made to a variety of clients, ranging from large corporate and institutional clients to high-net-worth individuals.

The primary credit quality indicator for wholesale loans is the internal risk rating assigned to each loan. Risk ratings are used to identify the credit quality of loans and differentiate risk within the portfolio. Risk ratings on loans consider the PD and the LGD. The PD is the likelihood that a loan will default. The LGD is the estimated loss on the loan that would be realized upon the default of the borrower and takes into consideration collateral and structural support for each credit facility.

Management considers several factors to determine an appropriate internal risk rating, including the obligor's debt capacity and financial flexibility, the level of the obligor's earnings, the amount and sources for repayment, the level and nature of contingencies, management strength, and the industry and geography in which the obligor operates. The Firm's internal risk ratings generally align with the qualitative characteristics (e.g., borrower capacity to meet financial commitments and vulnerability to changes in the economic environment) defined by S&P and Moody's, however the quantitative characteristics (e.g., PDs and LGDs) may differ as they reflect internal historical experiences and assumptions. The Firm considers internal ratings equivalent to BBB-/Baa3 or higher as investment grade, and these ratings have a lower PD and/or lower LGD than non-investment grade ratings.

Noninvestment-grade ratings are further classified as noncriticized and criticized, and the criticized portion is further subdivided into performing and nonaccrual loans, representing management's assessment of the collectibility of principal and interest. Criticized loans have a higher PD than noncriticized loans. The Firm's definition of criticized aligns with the U.S. banking regulatory definition of criticized exposures, which consist of special mention, substandard and doubtful categories.

Risk ratings are reviewed on a regular and ongoing basis by Credit Risk Management and are adjusted as necessary for updated information affecting the obligor's ability to fulfill its obligations.

As noted above, the risk rating of a loan considers the industry in which the obligor conducts its operations. As part of the overall credit risk management framework, the Firm focuses on the management and diversification of its industry and client exposures, with particular attention paid to industries with actual or potential credit concern. Refer to Note 4 for further detail on industry concentrations.

The table below provides information by class of receivable for the retained loans in the Wholesale portfolio segment. Refer to Note 4 for additional information on industry concentrations.

As of or for the year ended December 31, (in millions, except ratios)	Commercial and industrial		Real estate		Financial institutions		Governments & Agencies		Other[d]		Total retained loans	
	2019	2018	**2019**	2018	**2019**	2018	**2019**	2018	**2019**	2018	**2019**	2018
Loans by risk ratings												
Investment-grade	**$ 60,700**	$ 73,497	**$ 101,354**	$100,107	**$ 40,263**	$ 32,178	**$ 12,616**	$ 13,984	**$129,266**	$119,963	**$344,199**	$339,729
Noninvestment-grade:												
Noncriticized	**51,356**	51,720	**13,841**	14,876	**15,768**	15,316	**126**	201	**12,411**	11,478	**93,502**	93,591
Criticized performing	**4,071**	3,738	**1,001**	620	**574**	150	**–**	2	**449**	182	**6,095**	4,692
Criticized nonaccrual	**752**	851	**48**	134	**3**	4	**–**	–	**40**	161	**843**	1,150
Total noninvestment-grade	**56,179**	56,309	**14,890**	15,630	**16,345**	15,470	**126**	203	**12,900**	11,821	**100,440**	99,433
Total retained loans	**$116,879**	$129,806	**$ 116,244**	$115,737	**$ 56,608**	$ 47,648	**$ 12,742**	$ 14,187	**$142,166**	$131,784	**$444,639**	$439,162
% of total criticized to total retained loans	**4.13%**	3.54%	**0.90%**	0.65%	**1.02%**	0.32%	**–%**	0.01%	**0.34%**	0.26%	**1.56%**	1.33%
% of criticized nonaccrual to total retained loans	**0.64**	0.66	**0.04**	0.12	**0.01**	0.01	**–**	–	**0.03**	0.12	**0.19**	0.26
Loans by geographic distribution[a]												
Total non-U.S.	**$ 28,253**	$ 29,572	**$ 4,123**	$ 2,967	**$ 16,800**	$ 18,524	**$ 2,232**	$ 3,150	**$ 49,966**	$ 48,433	**$101,374**	$102,646
Total U.S.	**88,626**	100,234	**112,121**	112,770	**39,808**	29,124	**10,510**	11,037	**92,200**	83,351	**343,265**	336,516
Total retained loans	**$116,879**	$129,806	**$ 116,244**	$115,737	**$ 56,608**	$ 47,648	**$ 12,742**	$ 14,187	**$142,166**	$131,784	**$444,639**	$439,162
Net charge-offs/(recoveries)	**$ 329**	$ 165	**$ 12**	$ (20)	**$ –**	$ –	**$ –**	$ –	**$ 28**	$ 10	**$ 369**	$ 155
% of net charge-offs/(recoveries) to end-of-period retained loans	**0.28%**	0.13%	**0.01%**	(0.02)%	**–%**	–%	**–%**	–%	**0.02%**	0.01%	**0.08%**	0.04%
Loan delinquency[b]												
Current and less than 30 days past due and still accruing	**$115,753**	$128,678	**$ 116,098**	$115,533	**$ 56,583**	$ 47,622	**$ 12,713**	$ 14,165	**$141,739**	$130,918	**$442,886**	$436,916
30–89 days past due and still accruing	**339**	109	**94**	67	**20**	12	**28**	18	**387**	702	**868**	908
90 or more days past due and still accruing[c]	**35**	168	**4**	3	**2**	10	**1**	4	**–**	3	**42**	188
Criticized nonaccrual	**752**	851	**48**	134	**3**	4	**–**	–	**40**	161	**843**	1,150
Total retained loans	**$116,879**	$129,806	**$ 116,244**	$115,737	**$ 56,608**	$ 47,648	**$ 12,742**	$ 14,187	**$142,166**	$131,784	**$444,639**	$439,162

(a) The U.S. and non-U.S. distribution is determined based predominantly on the domicile of the borrower.
(b) The credit quality of wholesale loans is assessed primarily through ongoing review and monitoring of an obligor's ability to meet contractual obligations rather than relying on the past due status, which is generally a lagging indicator of credit quality.
(c) Represents loans that are considered well-collateralized and therefore still accruing interest.
(d) Other includes individuals and individual entities (predominantly consists of Wealth Management clients within AWM and includes loans to personal investment companies and personal and testamentary trusts), SPEs and Private education and civic organizations. Refer to Note 14 for more information on SPEs.

The following table presents additional information on the real estate class of loans within the Wholesale portfolio for the periods indicated, which consists primarily of secured commercial loans, of which multifamily is the largest segment. Multifamily lending finances acquisition, leasing and construction of apartment buildings, and includes loans to real estate investment trusts ("REITs"). Other commercial lending largely includes financing for acquisition, leasing and construction, largely for office, retail and industrial real estate, and includes loans to REITs. Included in real estate loans is $8.2 billion and $10.5 billion as of December 31, 2019 and 2018, respectively, of construction and development loans originally purposed for construction and development, general purpose loans for builders, as well as loans for land subdivision and pre-development.

December 31, (in millions, except ratios)	Multifamily		Other Commercial		Total real estate loans	
	2019	2018	**2019**	2018	**2019**	2018
Real estate retained loans	**$ 79,402**	$ 79,184	**$ 36,842**	$ 36,553	**$ 116,244**	$ 115,737
Criticized	**407**	388	**642**	366	**1,049**	754
% of total criticized to total real estate retained loans	**0.51%**	0.49%	**1.74%**	1.00%	**0.90%**	0.65%
Criticized nonaccrual	**$ 38**	$ 57	**$ 10**	$ 77	**$ 48**	$ 134
% of criticized nonaccrual loans to total real estate retained loans	**0.05%**	0.07%	**0.03%**	0.21%	**0.04%**	0.12%

Wholesale impaired retained loans and loan modifications

Wholesale impaired retained loans consist of loans that have been placed on nonaccrual status and/or that have been modified in a TDR. All impaired loans are evaluated for an asset-specific allowance as described in Note 13.

The table below sets forth information about the Firm's wholesale impaired retained loans.

December 31, (in millions)	Commercial and industrial		Real estate		Financial institutions		Other		Total retained loans	
	2019	2018	**2019**	2018	**2019**	2018	**2019**	2018	**2019**	2018
Impaired loans										
With an allowance	**$ 637**	$ 807	**$ 49**	$ 107	**$ 3**	$ 4	**$ 42**	$ 152	**$ 731**	$ 1,070
Without an allowance[a]	**177**	140	**—**	27	**—**	—	**4**	13	**181**	180
Total impaired loans	**$ 814**	$ 947	**$ 49**	$ 134	**$ 3**	$ 4	**$ 46**	$ 165	**$ 912** [c]	$ 1,250 [c]
Allowance for loan losses related to impaired loans	**$ 221**	$ 252	**$ 9**	$ 25	**$ 1**	$ 1	**$ 3**	$ 19	**$ 234**	$ 297
Unpaid principal balance of impaired loans[b]	**974**	1,043	**72**	203	**4**	4	**54**	473	**1,104**	1,723

(a) When the discounted cash flows, collateral value or market price equals or exceeds the recorded investment in the loan, the loan does not require an allowance. This typically occurs when the impaired loans have been partially charged-off and/or there have been interest payments received and applied to the loan balance.
(b) Represents the contractual amount of principal owed at December 31, 2019 and 2018. The unpaid principal balance differs from the impaired loan balances due to various factors, including charge-offs; interest payments received and applied to the carrying value; net deferred loan fees or costs; and unamortized discount or premiums on purchased loans.
(c) Based upon the domicile of the borrower, largely consists of loans in the U.S.

The following table presents the Firm's average impaired retained loans for the years ended 2019, 2018 and 2017.

Year ended December 31, (in millions)	2019	2018	2017
Commercial and industrial	**$ 1,086**	$ 1,027	$ 1,256
Real estate	**94**	133	165
Financial institutions	**11**	57	48
Other	**168**	199	241
Total[a]	**$ 1,359**	$ 1,416	$ 1,710

(a) The related interest income on accruing impaired loans and interest income recognized on a cash basis were not material for the years ended December 31, 2019, 2018 and 2017.

Certain loan modifications are considered to be TDRs as they provide various concessions to borrowers who are experiencing financial difficulty. All TDRs are reported as impaired loans in the tables above. TDRs were $460 million and $576 million as of December 31, 2019 and 2018, respectively. The impact of these modifications, as well as new TDRs, were not material to the Firm for the years ended December 31, 2019, 2018 and 2017.

Note 13 – Allowance for credit losses

JPMorgan Chase's allowance for loan losses represents management's estimate of probable credit losses inherent in the Firm's retained loan portfolio, which consists of the two consumer portfolio segments (primarily scored) and the wholesale portfolio segment (risk-rated). The allowance for loan losses includes a formula-based component, an asset-specific component, and a component related to PCI loans, as described below. Management also estimates an allowance for wholesale and certain consumer lending-related commitments using methodologies similar to those used to estimate the allowance on the underlying loans.

The Firm's policies used to determine its allowance for credit losses are described in the following paragraphs.

Determining the appropriateness of the allowance is complex and requires judgment by management about the effect of matters that are inherently uncertain. Subsequent evaluations of the loan portfolio, in light of the factors then prevailing, may result in significant changes in the allowances for loan losses and lending-related commitments in future periods. At least quarterly, the allowance for credit losses is reviewed by the CRO, the CFO and the Controller of the Firm. As of December 31, 2019, JPMorgan Chase deemed the allowance for credit losses to be appropriate and sufficient to absorb probable credit losses inherent in the portfolio.

Formula-based component

The formula-based component is based on a statistical calculation to provide for incurred credit losses in all consumer loans and performing risk-rated loans. All loans restructured in TDRs as well as any impaired risk-rated loans have an allowance assessed as part of the asset-specific component, while PCI loans have an allowance assessed as part of the PCI component. Refer to Note 12 for more information on TDRs, Impaired loans and PCI loans.

Formula-based component - Consumer loans and certain lending-related commitments

The formula-based allowance for credit losses for the consumer portfolio segments is calculated by applying statistical credit loss factors (estimated PD and loss severities) to the recorded investment balances or loan-equivalent amounts of pools of loan exposures with similar risk characteristics over a loss emergence period to arrive at an estimate of incurred credit losses. Estimated loss emergence periods may vary by product and may change over time; management applies judgment in estimating loss emergence periods, using available credit information and trends. In addition, management applies judgment to the statistical loss estimates for each loan portfolio category, using delinquency trends and other risk characteristics to estimate the total incurred credit losses in the portfolio. Management uses additional statistical methods and considers actual portfolio performance, including actual losses recognized on defaulted loans and collateral valuation trends, to review the appropriateness of the primary statistical loss estimate. The economic impact of potential modifications of residential real estate loans is not included in the statistical calculation because of the uncertainty regarding the type and results of such modifications.

The statistical calculation is then adjusted to take into consideration model imprecision, external factors and current economic events that have occurred but that are not yet reflected in the factors used to derive the statistical calculation; these adjustments are accomplished in part by analyzing the historical loss experience for each major product segment. However, it is difficult to predict whether historical loss experience is indicative of future loss levels. Management applies judgment in making this adjustment, taking into account uncertainties associated with current macroeconomic and political conditions, quality of underwriting standards, borrower behavior, and other relevant internal and external factors affecting the credit quality of the portfolio. In certain instances, the interrelationships between these factors create further uncertainties. The application of different inputs into the statistical calculation, and the assumptions used by management to adjust the statistical calculation, are subject to management judgment, and emphasizing one input or assumption over another, or considering other inputs or assumptions, could affect the estimate of the allowance for credit losses for the consumer credit portfolio.

Overall, the allowance for credit losses for consumer portfolios is sensitive to changes in the economic environment (e.g., unemployment rates), delinquency rates, the realizable value of collateral (e.g., housing prices), FICO scores, borrower behavior and other risk factors. While all of these factors are important determinants of overall allowance levels, changes in the various factors may not occur at the same time or at the same rate, or changes may be directionally inconsistent such that improvement in one factor may offset deterioration in another. In addition, changes in these factors would not necessarily be consistent across all geographies or product types. Finally, it is difficult to predict the extent to which changes in these factors would ultimately affect the frequency of losses, the severity of losses or both.

Formula-based component - Wholesale loans and lending-related commitments

The Firm's methodology for determining the allowance for loan losses and the allowance for lending-related commitments involves the early identification of credits that are deteriorating. The formula-based component of the allowance for wholesale loans and lending-related commitments is calculated by applying statistical credit loss factors (estimated PD and LGD) to the recorded investment balances or loan-equivalent over a loss emergence period to arrive at an estimate of incurred credit losses in the portfolio. Estimated loss emergence periods may vary by the funded versus unfunded status of the instrument and may change over time.

The Firm assesses the credit quality of a borrower or counterparty and assigns an internal risk rating. Risk ratings are assigned at origination or acquisition, and if necessary, adjusted for changes in credit quality over the life of the exposure. In assessing the risk rating of a particular loan or lending-related commitment, among the factors considered are the obligor's debt capacity and financial flexibility, the level of the obligor's earnings, the amount and sources for repayment, the level and nature of contingencies, management strength, and the industry and geography in which the obligor operates. These factors are based on an evaluation of historical and current information and involve subjective assessment and interpretation. Determining risk ratings involves significant judgment; emphasizing one factor over another or considering additional factors could affect the risk rating assigned by the Firm.

A PD estimate is determined based on the Firm's history of defaults over more than one credit cycle.

LGD estimate is a judgment-based estimate assigned to each loan or lending-related commitment. The estimate represents the amount of economic loss if the obligor were to default. The type of obligor, quality of collateral, and the seniority of the Firm's lending exposure in the obligor's capital structure affect LGD.

The Firm applies judgment in estimating PD, LGD, loss emergence period and loan-equivalent used in calculating the allowance for credit losses. Estimates of PD, LGD, loss emergence period and loan-equivalent used are subject to periodic refinement based on any changes to underlying external or Firm-specific historical data. Changes to the time period used for PD and LGD estimates could also affect the allowance for credit losses. The use of different inputs, estimates or methodologies could change the amount of the allowance for credit losses determined appropriate by the Firm.

In addition to the statistical credit loss estimates applied to the wholesale portfolio, management applies its judgment to adjust the statistical estimates for wholesale loans and lending-related commitments, taking into consideration model imprecision, external factors and economic events that have occurred but are not yet reflected in the loss factors. Historical experience of both LGD and PD are considered when estimating these adjustments. Factors related to concentrated and deteriorating industries also are incorporated where relevant. These estimates are based on management's view of uncertainties that relate to current macroeconomic conditions, quality of underwriting standards and other relevant internal and external factors affecting the credit quality of the current portfolio.

Asset-specific component

The asset-specific component of the allowance relates to loans considered to be impaired, which includes loans that have been modified in TDRs as well as risk-rated loans that have been placed on nonaccrual status. To determine the asset-specific component of the allowance, larger risk-rated loans (primarily loans in the wholesale portfolio segment) are evaluated individually, while smaller loans (both risk-rated and scored) are evaluated as pools using historical loss experience for the respective class of assets.

The Firm generally measures the asset-specific allowance as the difference between the recorded investment in the loan and the present value of the cash flows expected to be collected, discounted at the loan's original effective interest rate. Subsequent changes in impairment are reported as an adjustment to the allowance for loan losses. In certain cases, the asset-specific allowance is determined using an observable market price, and the allowance is measured as the difference between the recorded investment in the loan and the loan's fair value. Collateral-dependent loans are charged down to the fair value of collateral less costs to sell. For any of these impaired loans, the amount of the asset-specific allowance required to be recorded, if any, is dependent upon the recorded investment in the loan (including prior charge-offs), and either the expected cash flows or fair value of collateral. Refer to Note 12 for more information about charge-offs and collateral-dependent loans.

The asset-specific component of the allowance for impaired loans that have been modified in TDRs (including forgone interest, principal forgiveness, as well as other concessions) incorporates the effect of the modification on the loan's expected cash flows, which considers the potential for redefault. For residential real estate loans modified in TDRs, the Firm develops product-specific probability of default estimates, which are applied at a loan level to compute expected losses. In developing these probabilities of default, the Firm considers the relationship between the credit quality characteristics of the underlying loans and certain assumptions about home prices and unemployment, based upon industry-wide data. The Firm also considers its own historical loss experience to-date based on actual redefaulted modified loans. For credit card loans modified in TDRs, expected losses incorporate projected redefaults based on the Firm's historical experience by type of modification program. For wholesale loans modified in TDRs, expected losses incorporate management's expectation of the borrower's ability to repay under the modified terms.

Estimating the timing and amounts of future cash flows is highly judgmental as these cash flow projections rely upon estimates such as loss severities, asset valuations, default rates (including redefault rates on modified loans), the amounts and timing of interest or principal payments (including any expected prepayments) or other factors that are reflective of current and expected market conditions. These estimates are, in turn, dependent on factors such as the duration of current overall economic conditions, industry-, portfolio-, or borrower-specific factors, the expected outcome of insolvency proceedings as well as, in certain circumstances, other economic factors, including the level of future home prices. All of these estimates and assumptions require significant management judgment and certain assumptions are highly subjective.

PCI loans

In connection with the acquisition of certain PCI loans, which are accounted for as described in Note 12, the allowance for loan losses for the PCI portfolio is based on quarterly estimates of the amount of principal and interest cash flows expected to be collected over the estimated remaining lives of the loans.

These cash flow projections are based on estimates regarding default rates (including redefault rates on modified loans), loss severities, the amounts and timing of prepayments and other factors that are reflective of current and expected future market conditions. These estimates are dependent on assumptions regarding the level of future home prices, and the duration of current overall economic conditions, among other factors. These estimates and assumptions require significant management judgment and certain assumptions are highly subjective.

Allowance for credit losses and related information

The table below summarizes information about the allowances for loan losses and lending-relating commitments, and includes a breakdown of loans and lending-related commitments by impairment methodology.

(Table continued on next page)

Year ended December 31, (in millions)	2019 Consumer, excluding credit card	Credit card	Wholesale	Total
Allowance for loan losses				
Beginning balance at January 1,	$ 4,146	$ 5,184	$ 4,115	$ 13,445
Gross charge-offs	963	5,436	411	6,810
Gross recoveries	(551)	(588)	(42)	(1,181)
Net charge-offs	412	4,848	369	5,629
Write-offs of PCI loans[(a)]	151	–	–	151
Provision for loan losses	(383)	5,348	484	5,449
Other	(1)	(1)	11	9
Ending balance at December 31,	$ 3,199	$ 5,683	$ 4,241	$ 13,123
Allowance for loan losses by impairment methodology				
Asset-specific[(b)]	$ 136	$ 477 (c)	$ 234	$ 847
Formula-based	2,076	5,206	4,007	11,289
PCI	987	–	–	987
Total allowance for loan losses	$ 3,199	$ 5,683	$ 4,241	$ 13,123
Loans by impairment methodology				
Asset-specific	$ 6,172	$ 1,452	$ 912	$ 8,536
Formula-based	305,503	167,472	443,727	916,702
PCI	20,363	–	–	20,363
Total retained loans	$ 332,038	$ 168,924	$ 444,639	$ 945,601
Impaired collateral-dependent loans				
Net charge-offs	$ 57	$ –	$ 25	$ 82
Loans measured at fair value of collateral less cost to sell	2,059	–	81	2,140
Allowance for lending-related commitments				
Beginning balance at January 1,	$ 33	$ –	$ 1,022	$ 1,055
Provision for lending-related commitments	–	–	136	136
Other	–	–	–	–
Ending balance at December 31,	$ 33	$ –	$ 1,158	$ 1,191
Allowance for lending-related commitments by impairment methodology				
Asset-specific	$ –	$ –	$ 102	$ 102
Formula-based	33	–	1,056	1,089
Total allowance for lending-related commitments	$ 33	$ –	$ 1,158	$ 1,191
Lending-related commitments by impairment methodology				
Asset-specific	$ –	$ –	$ 474	$ 474
Formula-based	51,412	650,720	403,641	1,105,773
Total lending-related commitments	$ 51,412	$ 650,720	$ 404,115	$ 1,106,247

(a) Write-offs of PCI loans are recorded against the allowance for loan losses when actual losses for a pool exceed estimated losses that were recorded as purchase accounting adjustments at the time of acquisition. A write-off of a PCI loan is recognized when the underlying loan is removed from a pool.
(b) Includes risk-rated loans that have been placed on nonaccrual status and loans that have been modified in a TDR.
(c) The asset-specific credit card allowance for loan losses is related to loans that have been modified in a TDR; such allowance is calculated based on the loans' original contractual interest rates and does not consider any incremental penalty rates.

(table continued from previous page)

2018				2017			
Consumer, excluding credit card	Credit card	Wholesale	Total	Consumer, excluding credit card	Credit card	Wholesale	Total
$ 4,579	$ 4,884	$ 4,141	$ 13,604	$ 5,198	$ 4,034	$ 4,544	$ 13,776
1,025	5,011	313	6,349	1,779	4,521	212	6,512
(842)	(493)	(158)	(1,493)	(634)	(398)	(93)	(1,125)
183	4,518	155	4,856	1,145	4,123	119	5,387
187	–	–	187	86	–	–	86
(63)	4,818	130	4,885	613	4,973	(286)	5,300
–	–	(1)	(1)	(1)	–	2	1
$ 4,146	$ 5,184	$ 4,115	$ 13,445	$ 4,579	$ 4,884	$ 4,141	$ 13,604
$ 196	$ 440 (c)	$ 297	$ 933	$ 246	$ 383 (c)	$ 461	$ 1,090
2,162	4,744	3,818	10,724	2,108	4,501	3,680	10,289
1,788	–	–	1,788	2,225	–	–	2,225
$ 4,146	$ 5,184	$ 4,115	$ 13,445	$ 4,579	$ 4,884	$ 4,141	$ 13,604
$ 6,874	$ 1,319	$ 1,250	$ 9,443	$ 8,078	$ 1,215	$ 1,867	$ 11,160
342,729	155,297	437,909	935,935	333,899	148,172	401,028	883,099
24,034	–	3	24,037	30,576	–	3	30,579
$ 373,637	$ 156,616	$ 439,162	$ 969,415	$ 372,553	$ 149,387	$ 402,898	$ 924,838
$ 24	$ –	$ 21	$ 45	$ 64	$ –	$ 31	$ 95
2,080	–	202	2,282	2,133	–	233	2,366
$ 33	$ –	$ 1,035	$ 1,068	$ 26	$ –	$ 1,052	$ 1,078
–	–	(14)	(14)	7	–	(17)	(10)
–	–	1	1	–	–	–	–
$ 33	$ –	$ 1,022	$ 1,055	$ 33	$ –	$ 1,035	$ 1,068
$ –	$ –	$ 99	$ 99	$ –	$ –	$ 187	$ 187
33	–	923	956	33	–	848	881
$ 33	$ –	$ 1,022	$ 1,055	$ 33	$ –	$ 1,035	$ 1,068
$ –	$ –	$ 469	$ 469	$ –	$ –	$ 731	$ 731
46,066	605,379	387,344	1,038,789	48,553	572,831	369,367	990,751
$ 46,066	$ 605,379	$ 387,813	$ 1,039,258	$ 48,553	$ 572,831	$ 370,098	$ 991,482

Note 14 – Variable interest entities

Refer to Note 1 on page 151 for a further description of JPMorgan Chase's accounting policies regarding consolidation of VIEs.

The following table summarizes the most significant types of Firm-sponsored VIEs by business segment. The Firm considers a "sponsored" VIE to include any entity where: (1) JPMorgan Chase is the primary beneficiary of the structure; (2) the VIE is used by JPMorgan Chase to securitize Firm assets; (3) the VIE issues financial instruments with the JPMorgan Chase name; or (4) the entity is a JPMorgan Chase–administered asset-backed commercial paper conduit.

Line of Business	*Transaction Type*	*Activity*	*2019 Form 10-K page references*
CCB	Credit card securitization trusts	Securitization of originated credit card receivables	242–243
	Mortgage securitization trusts	Servicing and securitization of both originated and purchased residential mortgages	243–245
CIB	Mortgage and other securitization trusts	Securitization of both originated and purchased residential and commercial mortgages, and other consumer loans	243–245
	Multi-seller conduits	Assist clients in accessing the financial markets in a cost-efficient manner and structures transactions to meet investor needs	245
	Municipal bond vehicles	Financing of municipal bond investments	245–246

The Firm's other business segments are also involved with VIEs (both third-party and Firm-sponsored), but to a lesser extent, as follows:

- Asset & Wealth Management: AWM sponsors and manages certain funds that are deemed VIEs. As asset manager of the funds, AWM earns a fee based on assets managed; the fee varies with each fund's investment objective and is competitively priced. For fund entities that qualify as VIEs, AWM's interests are, in certain cases, considered to be significant variable interests that result in consolidation of the financial results of these entities.
- Commercial Banking: CB provides financing and lending-related services to a wide spectrum of clients, including certain third-party-sponsored entities that may meet the definition of a VIE. CB does not control the activities of these entities and does not consolidate these entities. CB's maximum loss exposure, regardless of whether the entity is a VIE, is generally limited to loans and lending-related commitments which are reported and disclosed in the same manner as any other third-party transaction.
- Corporate: Corporate is involved with entities that may meet the definition of VIEs; however these entities are generally subject to specialized investment company accounting, which does not require the consolidation of investments, including VIEs. In addition, Treasury and CIO invest in securities generally issued by third parties which may meet the definition of VIEs (e.g., issuers of asset-backed securities). In general, the Firm does not have the power to direct the significant activities of these entities and therefore does not consolidate these entities. Refer to Note 10 for further information on the Firm's investment securities portfolio.

In addition, CIB also invests in and provides financing and other services to VIEs sponsored by third parties. Refer to page 247 of this Note for more information on the VIEs sponsored by third parties.

Significant Firm-sponsored variable interest entities

Credit card securitizations

CCB's Card business may securitize originated credit card loans, primarily through the Chase Issuance Trust (the "Trust"). The Firm's continuing involvement in credit card securitizations includes servicing the receivables, retaining an undivided seller's interest in the receivables, retaining certain senior and subordinated securities and maintaining escrow accounts.

The Firm is considered to be the primary beneficiary of these Firm-sponsored credit card securitization trusts based on the Firm's ability to direct the activities of these VIEs through its servicing responsibilities and other duties, including making decisions as to the receivables that are transferred into those trusts and as to any related modifications and workouts. Additionally, the nature and extent of the Firm's other continuing involvement with the trusts, as indicated above, obligates the Firm to absorb losses and gives the Firm the right to receive certain benefits from these VIEs that could potentially be significant.

The underlying securitized credit card receivables and other assets of the securitization trusts are available only for payment of the beneficial interests issued by the securitization trusts; they are not available to pay the Firm's other obligations or the claims of the Firm's creditors.

The agreements with the credit card securitization trusts require the Firm to maintain a minimum undivided interest in the credit card trusts (generally 5%). As of December 31, 2019 and 2018, the Firm held undivided interests in Firm-sponsored credit card securitization trusts of $5.3 billion and $15.1 billion, respectively. The Firm maintained an average undivided interest in principal receivables owned by those trusts of approximately 50% and 37% for the years ended December 31, 2019 and 2018. The Firm did not retain any senior securities and retained $3.0 billion of subordinated securities in certain of its credit card securitization trusts as of both December 31, 2019 and 2018, respectively. The Firm's undivided interests in the credit card trusts and securities retained are eliminated in consolidation.

Firm-sponsored mortgage and other securitization trusts
The Firm securitizes (or has securitized) originated and purchased residential mortgages, commercial mortgages and other consumer loans primarily in its CCB and CIB businesses. Depending on the particular transaction, as well as the respective business involved, the Firm may act as the servicer of the loans and/or retain certain beneficial interests in the securitization trusts.

The following table presents the total unpaid principal amount of assets held in Firm-sponsored private-label securitization entities, including those in which the Firm has continuing involvement, and those that are consolidated by the Firm. Continuing involvement includes servicing the loans, holding senior interests or subordinated interests (including amounts required to be held pursuant to credit risk retention rules), recourse or guarantee arrangements, and derivative contracts. In certain instances, the Firm's only continuing involvement is servicing the loans. The Firm's maximum loss exposure from retained and purchased interests is the carrying value of these interests. Refer to Securitization activity on page 248 of this Note for further information regarding the Firm's cash flows associated with and interests retained in nonconsolidated VIEs, and pages 248–249 of this Note for information on the Firm's loan sales and securitization activity related to U.S. GSEs and government agencies.

	Principal amount outstanding			JPMorgan Chase interest in securitized assets in nonconsolidated VIEs(c)(d)(e)			
December 31, 2019 (in millions)	Total assets held by securitization VIEs	Assets held in consolidated securitization VIEs	Assets held in nonconsolidated securitization VIEs with continuing involvement	Trading assets	Investment securities	Other financial assets	Total interests held by JPMorgan Chase
Securitization-related(a)							
Residential mortgage:							
Prime/Alt-A and option ARMs	**$ 60,348**	**$ 2,796**	**$ 48,734**	**$ 535**	**$ 625**	**$ –**	**$ 1,160**
Subprime	**14,661**	**–**	**13,490**	**7**	**–**	**–**	**7**
Commercial and other(b)	**111,903**	**–**	**80,878**	**785**	**773**	**241**	**1,799**
Total	**$ 186,912**	**$ 2,796**	**$ 143,102**	**$ 1,327**	**$ 1,398**	**$ 241**	**$ 2,966**

	Principal amount outstanding			JPMorgan Chase interest in securitized assets in nonconsolidated VIEs(c)(d)(e)			
December 31, 2018 (in millions)	Total assets held by securitization VIEs	Assets held in consolidated securitization VIEs	Assets held in nonconsolidated securitization VIEs with continuing involvement	Trading assets	Investment securities	Other financial assets	Total interests held by JPMorgan Chase
Securitization-related(a)							
Residential mortgage:							
Prime/Alt-A and option ARMs	$ 63,350	$ 3,237	$ 50,679	$ 623	$ 647	$ –	$ 1,270
Subprime	16,729	32	15,434	53	–	–	53
Commercial and other(b)	102,961	–	79,387	783	801	210	1,794
Total	$ 183,040	$ 3,269	$ 145,500	$ 1,459	$ 1,448	$ 210	$ 3,117

(a) Excludes U.S. GSEs and government agency securitizations and re-securitizations, which are not Firm-sponsored. Refer to pages 248–249 of this Note for information on the Firm's loan sales and securitization activity related to U.S. GSEs and government agencies.
(b) Consists of securities backed by commercial real estate loans and non-mortgage-related consumer receivables purchased from third parties.
(c) Excludes the following: retained servicing (refer to Note 15 for a discussion of MSRs); securities retained from loan sales and securitization activity related to U.S. GSEs and government agencies; interest rate and foreign exchange derivatives primarily used to manage interest rate and foreign exchange risks of securitization entities (refer to Note 5 for further information on derivatives); senior and subordinated securities of $106 million and $94 million, respectively, at December 31, 2019, and $87 million and $28 million, respectively, at December 31, 2018, which the Firm purchased in connection with CIB's secondary market-making activities.
(d) Includes interests held in re-securitization transactions.
(e) As of December 31, 2019 and 2018, 63% and 60%, respectively, of the Firm's retained securitization interests, which are predominantly carried at fair value and include amounts required to be held pursuant to credit risk retention rules, were risk-rated "A" or better, on an S&P-equivalent basis. The retained interests in prime residential mortgages consisted of $1.1 billion and $1.3 billion of investment-grade, and $72 million and $16 million of noninvestment-grade at December 31, 2019 and 2018, respectively. The retained interests in commercial and other securitizations trusts consisted of $1.2 billion of investment-grade for both periods, and $575 million and $623 million of noninvestment-grade retained interests at December 31, 2019 and 2018, respectively.

Residential mortgage
The Firm securitizes residential mortgage loans originated by CCB, as well as residential mortgage loans purchased from third parties by either CCB or CIB. CCB generally retains servicing for all residential mortgage loans it originated or purchased, and for certain mortgage loans purchased by CIB. For securitizations of loans serviced by CCB, the Firm has the power to direct the significant activities of the VIE because it is responsible for decisions related to loan modifications and workouts. CCB may also retain an interest upon securitization.

In addition, CIB engages in underwriting and trading activities involving securities issued by Firm-sponsored securitization trusts. As a result, CIB at times retains senior and/or subordinated interests (including residual interests and amounts required to be held pursuant to credit risk retention rules) in residential mortgage securitizations at the time of securitization, and/or reacquires positions in the secondary market in the normal course of business. In certain instances, as a result of the positions retained or reacquired by CIB or held by CCB, when considered together with the servicing arrangements entered into by CCB, the Firm is deemed to be the primary beneficiary of certain securitization trusts. Refer to the table on page 246 of this Note for more information on consolidated residential mortgage securitizations.

The Firm does not consolidate residential mortgage securitizations (Firm-sponsored or third-party-sponsored) when it is not the servicer (and therefore does not have the power to direct the most significant activities of the trust) or does not hold a beneficial interest in the trust that could potentially be significant to the trust. Refer to the table on page 246 of this Note for more information on the consolidated residential mortgage securitizations, and the table on the previous page of this Note for further information on interests held in nonconsolidated residential mortgage securitizations.

Commercial mortgages and other consumer securitizations
CIB originates and securitizes commercial mortgage loans, and engages in underwriting and trading activities involving the securities issued by securitization trusts. CIB may retain unsold senior and/or subordinated interests (including amounts required to be held pursuant to credit risk retention rules) in commercial mortgage securitizations at the time of securitization but, generally, the Firm does not service commercial loan securitizations. For commercial mortgage securitizations the power to direct the significant activities of the VIE generally is held by the servicer or investors in a specified class of securities ("controlling class"). The Firm generally does not retain an interest in the controlling class in its sponsored commercial mortgage securitization transactions. Refer to the table on page 246 of this Note for more information on the consolidated commercial mortgage securitizations, and the table on the previous page of this Note for further information on interests held in nonconsolidated securitizations.

Re-securitizations
The Firm engages in certain re-securitization transactions in which debt securities are transferred to a VIE in exchange for new beneficial interests. These transfers occur in connection with both U.S. GSEs and government agency sponsored VIEs, which are backed by residential mortgages. The Firm's consolidation analysis is largely dependent on the Firm's role and interest in the re-securitization trusts.

The following table presents the principal amount of securities transferred to re-securitization VIEs.

Year ended December 31, (in millions)	**2019**	2018	2017
Transfers of securities to VIEs			
U.S. GSEs and government agencies	**25,852**	15,532	12,617

Most re-securitizations with which the Firm is involved are client-driven transactions in which a specific client or group of clients is seeking a specific return or risk profile. For these transactions, the Firm has concluded that the decision-making power of the entity is shared between the Firm and its clients, considering the joint effort and decisions in establishing the re-securitization trust and its assets, as well as the significant economic interest the client holds in the re-securitization trust; therefore the Firm does not consolidate the re-securitization VIE.

The Firm did not transfer any private label securities to re-securitization VIEs during 2019, 2018 and 2017, respectively, and retained interests in any such Firm-sponsored VIEs as of December 31, 2019 and 2018 were immaterial.

Additionally, the Firm may invest in beneficial interests of third-party-sponsored re-securitizations and generally purchases these interests in the secondary market. In these circumstances, the Firm does not have the unilateral ability to direct the most significant activities of the re-securitization trust, either because it was not involved in the initial design of the trust, or the Firm is involved with an independent third-party sponsor and demonstrates shared power over the creation of the trust; therefore, the Firm does not consolidate the re-securitization VIE.

The following table presents information on nonconsolidated re-securitization VIEs.

December 31, (in millions)	Nonconsolidated re-securitization VIEs	
	2019	2018
U.S. GSEs and government agencies		
Interest in VIEs	**2,928**	3,058

As of December 31, 2019 and 2018, the Firm did not consolidate any U.S. GSE and government agency re-securitization VIEs or any Firm-sponsored private-label re-securitization VIEs.

Multi-seller conduits

Multi-seller conduit entities are separate bankruptcy remote entities that provide secured financing, collateralized by pools of receivables and other financial assets, to customers of the Firm. The conduits fund their financing facilities through the issuance of highly rated commercial paper. The primary source of repayment of the commercial paper is the cash flows from the pools of assets. In most instances, the assets are structured with deal-specific credit enhancements provided to the conduits by the customers (i.e., sellers) or other third parties. Deal-specific credit enhancements are generally structured to cover a multiple of historical losses expected on the pool of assets, and are typically in the form of overcollateralization provided by the seller. The deal-specific credit enhancements mitigate the Firm's potential losses on its agreements with the conduits.

To ensure timely repayment of the commercial paper, and to provide the conduits with funding to provide financing to customers in the event that the conduits do not obtain funding in the commercial paper market, each asset pool financed by the conduits has a minimum 100% deal-specific liquidity facility associated with it provided by JPMorgan Chase Bank, N.A. JPMorgan Chase Bank, N.A. also provides the multi-seller conduit vehicles with uncommitted program-wide liquidity facilities and program-wide credit enhancement in the form of standby letters of credit. The amount of program-wide credit enhancement required is based upon commercial paper issuance and approximates 10% of the outstanding balance of commercial paper.

The Firm consolidates its Firm-administered multi-seller conduits, as the Firm has both the power to direct the significant activities of the conduits and a potentially significant economic interest in the conduits. As administrative agent and in its role in structuring transactions, the Firm makes decisions regarding asset types and credit quality, and manages the commercial paper funding needs of the conduits. The Firm's interests that could potentially be significant to the VIEs include the fees received as administrative agent and liquidity and program-wide credit enhancement provider, as well as the potential exposure created by the liquidity and credit enhancement facilities provided to the conduits. Refer to page 246 of this Note for further information on consolidated VIE assets and liabilities.

In the normal course of business, JPMorgan Chase makes markets in and invests in commercial paper issued by the Firm-administered multi-seller conduits. The Firm held $16.3 billion and $20.1 billion of the commercial paper issued by the Firm-administered multi-seller conduits at December 31, 2019 and 2018, respectively, which have been eliminated in consolidation. The Firm's investments reflect the Firm's funding needs and capacity and were not driven by market illiquidity. Other than the amounts required to be held pursuant to credit risk retention rules, the Firm is not obligated under any agreement to purchase the commercial paper issued by the Firm-administered multi-seller conduits.

Deal-specific liquidity facilities, program-wide liquidity and credit enhancement provided by the Firm have been eliminated in consolidation. The Firm or the Firm-administered multi-seller conduits provide lending-related commitments to certain clients of the Firm-administered multi-seller conduits. The unfunded commitments were $8.9 billion and $8.0 billion at December 31, 2019 and 2018, respectively, and are reported as off-balance sheet lending-related commitments in other unfunded commitments to extend credit. Refer to Note 28 for more information on off-balance sheet lending-related commitments.

Municipal bond vehicles

Municipal bond vehicles or tender option bond ("TOB") trusts allow institutions to finance their municipal bond investments at short-term rates. In a typical TOB transaction, the trust purchases highly rated municipal bond(s) of a single issuer and funds the purchase by issuing two types of securities: (1) puttable floating-rate certificates ("floaters") and (2) inverse floating-rate residual interests ("residuals"). The floaters are typically purchased by money market funds or other short-term investors and may be tendered, with requisite notice, to the TOB trust. The residuals are retained by the investor seeking to finance its municipal bond investment. TOB transactions where the residual is held by a third-party investor are typically known as customer TOB trusts, and non-customer TOB trusts are transactions where the Residual is retained by the Firm. Customer TOB trusts are sponsored by a third party; refer to page 247 of this Note for further information. The Firm serves as sponsor for all non-customer TOB transactions. The Firm may provide various services to a TOB trust, including remarketing agent, liquidity or tender option provider, and/or sponsor.

J.P. Morgan Securities LLC may serve as a remarketing agent on the floaters for TOB trusts. The remarketing agent is responsible for establishing the periodic variable rate on the floaters, conducting the initial placement and remarketing tendered floaters. The remarketing agent may, but is not obligated to, make markets in floaters. Floaters held by the Firm were not material during 2019 and 2018.

JPMorgan Chase Bank, N.A. or J.P. Morgan Securities LLC often serves as the sole liquidity or tender option provider for the TOB trusts. The liquidity provider's obligation to perform is conditional and is limited by certain events ("Termination Events"), which include bankruptcy or failure to pay by the municipal bond issuer or credit enhancement provider, an event of taxability on the municipal bonds or the immediate downgrade of the municipal bond to below investment grade. In addition, the liquidity provider's exposure is typically further limited by the high credit quality of the underlying municipal bonds, the excess collateralization in the vehicle, or, in certain transactions, the reimbursement agreements with the Residual holders.

Holders of the floaters may "put," or tender, their floaters to the TOB trust. If the remarketing agent cannot successfully remarket the floaters to another investor, the liquidity provider either provides a loan to the TOB trust for the TOB trust's purchase of the floaters, or it directly purchases the tendered floaters.

TOB trusts are considered to be variable interest entities. The Firm consolidates non-customer TOB trusts because as the Residual holder, the Firm has the right to make decisions that significantly impact the economic performance of the municipal bond vehicle, and it has the right to receive benefits and bear losses that could potentially be significant to the municipal bond vehicle.

Consolidated VIE assets and liabilities

The following table presents information on assets and liabilities related to VIEs consolidated by the Firm as of December 31, 2019 and 2018.

	Assets				Liabilities		
December 31, 2019 (in millions)	Trading assets	Loans	Other[b]	Total assets[c]	Beneficial interests in VIE assets[d]	Other[e]	Total liabilities
VIE program type							
Firm-sponsored credit card trusts	**$ –**	**$ 14,986**	**$ 266**	**$ 15,252**	**$ 6,461**	**$ 6**	**$ 6,467**
Firm-administered multi-seller conduits	**1**	**25,183**	**355**	**25,539**	**9,223**	**36**	**9,259**
Municipal bond vehicles	**1,903**	**–**	**4**	**1,907**	**1,881**	**3**	**1,884**
Mortgage securitization entities[a]	**66**	**2,762**	**64**	**2,892**	**276**	**130**	**406**
Other	**663**	**–**	**192**	**855**	**–**	**272**	**272**
Total	**$ 2,633**	**$ 42,931**	**$ 881**	**$ 46,445**	**$ 17,841**	**$ 447**	**$ 18,288**

	Assets				Liabilities		
December 31, 2018 (in millions)	Trading assets	Loans	Other[b]	Total assets[c]	Beneficial interests in VIE assets[d]	Other[e]	Total liabilities
VIE program type							
Firm-sponsored credit card trusts	$ –	$ 31,760	$ 491	$ 32,251	$ 13,404	$ 12	$ 13,416
Firm-administered multi-seller conduits	–	24,411	300	24,711	4,842	33	4,875
Municipal bond vehicles	1,779	–	4	1,783	1,685	3	1,688
Mortgage securitization entities[a]	53	3,285	40	3,378	308	161	469
Other	134	–	178	312	2	103	105
Total	$ 1,966	$ 59,456	$ 1,013	$ 62,435	$ 20,241	$ 312	$ 20,553

(a) Includes residential and commercial mortgage securitizations.
(b) Includes assets classified as cash and other assets on the Consolidated balance sheets.
(c) The assets of the consolidated VIEs included in the program types above are used to settle the liabilities of those entities. The assets and liabilities include third-party assets and liabilities of consolidated VIEs and exclude intercompany balances that eliminate in consolidation.
(d) The interest-bearing beneficial interest liabilities issued by consolidated VIEs are classified in the line item on the Consolidated balance sheets titled, "Beneficial interests issued by consolidated variable interest entities." The holders of these beneficial interests generally do not have recourse to the general credit of JPMorgan Chase. Included in beneficial interests in VIE assets are long-term beneficial interests of $6.7 billion and $13.7 billion at December 31, 2019 and 2018, respectively. Refer to Note 20 for additional information on interest-bearing long-term beneficial interests.
(e) Includes liabilities classified as accounts payable and other liabilities on the Consolidated balance sheets.

VIEs sponsored by third parties

The Firm enters into transactions with VIEs structured by other parties. These include, for example, acting as a derivative counterparty, liquidity provider, investor, underwriter, placement agent, remarketing agent, trustee or custodian. These transactions are conducted at arm's-length, and individual credit decisions are based on the analysis of the specific VIE, taking into consideration the quality of the underlying assets. Where the Firm does not have the power to direct the activities of the VIE that most significantly impact the VIE's economic performance, or a variable interest that could potentially be significant, the Firm generally does not consolidate the VIE, but it records and reports these positions on its Consolidated balance sheets in the same manner it would record and report positions in respect of any other third-party transaction.

Tax credit vehicles

The Firm holds investments in unconsolidated tax credit vehicles, which are limited partnerships and similar entities that own and operate affordable housing, energy, and other projects. These entities are primarily considered VIEs. A third party is typically the general partner or managing member and has control over the significant activities of the tax credit vehicles, and accordingly the Firm does not consolidate tax credit vehicles. The Firm generally invests in these partnerships as a limited partner and earns a return primarily through the receipt of tax credits allocated to the projects. The maximum loss exposure, represented by equity investments and funding commitments, was $19.1 billion and $16.5 billion, of which $5.5 billion and $4.0 billion was unfunded at December 31, 2019 and 2018, respectively. In order to reduce the risk of loss, the Firm assesses each project and withholds varying amounts of its capital investment until the project qualifies for tax credits. Refer to Note 25 for further information on affordable housing tax credits. Refer to Note 28 for more information on off-balance sheet lending-related commitments.

Customer municipal bond vehicles (TOB trusts)

The Firm may provide various services to customer TOB trusts, including remarketing agent, liquidity or tender option provider. In certain customer TOB transactions, the Firm, as liquidity provider, has entered into a reimbursement agreement with the Residual holder. In those transactions, upon the termination of the vehicle, the Firm has recourse to the third-party Residual holders for any shortfall. The Firm does not have any intent to protect Residual holders from potential losses on any of the underlying municipal bonds. The Firm does not consolidate customer TOB trusts, since the Firm does not have the power to make decisions that significantly impact the economic performance of the municipal bond vehicle. The Firm's maximum exposure as a liquidity provider to customer TOB trusts at December 31, 2019 and 2018, was $5.5 billion and $4.8 billion, respectively. The fair value of assets held by such VIEs at December 31, 2019 and 2018 was $8.6 billion and $7.7 billion, respectively. Refer to Note 28 for more information on off-balance sheet lending-related commitments.

Loan securitizations

The Firm has securitized and sold a variety of loans, including residential mortgage, credit card, and commercial mortgage. The purposes of these securitization transactions were to satisfy investor demand and to generate liquidity for the Firm.

For loan securitizations in which the Firm is not required to consolidate the trust, the Firm records the transfer of the loan receivable to the trust as a sale when all of the following accounting criteria for a sale are met: (1) the transferred financial assets are legally isolated from the Firm's creditors; (2) the transferee or beneficial interest holder can pledge or exchange the transferred financial assets; and (3) the Firm does not maintain effective control over the transferred financial assets (e.g., the Firm cannot repurchase the transferred assets before their maturity and it does not have the ability to unilaterally cause the holder to return the transferred assets).

For loan securitizations accounted for as a sale, the Firm recognizes a gain or loss based on the difference between the value of proceeds received (including cash, beneficial interests, or servicing assets received) and the carrying value of the assets sold. Gains and losses on securitizations are reported in noninterest revenue.

Securitization activity

The following table provides information related to the Firm's securitization activities for the years ended December 31, 2019, 2018 and 2017, related to assets held in Firm-sponsored securitization entities that were not consolidated by the Firm, and where sale accounting was achieved at the time of the securitization.

	2019		2018		2017	
Year ended December 31, (in millions)	Residential mortgage[e]	Commercial and other[f]	Residential mortgage[e]	Commercial and other[f]	Residential mortgage[e]	Commercial and other[f]
Principal securitized	**$ 9,957**	**$ 9,390**	$ 6,431	$ 10,159	$ 5,532	$ 10,252
All cash flows during the period:[a]						
Proceeds received from loan sales as financial instruments[b][c]	**$ 10,238**	**$ 9,544**	$ 6,449	$ 10,218	$ 5,661	$ 10,340
Servicing fees collected[d]	**287**	**2**	319	2	338	3
Cash flows received on interests	**507**	**237**	411	301	463	918

(a) Excludes re-securitization transactions.
(b) Predominantly includes Level 2 assets.
(c) The carrying value of the loans accounted for at fair value approximated the proceeds received upon loan sale.
(d) The prior period amounts have been revised to conform with the current period presentation.
(e) Includes prime mortgages only. Excludes loan securitization activity related to U.S. GSEs and government agencies.
(f) Includes commercial mortgage and other consumer loans.

Key assumptions used to value retained interests originated during the year are shown in the table below.

Year ended December 31,	**2019**	2018	2017
Residential mortgage retained interest:			
Weighted-average life (in years)	**4.8**	7.6	4.8
Weighted-average discount rate	**7.4%**	3.6%	2.9%
Commercial mortgage retained interest:			
Weighted-average life (in years)	**6.4**	5.3	7.1
Weighted-average discount rate	**4.1%**	4.0%	4.4%

Loans and excess MSRs sold to U.S. government-sponsored enterprises and loans in securitization transactions pursuant to Ginnie Mae guidelines

In addition to the amounts reported in the securitization activity tables above, the Firm, in the normal course of business, sells originated and purchased mortgage loans and certain originated excess MSRs on a nonrecourse basis, predominantly to U.S. GSEs. These loans and excess MSRs are sold primarily for the purpose of securitization by the U.S. GSEs, who provide certain guarantee provisions (e.g., credit enhancement of the loans). The Firm also sells loans into securitization transactions pursuant to Ginnie Mae guidelines; these loans are typically insured or guaranteed by another U.S. government agency. The Firm does not consolidate the securitization vehicles underlying these transactions as it is not the primary beneficiary. For a limited number of loan sales, the Firm is obligated to share a portion of the credit risk associated with the sold loans with the purchaser. Refer to Note 28 for additional information about the Firm's loan sales- and securitization-related indemnifications. Refer to Note 15 for additional information about the impact of the Firm's sale of certain excess MSRs.

The following table summarizes the activities related to loans sold to the U.S. GSEs, and loans in securitization transactions pursuant to Ginnie Mae guidelines.

Year ended December 31, (in millions)	2019	2018	2017
Carrying value of loans sold	**$ 92,349**	$ 44,609	$ 64,542
Proceeds received from loan sales as cash	**$ 73**	$ 9	$ 117
Proceeds from loan sales as securities[(a)(b)]	**91,422**	43,671	63,542
Total proceeds received from loan sales[(c)]	**$ 91,495**	$ 43,680	$ 63,659
Gains/(losses) on loan sales[(d)(e)]	**$ 499**	$ (93)	$ 163

(a) Includes securities from U.S. GSEs and Ginnie Mae that are generally sold shortly after receipt or retained as part of the Firm's investment securities portfolio.
(b) Included in level 2 assets.
(c) Excludes the value of MSRs retained upon the sale of loans.
(d) Gains/(losses) on loan sales include the value of MSRs.
(e) The carrying value of the loans accounted for at fair value approximated the proceeds received upon loan sale.

Options to repurchase delinquent loans

In addition to the Firm's obligation to repurchase certain loans due to material breaches of representations and warranties as discussed in Note 28, the Firm also has the option to repurchase delinquent loans that it services for Ginnie Mae loan pools, as well as for other U.S. government agencies under certain arrangements. The Firm typically elects to repurchase delinquent loans from Ginnie Mae loan pools as it continues to service them and/or manage the foreclosure process in accordance with the applicable requirements, and such loans continue to be insured or guaranteed. When the Firm's repurchase option becomes exercisable, such loans must be reported on the Consolidated balance sheets as a loan with a corresponding liability. Refer to Note 12 for additional information.

The following table presents loans the Firm repurchased or had an option to repurchase, real estate owned, and foreclosed government-guaranteed residential mortgage loans recognized on the Firm's Consolidated balance sheets as of December 31, 2019 and 2018. Substantially all of these loans and real estate are insured or guaranteed by U.S. government agencies.

December 31, (in millions)	2019	2018
Loans repurchased or option to repurchase[(a)]	**$ 2,941**	$ 7,021
Real estate owned	**41**	75
Foreclosed government-guaranteed residential mortgage loans[(b)]	**198**	361

(a) Predominantly all of these amounts relate to loans that have been repurchased from Ginnie Mae loan pools.
(b) Relates to voluntary repurchases of loans, which are included in accrued interest and accounts receivable.

Loan delinquencies and liquidation losses

The table below includes information about components of nonconsolidated securitized financial assets held in Firm-sponsored private-label securitization entities, in which the Firm has continuing involvement, and delinquencies as of December 31, 2019 and 2018.

	Securitized assets		90 days past due		Net liquidation losses[(a)]	
As of or for the year ended December 31, (in millions)	**2019**	2018	**2019**	2018	**2019**	2018
Securitized loans						
Residential mortgage:						
Prime/ Alt-A & option ARMs	**$ 48,734**	$ 50,679	**$ 2,449**	$ 3,354	**$ 579**	$ 610
Subprime	**13,490**	15,434	**1,813**	2,478	**532**	(169)
Commercial and other	**80,878**	79,387	**187**	225	**445**	280
Total loans securitized	**$ 143,102**	$ 145,500	**$ 4,449**	$ 6,057	**$ 1,556**	$ 721

(a) Includes liquidation gains as a result of private label mortgage settlement payments during the first quarter of 2018, which were reflected as asset recoveries by trustees.

Note 15 – Goodwill and Mortgage servicing rights

Goodwill

Goodwill is recorded upon completion of a business combination as the difference between the purchase price and the fair value of the net assets acquired. Subsequent to initial recognition, goodwill is not amortized but is tested for impairment during the fourth quarter of each fiscal year, or more often if events or circumstances, such as adverse changes in the business climate, indicate there may be impairment.

The goodwill associated with each business combination is allocated to the related reporting units, which are determined based on how the Firm's businesses are managed and how they are reviewed by the Firm's Operating Committee. The following table presents goodwill attributed to the business segments.

December 31, (in millions)	2019	2018	2017
Consumer & Community Banking	**$ 31,041**	$ 30,984	$ 31,013
Corporate & Investment Bank	**6,942**	6,770	6,776
Commercial Banking	**2,982**	2,860	2,860
Asset & Wealth Management	**6,858**	6,857	6,858
Total goodwill	**$ 47,823**	$ 47,471	$ 47,507

The following table presents changes in the carrying amount of goodwill.

Year ended December 31, (in millions)	2019	2018	2017
Balance at beginning of period	**$ 47,471**	$ 47,507	$ 47,288
Changes during the period from:			
Business combinations[(a)]	**349**	–	199
Other[(b)]	**3**	(36)	20
Balance at December 31,	**$ 47,823**	$ 47,471	$ 47,507

(a) For 2019, represents goodwill associated with the acquisition of InstaMed. This goodwill was allocated to CIB, CB and CCB. For 2017, represents CCB goodwill in connection with an acquisition.
(b) Primarily relates to foreign currency adjustments.

Goodwill impairment testing

The Firm's goodwill was not impaired at December 31, 2019, 2018, and 2017.

The goodwill impairment test is performed in two steps. In the first step, the current fair value of each reporting unit is compared with its carrying value. If the fair value is in excess of the carrying value, then the reporting unit's goodwill is considered not to be impaired. If the fair value is less than the carrying value, then a second step is performed. In the second step, the implied current fair value of the reporting unit's goodwill is determined by comparing the fair value of the reporting unit (as determined in step one) to the fair value of the net assets of the reporting unit, as if the reporting unit were being acquired in a business combination. The resulting implied current fair value of goodwill is then compared with the carrying value of the reporting unit's goodwill. If the carrying value of the goodwill exceeds its implied current fair value, then an impairment charge is recognized for the excess. If the carrying value of goodwill is less than its implied current fair value, then no goodwill impairment is recognized.

The Firm uses the reporting units' allocated capital plus goodwill and other intangible assets as a proxy for the carrying values of equity for the reporting units in the goodwill impairment testing. Reporting unit equity is determined on a similar basis as the allocation of capital to the LOBs which takes into consideration a variety of factors including capital levels of similarly rated peers and applicable regulatory capital requirements. Proposed LOB equity levels are incorporated into the Firm's annual budget process, which is reviewed by the Firm's Board of Directors. Allocated capital is further reviewed periodically and updated as needed.

The primary method the Firm uses to estimate the fair value of its reporting units is the income approach. This approach projects cash flows for the forecast period and uses the perpetuity growth method to calculate terminal values. These cash flows and terminal values are then discounted using an appropriate discount rate. Projections of cash flows are based on the reporting units' earnings forecasts which are reviewed with senior management of the Firm. The discount rate used for each reporting unit represents an estimate of the cost of equity for that reporting unit and is determined considering the Firm's overall estimated cost of equity (estimated using the Capital Asset Pricing Model), as adjusted for the risk characteristics specific to each reporting unit (for example, for higher levels of risk or uncertainty associated with the business or management's forecasts and assumptions). To assess the reasonableness of the discount rates used for each reporting unit management compares the discount rate to the estimated cost of equity for publicly traded institutions with similar businesses and risk characteristics. In addition, the weighted average cost of equity (aggregating the various reporting units) is compared with the Firm's overall estimated cost of equity to ensure reasonableness.

The valuations derived from the discounted cash flow analysis are then compared with market-based trading and transaction multiples for relevant competitors. Trading and transaction comparables are used as general indicators to assess the general reasonableness of the estimated fair values, although precise conclusions generally cannot be drawn due to the differences that naturally exist between the Firm's businesses and competitor institutions. Management also takes into consideration a comparison between the aggregate fair values of the Firm's reporting units and JPMorgan Chase's market capitalization. In evaluating this comparison, management considers several factors, including (i) a control premium that would exist in a market transaction, (ii) factors related to the level of execution risk that would exist at the firmwide level that do not exist at the reporting unit level and (iii) short-term market volatility and other factors that do not directly affect the value of individual reporting units.

Declines in business performance, increases in credit losses, increases in capital requirements, as well as deterioration in economic or market conditions, adverse regulatory or legislative changes or increases in the estimated market cost of equity, could cause the estimated fair values of the Firm's reporting units or their associated goodwill to decline in the future, which could result in a material impairment charge to earnings in a future period related to some portion of the associated goodwill.

Mortgage servicing rights

MSRs represent the fair value of expected future cash flows for performing servicing activities for others. The fair value considers estimated future servicing fees and ancillary revenue, offset by estimated costs to service the loans, and generally declines over time as net servicing cash flows are received, effectively amortizing the MSR asset against contractual servicing and ancillary fee income. MSRs are either purchased from third parties or recognized upon sale or securitization of mortgage loans if servicing is retained.

As permitted by U.S. GAAP, the Firm has elected to account for its MSRs at fair value. The Firm treats its MSRs as a single class of servicing assets based on the availability of market inputs used to measure the fair value of its MSR asset and its treatment of MSRs as one aggregate pool for risk management purposes. The Firm estimates the fair value of MSRs using an option-adjusted spread ("OAS") model, which projects MSR cash flows over multiple interest rate scenarios in conjunction with the Firm's prepayment model, and then discounts these cash flows at risk-adjusted rates. The model considers portfolio characteristics, contractually specified servicing fees, prepayment assumptions, delinquency rates, costs to service, late charges and other ancillary revenue, and other economic factors. The Firm compares fair value estimates and assumptions to observable market data where available, and also considers recent market activity and actual portfolio experience.

The fair value of MSRs is sensitive to changes in interest rates, including their effect on prepayment speeds. MSRs typically decrease in value when interest rates decline because declining interest rates tend to increase prepayments and therefore reduce the expected life of the net servicing cash flows that comprise the MSR asset. Conversely, securities (e.g., mortgage-backed securities), principal-only certificates and certain derivatives (i.e., those for which the Firm receives fixed-rate interest payments) increase in value when interest rates decline. JPMorgan Chase uses combinations of derivatives and securities to manage the risk of changes in the fair value of MSRs. The intent is to offset any interest-rate related changes in the fair value of MSRs with changes in the fair value of the related risk management instruments.

The following table summarizes MSR activity for the years ended December 31, 2019, 2018 and 2017.

As of or for the year ended December 31, (in millions, except where otherwise noted)	2019	2018	2017
Fair value at beginning of period	$ 6,130	$ 6,030	$ 6,096
MSR activity:			
Originations of MSRs	1,384	931	1,103
Purchase of MSRs	105	315	–
Disposition of MSRs[(a)]	(789)	(636)	(140)
Net additions	700	610	963
Changes due to collection/realization of expected cash flows	(951)	(740)	(797)
Changes in valuation due to inputs and assumptions:			
Changes due to market interest rates and other[(b)]	(893)	300	(202)
Changes in valuation due to other inputs and assumptions:			
Projected cash flows (e.g., cost to service)	(333) [(e)]	15	(102)
Discount rates	153	24	(19)
Prepayment model changes and other[(c)]	(107)	(109)	91
Total changes in valuation due to other inputs and assumptions	(287)	(70)	(30)
Total changes in valuation due to inputs and assumptions	(1,180)	230	(232)
Fair value at December 31,	$ 4,699	$ 6,130	$ 6,030
Change in unrealized gains/(losses) included in income related to MSRs held at December 31,	$ (1,180)	$ 230	$ (232)
Contractual service fees, late fees and other ancillary fees included in income	1,639	1,778	1,886
Third-party mortgage loans serviced at December 31, (in billions)	522.0	521.0	555.0
Servicer advances, net of an allowance for uncollectible amounts, at December 31, (in billions)[(d)]	2.0	3.0	4.0

(a) Includes excess MSRs transferred to agency-sponsored trusts in exchange for stripped mortgage backed securities ("SMBS"). In each transaction, a portion of the SMBS was acquired by third parties at the transaction date; the Firm acquired the remaining balance of those SMBS as trading securities.
(b) Represents both the impact of changes in estimated future prepayments due to changes in market interest rates, and the difference between actual and expected prepayments.
(c) Represents changes in prepayments other than those attributable to changes in market interest rates.
(d) Represents amounts the Firm pays as the servicer (e.g., scheduled principal and interest, taxes and insurance), which will generally be reimbursed within a short period of time after the advance from future cash flows from the trust or the underlying loans. The Firm's credit risk associated with these servicer advances is minimal because reimbursement of the advances is typically senior to all cash payments to investors. In addition, the Firm maintains the right to stop payment to investors if the collateral is insufficient to cover the advance. However, certain of these servicer advances may not be recoverable if they were not made in accordance with applicable rules and agreements.
(e) The decrease in projected cash flows was largely related to default servicing assumption updates.

The following table presents the components of mortgage fees and related income (including the impact of MSR risk management activities) for the years ended December 31, 2019, 2018 and 2017.

Year ended December 31, (in millions)	2019	2018	2017
CCB mortgage fees and related income			
Net production revenue	**$ 1,618**	$ 268	$ 636
Net mortgage servicing revenue:			
Operating revenue:			
Loan servicing revenue	**1,533**	1,835	2,014
Changes in MSR asset fair value due to collection/realization of expected cash flows	**(951)**	(740)	(795)
Total operating revenue	**582**	1,095	1,219
Risk management:			
Changes in MSR asset fair value due to market interest rates and other[(a)]	**(893)**	300	(202)
Other changes in MSR asset fair value due to other inputs and assumptions in model[(b)]	**(287)**	(70)	(30)
Change in derivative fair value and other	**1,015**	(341)	(10)
Total risk management	**(165)**	(111)	(242)
Total net mortgage servicing revenue	**417**	984	977
Total CCB mortgage fees and related income	**2,035**	1,252	1,613
All other	**1**	2	3
Mortgage fees and related income	**$ 2,036**	$ 1,254	$ 1,616

(a) Represents both the impact of changes in estimated future prepayments due to changes in market interest rates, and the difference between actual and expected prepayments.
(b) Represents the aggregate impact of changes in model inputs and assumptions such as projected cash flows (e.g., cost to service), discount rates and changes in prepayments other than those attributable to changes in market interest rates (e.g., changes in prepayments due to changes in home prices).

The table below outlines the key economic assumptions used to determine the fair value of the Firm's MSRs at December 31, 2019 and 2018, and outlines the sensitivities of those fair values to immediate adverse changes in those assumptions, as defined below.

December 31, (in millions, except rates)	2019	2018
Weighted-average prepayment speed assumption (constant prepayment rate)	**11.67%**	8.78%
Impact on fair value of 10% adverse change	**$ (200)**	$ (205)
Impact on fair value of 20% adverse change	**(384)**	(397)
Weighted-average option adjusted spread[(a)(b)]	**7.93%**	7.87%
Impact on fair value of 100 basis points adverse change	**$ (169)**	$ (235)
Impact on fair value of 200 basis points adverse change	**(326)**	(452)

(a) Includes the impact of operational risk and regulatory capital.
(b) The prior period amount has been revised to conform with the current period presentation.

Changes in fair value based on variations in assumptions generally cannot be easily extrapolated, because the relationship of the change in the assumptions to the change in fair value are often highly interrelated and may not be linear. In this table, the effect that a change in a particular assumption may have on the fair value is calculated without changing any other assumption. In reality, changes in one factor may result in changes in another, which would either magnify or counteract the impact of the initial change.

Note 16 – Premises and equipment

Premises and equipment, including leasehold improvements, are carried at cost less accumulated depreciation and amortization. JPMorgan Chase computes depreciation using the straight-line method over the estimated useful life of an asset. For leasehold improvements, the Firm uses the straight-line method computed over the lesser of the remaining term of the leased facility or the estimated useful life of the leased asset.

JPMorgan Chase capitalizes certain costs associated with the acquisition or development of internal-use software. Once the software is ready for its intended use, these costs are amortized on a straight-line basis over the software's expected useful life and reviewed for impairment on an ongoing basis.

Note 17 – Deposits

At December 31, 2019 and 2018, noninterest-bearing and interest-bearing deposits were as follows.

December 31, (in millions)	2019	2018
U.S. offices		
Noninterest-bearing (included **$22,637** and $17,204 at fair value)[(a)(b)]	**$ 395,667**	$ 386,709
Interest-bearing (included **$2,534** and $2,487 at fair value)[(a)(b)]	**876,156**	813,881
Total deposits in U.S. offices	**1,271,823**	1,200,590
Non-U.S. offices		
Noninterest-bearing (included **$1,980** and $2,367 at fair value)[(a)(b)]	**20,087**	21,459
Interest-bearing (included **$1,438** and $1,159 at fair value)[(a)(b)]	**270,521**	248,617
Total deposits in non-U.S. offices	**290,608**	270,076
Total deposits	**$ 1,562,431**	$1,470,666

(a) Includes structured notes classified as deposits for which the fair value option has been elected. Refer to Note 3 for further discussion.

(b) In the second quarter of 2019, the Firm reclassified balances related to certain structured notes from interest-bearing to noninterest-bearing deposits as the associated returns are recorded in principal transactions revenue and not in net interest income. This change was applied retrospectively and, accordingly, prior period amounts were revised to conform with the current presentation.

At December 31, 2019 and 2018, time deposits in denominations of $250,000 or more were as follows.

December 31, (in millions)	2019	2018
U.S. offices	**$ 44,127**	$ 25,119
Non-U.S. offices	**50,840**	41,661
Total	**$ 94,967**	$ 66,780

At December 31, 2019, the maturities of interest-bearing time deposits were as follows.

December 31, 2019 (in millions)	U.S.	Non-U.S.	**Total**
2020	$ 60,614	$ 49,443	$ 110,057
2021	3,700	123	3,823
2022	709	89	798
2023	175	13	188
2024	534	357	891
After 5 years	301	39	340
Total	$ 66,033	$ 50,064	$ 116,097

Note 18 - Leases

Lease commitments

Effective January 1, 2019, the Firm adopted new guidance that requires lessees to recognize on the Consolidated balance sheets all leases with lease terms greater than twelve months as a lease liability with a corresponding right-of-use ("ROU") asset. Accordingly, the Firm recognized operating lease liabilities and ROU assets of $8.2 billion and $8.1 billion, respectively. The adoption of the new lease guidance did not have a material impact on the Firm's Consolidated statements of income. The change in accounting due to the adoption of the new lease guidance did not result in a material change to the future net minimum rental payments/receivables or to the net rental expense when compared to December 31, 2018.

Firm as lessee

At December 31, 2019, JPMorgan Chase and its subsidiaries were obligated under a number of noncancelable leases, predominantly operating leases for premises and equipment used primarily for business purposes. These leases generally have terms of 20 years or less, determined based on the contractual maturity of the lease, and include periods covered by options to extend or terminate the lease when the Firm is reasonably certain that it will exercise those options. None of these lease agreements impose restrictions on the Firm's ability to pay dividends, engage in debt or equity financing transactions or enter into further lease agreements. Certain of these leases contain escalation clauses that will increase rental payments based on maintenance, utility and tax increases, which are non-lease components. The Firm elected not to separate lease and non-lease components of a contract for its real estate leases. As such, real estate lease payments represent payments on both lease and non-lease components.

Operating lease liabilities and ROU assets are recognized at the lease commencement date based on the present value of the future minimum lease payments over the lease term. The future lease payments are discounted at a rate that represents the Firm's collateralized borrowing rate for financing instruments of a similar term and are included in accounts payable and other liabilities. The operating lease ROU asset, included in premises and equipment, also includes any lease prepayments made, plus initial direct costs incurred, less any lease incentives received. Rental expense associated with operating leases is recognized on a straight-line basis over the lease term, and generally included in occupancy expense in the Consolidated statements of income. The following tables provide information related to the Firm's operating leases:

December 31, (in millions, except where otherwise noted)		2019
Right-of-use assets	$	8,190
Lease liabilities		8,505
Weighted average remaining lease term (in years)		8.8
Weighted average discount rate		3.68%
Supplemental cash flow information		
Cash paid for amounts included in the measurement of lease liabilities - operating cash flows	$	1,572
Supplemental non-cash information		
Right-of-use assets obtained in exchange for operating lease obligations	$	1,413

Year ended December 31, (in millions)		2019
Rental expense		
Gross rental expense	$	2,057
Sublease rental income		(184)
Net rental expense	$	1,873

The following table presents future payments under operating leases as of December 31, 2019:

Year ended December 31, (in millions)		
2020	$	1,604
2021		1,447
2022		1,257
2023		1,081
2024		944
After 2024		3,757
Total future minimum lease payments		10,090
Less: Imputed interest		(1,585)
Total	$	8,505

In addition to the table above, as of December 31, 2019, the Firm had additional future operating lease commitments of $1.2 billion that were signed but had not yet commenced. These operating leases will commence between 2020 and 2022 with lease terms up to 25 years.

Firm as lessor

The Firm provides auto and equipment lease financing to its customers through lease arrangements with lease terms that may contain renewal, termination and/or purchase options. Generally, the Firm's lease financings are operating leases. These assets are recognized in other assets on the Firm's Consolidated balance sheets and are depreciated on a straight-line basis over the lease term to reduce the asset to its estimated residual value. Depreciation expense is included in technology, communications and equipment expense in the Consolidated statements of income. The Firm's lease income is generally recognized on a straight-line basis over the lease term and is included in other income in the Consolidated statements of income.

On a periodic basis, the Firm assesses leased assets for impairment, and if the carrying amount of the leased asset exceeds the undiscounted cash flows from the lease payments and the estimated residual value upon disposition of the leased asset, an impairment loss is recognized.

The risk of loss on auto and equipment leased assets relating to the residual value of the leased assets is monitored through projections of the asset residual values at lease origination and periodic review of residual values, and is mitigated through arrangements with certain manufacturers or lessees.

The following table presents the carrying value of assets subject to leases reported on the Consolidated balance sheets:

December 31, (in millions)		2019		2018
Carrying value of assets subject to operating leases, net of accumulated depreciation	**$**	**23,587**	$	21,428
Accumulated depreciation		**6,121**		5,303

The following table presents the Firm's operating lease income and the related depreciation expense on the Consolidated statements of income:

Year ended December 31, (in millions)		**2019**		**2018**		**2017**
Operating lease income	**$**	**5,455**	$	4,540	$	3,611
Depreciation expense		**4,157**		3,522		2,808

The following table presents future receipts under operating leases as of December 31, 2019:

Year ended December 31, (in millions)		
2020	$	4,168
2021		2,733
2022		1,025
2023		86
2024		37
After 2024		52
Total future minimum lease receipts	$	8,101

Note 19 – Accounts payable and other liabilities

Accounts payable and other liabilities consist of brokerage payables, which includes payables to customers, dealers and clearing organizations, and payables from security purchases that did not settle; accrued expenses, including income tax payables and credit card rewards liability; and all other liabilities, including obligations to return securities received as collateral and litigation reserves.

The following table details the components of accounts payable and other liabilities.

December 31, (in millions)	**2019**	2018
Brokerage payables	**$ 118,375**	$ 114,794
Other payables and liabilities[(a)]	**92,032**	81,916
Total accounts payable and other liabilities	**$ 210,407**	$ 196,710

(a) Includes credit card rewards liability of $6.4 billion and $5.8 billion at December 31, 2019 and 2018, respectively.

Note 20 – Long-term debt

JPMorgan Chase issues long-term debt denominated in various currencies, predominantly U.S. dollars, with both fixed and variable interest rates. Included in senior and subordinated debt below are various equity-linked or other indexed instruments, which the Firm has elected to measure at fair value. Changes in fair value are recorded in principal transactions revenue in the Consolidated statements of income, except for unrealized gains/(losses) due to DVA which are recorded in OCI. The following table is a summary of long-term debt carrying values (including unamortized premiums and discounts, issuance costs, valuation adjustments and fair value adjustments, where applicable) by remaining contractual maturity as of December 31, 2019.

By remaining maturity at December 31, (in millions, except rates)		2019				2018
		Under 1 year	1-5 years	After 5 years	Total	Total
Parent company						
Senior debt:	Fixed rate	**$ 13,580**	**$ 51,982**	**$ 95,636**	**$ 161,198**	$ 145,820
	Variable rate	**2,788**	**12,708**	**3,119**	**18,615**	22,978
	Interest rates[(a)]	**0.15-4.95%**	**0.50-4.63%**	**0.45-6.40%**	**0.15-6.40%**	0.17-6.40%
Subordinated debt:	Fixed rate	**$ –**	**$ 5,109**	**$ 10,046**	**$ 15,155**	$ 14,308
	Variable rate	**–**	**–**	**9**	**9**	9
	Interest rates[(a)]	**–%**	**3.38-3.88%**	**3.63-8.00%**	**3.38-8.00%**	3.38-8.53%
	Subtotal	**$ 16,368**	**$ 69,799**	**$ 108,810**	**$ 194,977**	$ 183,115
Subsidiaries						
Federal Home Loan Banks advances:	Fixed rate	**$ 4**	**$ 35**	**$ 96**	**$ 135**	$ 155
	Variable rate	**9,500**	**19,000**	**–**	**28,500**	44,300
	Interest rates[(a)]	**1.88-2.18%**	**1.67-2.24%**	**–%**	**1.67-2.24%**	2.36-2.96%
Senior debt:	Fixed rate	**$ 761**	**$ 6,955**	**$ 11,881**	**$ 19,597**	$ 16,434
	Variable rate	**11,650**	**24,938**	**9,273**	**45,861**	35,601
	Interest rates[(a)]	**7.50%**	**2.15-9.43%**	**1.00-7.50%**	**1.00-9.43%**	1.00-7.50%
Subordinated debt:	Fixed rate	**$ –**	**$ 305**	**$ –**	**$ 305**	$ 301
	Variable rate	**–**	**–**	**–**	**–**	–
	Interest rates[(a)]	**–%**	**8.25%**	**–%**	**8.25%**	8.25%
	Subtotal	**$ 21,915**	**$ 51,233**	**$ 21,250**	**$ 94,398**	$ 96,791
Junior subordinated debt:	Fixed rate	**$ –**	**$ –**	**$ 693**	**$ 693**	$ 659
	Variable rate	**–**	**–**	**1,430**	**1,430**	1,466
	Interest rates[(a)]	**–%**	**–%**	**2.41-8.75%**	**2.41-8.75%**	3.04-8.75%
	Subtotal	**$ –**	**$ –**	**$ 2,123**	**$ 2,123**	$ 2,125
Total long-term debt[(b)(c)(d)]		**$ 38,283**	**$ 121,032**	**$ 132,183**	**$ 291,498** [(f)(g)]	$ 282,031
Long-term beneficial interests:	Fixed rate	**$ 1,621**	**$ 1,369**	**$ –**	**$ 2,990**	$ 7,611
	Variable rate	**900**	**2,572**	**276**	**3,748**	6,103
	Interest rates	**1.49-2.19%**	**0.00-2.77%**	**0.84-4.06%**	**0.00-4.06%**	0.00-4.62%
Total long-term beneficial interests[(e)]		**$ 2,521**	**$ 3,941**	**$ 276**	**$ 6,738**	$ 13,714

(a) The interest rates shown are the range of contractual rates in effect at December 31, 2019 and 2018, respectively, including non-U.S. dollar fixed- and variable-rate issuances, which excludes the effects of the associated derivative instruments used in hedge accounting relationships, if applicable. The use of these derivative instruments modifies the Firm's exposure to the contractual interest rates disclosed in the table above. Including the effects of the hedge accounting derivatives, the range of modified rates in effect at December 31, 2019, for total long-term debt was (0.02)% to 9.43%, versus the contractual range of 0.15% to 9.43% presented in the table above. The interest rate ranges shown exclude structured notes accounted for at fair value.

(b) Included long-term debt of $32.0 billion and $47.7 billion secured by assets totaling $186.1 billion and $207.0 billion at December 31, 2019 and 2018, respectively. The amount of long-term debt secured by assets does not include amounts related to hybrid instruments.

(c) Included $75.7 billion and $54.9 billion of long-term debt accounted for at fair value at December 31, 2019 and 2018, respectively.

(d) Included $13.6 billion and $11.2 billion of outstanding zero-coupon notes at December 31, 2019 and 2018, respectively. The aggregate principal amount of these notes at their respective maturities is $39.3 billion and $37.4 billion, respectively. The aggregate principal amount reflects the contractual principal payment at maturity, which may exceed the contractual principal payment at the Firm's next call date, if applicable.

(e) Included on the Consolidated balance sheets in beneficial interests issued by consolidated VIEs. Also included $36 million and $28 million accounted for at fair value at December 31, 2019 and 2018, respectively. Excluded short-term commercial paper and other short-term beneficial interests of $11.1 billion and $6.5 billion at December 31, 2019 and 2018, respectively.

(f) At December 31, 2019, long-term debt in the aggregate of $141.3 billion was redeemable at the option of JPMorgan Chase, in whole or in part, prior to maturity, based on the terms specified in the respective instruments.

(g) The aggregate carrying values of debt that matures in each of the five years subsequent to 2019 is $38.3 billion in 2020, $45.8 billion in 2021, $19.6 billion in 2022, $29.7 billion in 2023 and $25.9 billion in 2024.

The weighted-average contractual interest rates for total long-term debt excluding structured notes accounted for at fair value were 3.13% and 3.28% as of December 31, 2019 and 2018, respectively. In order to modify exposure to interest rate and currency exchange rate movements, JPMorgan Chase utilizes derivative instruments, primarily interest rate and cross-currency interest rate swaps, in conjunction with some of its debt issuances. The use of these instruments modifies the Firm's interest expense on the associated debt. The modified weighted-average interest rates for total long-term debt, including the effects of related derivative instruments, were 3.19% and 3.64% as of December 31, 2019 and 2018, respectively.

JPMorgan Chase & Co. has guaranteed certain long-term debt of its subsidiaries, including both long-term debt and structured notes. These guarantees rank on parity with the Firm's other unsecured and unsubordinated indebtedness. The amount of such guaranteed long-term debt and structured notes was $14.4 billion and $10.9 billion at December 31, 2019 and 2018, respectively.

The Firm's unsecured debt does not contain requirements that would call for an acceleration of payments, maturities or changes in the structure of the existing debt, provide any limitations on future borrowings or require additional collateral, based on unfavorable changes in the Firm's credit ratings, financial ratios, earnings or stock price.

Note 21 – Preferred stock

At December 31, 2019 and 2018, JPMorgan Chase was authorized to issue 200 million shares of preferred stock, in one or more series, with a par value of $1 per share.

In the event of a liquidation or dissolution of the Firm, JPMorgan Chase's preferred stock then outstanding takes precedence over the Firm's common stock with respect to the payment of dividends and the distribution of assets.

The following is a summary of JPMorgan Chase's non-cumulative preferred stock outstanding as of December 31, 2019 and 2018.

	Shares[a]		Carrying value (in millions)					Floating annualized rate of three-month LIBOR/Term SOFR plus:	Dividend declared per share[c]			
	December 31,		December 31,			Contractual rate in effect at December 31, 2019	Earliest redemption date[b]		Year ended December 31,			
	2019	2018	2019	2018	Issue date				2019	2018	2017	
Fixed-rate:												
Series P	–	90,000	$ –	$ 900	2/5/2013	–%	3/1/2018	NA	$545.00	$545.00	$545.00	
Series T	–	92,500	–	925	1/30/2014	–	3/1/2019	NA	167.50	670.00	670.00	
Series W	–	88,000	–	880	6/23/2014	–	9/1/2019	NA	472.50	630.00	630.00	
Series Y	**143,000**	143,000	**1,430**	1,430	2/12/2015	**6.125**	3/1/2020	NA	612.52	612.52	612.52	
Series AA	**142,500**	142,500	**1,425**	1,425	6/4/2015	**6.100**	9/1/2020	NA	610.00	610.00	610.00	
Series BB	**115,000**	115,000	**1,150**	1,150	7/29/2015	**6.150**	9/1/2020	NA	615.00	615.00	615.00	
Series DD	**169,625**	169,625	**1,696**	1,696	9/21/2018	**5.750**	12/1/2023	NA	575.00	111.81	–	
Series EE	**185,000**	–	**1,850**	–	1/24/2019	**6.000**	3/1/2024	NA	511.67	–	–	(d)
Series GG	**90,000**	–	**900**	–	11/7/2019	**4.750**	12/1/2024	NA	–	–	–	(e)
Fixed-to-floating-rate:												
Series I	**293,375**	430,375	**2,934**	4,304	4/23/2008	**LIBOR + 3.47%**	4/30/2018	LIBOR + 3.47%	$593.23	$646.38	$790.00	(f)
Series Q	**150,000**	150,000	**1,500**	1,500	4/23/2013	**5.150**	5/1/2023	LIBOR + 3.25	515.00	515.00	515.00	
Series R	**150,000**	150,000	**1,500**	1,500	7/29/2013	**6.000**	8/1/2023	LIBOR + 3.30	600.00	600.00	600.00	
Series S	**200,000**	200,000	**2,000**	2,000	1/22/2014	**6.750**	2/1/2024	LIBOR + 3.78	675.00	675.00	675.00	
Series U	**100,000**	100,000	**1,000**	1,000	3/10/2014	**6.125**	4/30/2024	LIBOR + 3.33	612.50	612.50	612.50	
Series V	**250,000**	250,000	**2,500**	2,500	6/9/2014	**LIBOR + 3.32%**	7/1/2019	LIBOR + 3.32	534.09	500.00	500.00	(g)
Series X	**160,000**	160,000	**1,600**	1,600	9/23/2014	**6.100**	10/1/2024	LIBOR + 3.33	610.00	610.00	610.00	
Series Z	**200,000**	200,000	**2,000**	2,000	4/21/2015	**5.300**	5/1/2020	LIBOR + 3.80	530.00	530.00	530.00	
Series CC	**125,750**	125,750	**1,258**	1,258	10/20/2017	**4.625**	11/1/2022	LIBOR + 2.58	462.50	462.50	129.76	
Series FF	**225,000**	–	**2,250**	–	7/31/2019	**5.000**	8/1/2024	SOFR + 3.38	251.39	–	–	(h)
Total preferred stock	**2,699,250**	2,606,750	**$ 26,993**	$ 26,068								

(a) Represented by depositary shares.
(b) Fixed-to-floating rate notes convert to a floating rate at the earliest redemption date.
(c) Dividends are declared quarterly. Dividends are payable quarterly on fixed-rate preferred stock. Dividends are payable semiannually on fixed-to-floating-rate preferred stock while at a fixed rate, and payable quarterly after converting to a floating rate.
(d) Dividends in the amount of $211.67 per share were declared on April 12, 2019 and include dividends from the original issue date of January 24, 2019 through May 31, 2019. Dividends in the amount of $150.00 per share were declared thereafter on July 10, 2019 and October 9, 2019.
(e) No dividends were declared for Series GG from the original issue date of November 7, 2019 through December 31, 2019.
(f) The dividend rate for Series I preferred stock became floating and payable quarterly starting on April 30, 2018; prior to which the dividend rate was fixed at 7.90% or $395.00 per share payable semi annually.
(g) The dividend rate for Series V preferred stock became floating and payable quarterly starting on July 1, 2019; prior to which the dividend rate was fixed at 5% or $250.00 per share payable semi annually. The Firm declared a dividend of $144.11 and $139.98 per share on outstanding Series V preferred stock on August 15, 2019 and November 15, 2019, respectively.
(h) Dividends in the amount of $126.39 per share were declared on September 9, 2019 and include dividends from the original issue date of July 31, 2019 through October 31, 2019. Dividends in the amount of $125.00 per share were declared thereafter on December 10, 2019.

Each series of preferred stock has a liquidation value and redemption price per share of $10,000, plus accrued but unpaid dividends. The aggregate liquidation value was $27.3 billion at December 31, 2019.

On February 24, 2020, the Firm issued $1.5 billion of fixed-to- floating rate non-cumulative preferred stock, Series II.

On January 31, 2020, the Firm announced that it will redeem all $1.43 billion of its 6.125% non-cumulative preferred stock, Series Y on March 1, 2020.

On January 23, 2020, the Firm issued $3.0 billion of fixed-to-floating rate non-cumulative preferred stock, Series HH.

On December 1, 2019, the Firm redeemed all $900 million of its 5.45% non-cumulative preferred stock, Series P.

On November 7, 2019, the Firm issued $900 million of 4.75% non-cumulative preferred stock, Series GG.

On October 30, 2019, the Firm redeemed $1.37 billion of its fixed-to-floating rate non-cumulative perpetual preferred stock, Series I.

On September 1, 2019, the Firm redeemed all $880 million of its 6.30% non-cumulative preferred stock, Series W.

On July 31, 2019, the Firm issued $2.25 billion of fixed-to-floating rate non-cumulative preferred stock, Series FF.

On March 1, 2019, the Firm redeemed $925 million of its 6.70% non-cumulative preferred stock, Series T.

On January 24, 2019, the Firm issued $1.85 billion of 6.00% non-cumulative preferred stock, Series EE.

On October 30, 2018, the Firm redeemed $1.7 billion of its fixed-to-floating rate non-cumulative perpetual preferred stock, Series I.

On September 21, 2018, the Firm issued $1.7 billion of 5.75% non-cumulative preferred stock, Series DD.

Dividends in the amount of $550.00 per share were declared for series O from January 1, 2017 through redemption on December 1, 2017.

Redemption rights

Each series of the Firm's preferred stock may be redeemed on any dividend payment date on or after the earliest redemption date for that series. All outstanding preferred stock series except Series I may also be redeemed following a "capital treatment event," as described in the terms of each series. Any redemption of the Firm's preferred stock is subject to non-objection from the Board of Governors of the Federal Reserve System (the "Federal Reserve").

Note 22 – Common stock

At December 31, 2019 and 2018, JPMorgan Chase was authorized to issue 9.0 billion shares of common stock with a par value of $1 per share.

Common shares issued (newly issued or reissuance from treasury) by JPMorgan Chase during the years ended December 31, 2019, 2018 and 2017 were as follows.

Year ended December 31, (in millions)	2019	2018	2017
Total issued – balance at January 1	**4,104.9**	4,104.9	4,104.9
Treasury – balance at January 1	**(829.1)**	(679.6)	(543.7)
Repurchase	**(213.0)**	(181.5)	(166.6)
Reissuance:			
Employee benefits and compensation plans	**20.4**	21.7	24.5
Warrant exercise	**–**	9.4	5.4
Employee stock purchase plans	**0.8**	0.9	0.8
Total reissuance	**21.2**	32.0	30.7
Total treasury – balance at December 31	**(1,020.9)**	(829.1)	(679.6)
Outstanding at December 31	**3,084.0**	3,275.8	3,425.3

There were no warrants to purchase shares of common stock ("Warrants") outstanding at December 31, 2019, as any Warrants that were not exercised on or before October 29, 2018, have expired. At December 31, 2017, the Firm had 15.0 million Warrants outstanding.

On June 27, 2019, in conjunction with the Federal Reserve's release of its 2019 CCAR results, the Firm's Board of Directors authorized a $29.4 billion common equity repurchase program. As of December 31, 2019, $15.6 billion of authorized repurchase capacity remained under the program. This authorization includes shares repurchased to offset issuances under the Firm's share-based compensation plans.

The following table sets forth the Firm's repurchases of common equity for the years ended December 31, 2019, 2018 and 2017. There were no Warrants repurchased during any of the years.

Year ended December 31, (in millions)	2019	2018	2017
Total number of shares of common stock repurchased	**213.0**	181.5	166.6
Aggregate purchase price of common stock repurchases	**$24,121**	$19,983	$15,410

The Firm from time to time enters into written trading plans under Rule 10b5-1 of the Securities Exchange Act of 1934 to facilitate repurchases in accordance with the common equity repurchase program. A Rule 10b5-1 repurchase plan allows the Firm to repurchase its equity during periods when it would not otherwise be repurchasing common equity — for example, during internal trading "blackout periods." All purchases under a Rule 10b5-1 plan must be made according to a predefined plan established when the Firm is not aware of material nonpublic information. Refer to Part II, Item 5: Market for registrant's common equity, related stockholder matters and issuer purchases of equity securities, on page 30 for additional information regarding repurchases of the Firm's equity securities.

As of December 31, 2019, approximately 70.5 million shares of common stock were reserved for issuance under various employee incentive, compensation, option and stock purchase plans, and directors' compensation plans.

Note 23 – Earnings per share

Basic earnings per share ("EPS") is calculated using the two-class method. Under the two-class method, all earnings (distributed and undistributed) are allocated to common stock and participating securities. JPMorgan Chase grants RSUs under its share-based compensation programs, predominantly all of which entitle recipients to receive nonforfeitable dividends during the vesting period on a basis equivalent to dividends paid to holders of the Firm's common stock. These unvested RSUs meet the definition of participating securities based on their respective rights to receive nonforfeitable dividends, and they are treated as a separate class of securities in computing basic EPS. Participating securities are not included as incremental shares in computing diluted EPS; refer to Note 9 for additional information.

Diluted EPS incorporates the potential impact of contingently issuable shares, including awards which require future service as a condition of delivery of the underlying common stock. Diluted EPS is calculated under both the two-class and treasury stock methods, and the more dilutive amount is reported. For each of the periods presented in the table below, diluted EPS calculated under the two-class method was more dilutive.

The following table presents the calculation of net income applicable to common stockholders and basic and diluted EPS for the years ended December 31, 2019, 2018 and 2017.

Year ended December 31, (in millions, except per share amounts)	2019	2018	2017
Basic earnings per share			
Net income	**$ 36,431**	$ 32,474	$ 24,441
Less: Preferred stock dividends	**1,587**	1,551	1,663
Net income applicable to common equity	**34,844**	30,923	22,778
Less: Dividends and undistributed earnings allocated to participating securities	**202**	214	211
Net income applicable to common stockholders	**$ 34,642**	$ 30,709	$ 22,567
Total weighted-average basic shares outstanding	**3,221.5**	3,396.4	3,551.6
Net income per share	**$ 10.75**	$ 9.04	$ 6.35
Diluted earnings per share			
Net income applicable to common stockholders	**$ 34,642**	$ 30,709	$ 22,567
Total weighted-average basic shares outstanding	**3,221.5**	3,396.4	3,551.6
Add: Dilutive impact of SARs and employee stock options, unvested PSUs and non-dividend-earning RSUs, and warrants	**8.9**	17.6	25.2
Total weighted-average diluted shares outstanding	**3,230.4**	3,414.0	3,576.8
Net income per share	**$ 10.72**	$ 9.00	$ 6.31

Note 24 – Accumulated other comprehensive income/(loss)

AOCI includes the after-tax change in unrealized gains and losses on investment securities, foreign currency translation adjustments (including the impact of related derivatives), fair value changes of excluded components on fair value hedges, cash flow hedging activities, net loss and prior service costs/(credit) related to the Firm's defined benefit pension and OPEB plans, and fair value option-elected liabilities arising from changes in the Firm's own credit risk (DVA).

Year ended December 31, (in millions)	Unrealized gains/(losses) on investment securities	Translation adjustments, net of hedges	Fair value hedges	Cash flow hedges	Defined benefit pension and OPEB plans	DVA on fair value option elected liabilities	Accumulated other comprehensive income/(loss)
Balance at December 31, 2016	$ 1,524	$ (164)	NA	$ (100)	$ (2,259)	$ (176)	$ (1,175)
Net change	640	(306)	NA	176	738	(192)	1,056
Balance at December 31, 2017	$ 2,164	$ (470)	$ –	$ 76	$ (1,521)	$ (368)	$ (119)
Cumulative effect of changes in accounting principles:[(a)]	896	(277)	(54)	16	(414)	(79)	88
Net change	(1,858)	20	(107)	(201)	(373)	1,043	(1,476)
Balance at December 31, 2018	$ 1,202	$ (727)	$ (161)	$ (109)	$ (2,308)	$ 596	$ (1,507)
Net change	**2,855**	**20**	**30**	**172**	**964**	**(965)**	**3,076**
Balance at December 31, 2019	**$ 4,057**	**$ (707)**	**$ (131)**	**$ 63**	**$ (1,344)**	**$ (369)**	**$ 1,569**

(a) Represents the adjustment to AOCI as a result of the accounting standards adopted in the first quarter of 2018. Refer to Note 1 for additional information.

The following table presents the pre-tax and after-tax changes in the components of OCI.

Year ended December 31, (in millions)	2019 Pre-tax	2019 Tax effect	2019 After-tax	2018 Pre-tax	2018 Tax effect	2018 After-tax	2017 Pre-tax	2017 Tax effect	2017 After-tax
Unrealized gains/(losses) on investment securities:									
Net unrealized gains/(losses) arising during the period	**$ 4,025**	**$ (974)**	**$ 3,051**	$ (2,825)	$ 665	$ (2,160)	$ 944	$ (346)	$ 598
Reclassification adjustment for realized (gains)/losses included in net income[(a)]	**(258)**	**62**	**(196)**	395	(93)	302	66	(24)	42
Net change	**3,767**	**(912)**	**2,855**	(2,430)	572	(1,858)	1,010	(370)	640
Translation adjustments[(b)]:									
Translation	**(49)**	**33**	**(16)**	(1,078)	156	(922)	1,313	(801)	512
Hedges	**46**	**(10)**	**36**	1,236	(294)	942	(1,294)	476	(818)
Net change	**(3)**	**23**	**20**	158	(138)	20	19	(325)	(306)
Fair value hedges, net change[(c)]:	**39**	**(9)**	**30**	(140)	33	(107)	NA	NA	NA
Cash flow hedges:									
Net unrealized gains/(losses) arising during the period	**122**	**(28)**	**94**	(245)	58	(187)	147	(55)	92
Reclassification adjustment for realized (gains)/losses included in net income[(d)]	**103**	**(25)**	**78**	(18)	4	(14)	134	(50)	84
Net change	**225**	**(53)**	**172**	(263)	62	(201)	281	(105)	176
Defined benefit pension and OPEB plans:									
Prior service credit/(cost) arising during the period	**(5)**	**1**	**(4)**	(29)	7	(22)	–	–	–
Net gain/(loss) arising during the period	**1,005**	**(169)**	**836**	(558)	102	(456)	802	(160)	642
Reclassification adjustments included in net income[(e)]:									
Amortization of net loss	**167**	**(36)**	**131**	103	(24)	79	250	(90)	160
Amortization of prior service cost/(credit)	**3**	**(1)**	**2**	(23)	6	(17)	(36)	13	(23)
Curtailment (gain)/loss	**–**	**–**	**–**	21	(5)	16	–	–	–
Settlement (gain)/loss	**–**	**–**	**–**	2	–	2	2	(1)	1
Foreign exchange and other	**(13)**	**12**	**(1)**	34	(9)	25	(54)	12	(42)
Net change	**1,157**	**(193)**	**964**	(450)	77	(373)	964	(226)	738
DVA on fair value option elected liabilities, net change:	**$ (1,264)**	**$ 299**	**$ (965)**	$ 1,364	$ (321)	$ 1,043	$ (303)	$ 111	$ (192)
Total other comprehensive income/(loss)	**$ 3,921**	**$ (845)**	**$ 3,076**	$ (1,761)	$ 285	$ (1,476)	$ 1,971	$ (915)	$ 1,056

(a) The pre-tax amount is reported in investment securities gains/(losses) in the Consolidated statements of income.
(b) Reclassifications of pre-tax realized gains/(losses) on translation adjustments and related hedges are reported in other income/expense in the Consolidated statements of income. During the year ended December 31, 2019, the Firm reclassified net pre-tax gains of $7 million to other income and $1 million to other expense, respectively. These amounts, which related to the liquidation of certain legal entities, are comprised of $18 million related to net investment hedge gains and$10 million related to cumulative translation adjustments. During the year ended December 31, 2018, the Firm reclassified a net pre-tax loss of $168 million to other expense related to the liquidation of certain legal entities, $17 million related to net investment hedge losses and $151 million related to cumulative translation adjustments. During the year ended December 31, 2017, the Firm reclassified a net pre-tax loss of $25 million to other expense related to the liquidation of a legal entity, $50 million related to net investment hedge gains and $75 million related to cumulative translation adjustments.
(c) Represents changes in fair value of cross-currency swaps attributable to changes in cross-currency basis spreads, which are excluded from the assessment of hedge effectiveness and recorded in other comprehensive income. The initial cost of cross-currency basis spreads is recognized in earnings as part of the accrual of interest on the cross-currency swap.
(d) The pre-tax amounts are primarily recorded in noninterest revenue, net interest income and compensation expense in the Consolidated statements of income.
(e) The pre-tax amount is reported in other expense in the Consolidated statements of income.

Note 25 – Income taxes

JPMorgan Chase and its eligible subsidiaries file a consolidated U.S. federal income tax return. JPMorgan Chase uses the asset and liability method to provide income taxes on all transactions recorded in the Consolidated Financial Statements. This method requires that income taxes reflect the expected future tax consequences of temporary differences between the carrying amounts of assets or liabilities for book and tax purposes. Accordingly, a deferred tax asset or liability for each temporary difference is determined based on the tax rates that the Firm expects to be in effect when the underlying items of income and expense are realized. JPMorgan Chase's expense for income taxes includes the current and deferred portions of that expense. A valuation allowance is established to reduce deferred tax assets to the amount the Firm expects to realize.

Due to the inherent complexities arising from the nature of the Firm's businesses, and from conducting business and being taxed in a substantial number of jurisdictions, significant judgments and estimates are required to be made. Agreement of tax liabilities between JPMorgan Chase and the many tax jurisdictions in which the Firm files tax returns may not be finalized for several years. Thus, the Firm's final tax-related assets and liabilities may ultimately be different from those currently reported.

Effective tax rate and expense

The following table presents a reconciliation of the applicable statutory U.S. federal income tax rate to the effective tax rate.

Effective tax rate

Year ended December 31,	**2019**	2018	2017
Statutory U.S. federal tax rate	**21.0%**	21.0%	35.0%
Increase/(decrease) in tax rate resulting from:			
U.S. state and local income taxes, net of U.S. federal income tax benefit	**3.5**	4.0	2.2
Tax-exempt income	**(1.4)**	(1.5)	(3.3)
Non-U.S. earnings	**1.8**	0.6	(3.1) (a)
Business tax credits	**(4.4)**	(3.5)	(4.2)
Tax audit resolutions	**(2.3)**	(0.1)	(0.3)
Impact of the TCJA	**–**	(0.7)	5.4
Other, net	**–**	0.5	0.2
Effective tax rate	**18.2%**	20.3%	31.9%

(a) Predominantly includes earnings of U.K. subsidiaries that were deemed to be reinvested indefinitely through December 31, 2017.

Impact of the TCJA

2018

The Firm's effective tax rate decreased in 2018 due to the TCJA, including the reduction in the U.S. federal statutory income tax rate as well as a $302 million net tax benefit recorded in 2018 resulting from changes in the estimates related to the remeasurement of certain deferred taxes and the deemed repatriation tax on non-U.S. earnings. The change in estimate was recorded under SEC Staff Accounting Bulletin No. 118 ("SAB 118") and the accounting under SAB 118 is complete.

2017

The Firm's effective tax rate increased in 2017 driven by a $1.9 billion income tax expense representing the estimated impact of the enactment of the TCJA. The $1.9 billion tax expense was predominantly driven by a deemed repatriation of the Firm's unremitted non-U.S. earnings and adjustments to the value of certain tax-oriented investments partially offset by a benefit from the revaluation of the Firm's net deferred tax liability.

The deemed repatriation of the Firm's unremitted non-U.S. earnings is based on the post-1986 earnings and profits of each controlled foreign corporation. The calculation resulted in an estimated income tax expense of $3.7 billion. Furthermore, accounting for income taxes requires the remeasurement of certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future. The Firm remeasured its deferred tax asset and liability balances in the fourth quarter of 2017 to the new statutory U.S. federal income tax rate of 21% as well as any federal benefit associated with state and local deferred income taxes. The remeasurement resulted in an estimated income tax benefit of $2.1 billion.

Adjustments were also recorded in 2017 to income tax expense for certain tax-oriented investments. These adjustments were driven by changes to affordable housing proportional amortization resulting from the reduction of the federal income tax rate under the TCJA. SAB 118 did not apply to these adjustments.

The following table reflects the components of income tax expense/(benefit) included in the Consolidated statements of income.

Income tax expense/(benefit)

Year ended December 31, (in millions)	2019	2018	2017
Current income tax expense/(benefit)			
U.S. federal	**$ 3,284**	$ 2,854	$ 5,718
Non-U.S.	**2,103**	2,077	2,400
U.S. state and local	**1,778**	1,638	1,029
Total current income tax expense/(benefit)	**7,165**	6,569	9,147
Deferred income tax expense/(benefit)			
U.S. federal	**709**	1,359	2,174
Non-U.S.	**20**	(93)	(144)
U.S. state and local	**220**	455	282
Total deferred income tax expense/(benefit)	**949**	1,721	2,312
Total income tax expense	**$ 8,114**	$ 8,290	$ 11,459

Total income tax expense includes $1.1 billion, $54 million and $252 million of tax benefits recorded in 2019, 2018, and 2017, respectively, resulting from the resolution of tax audits.

Tax effect of items recorded in stockholders' equity

The preceding table does not reflect the tax effect of certain items that are recorded each period directly in stockholders' equity. The tax effect of all items recorded directly to stockholders' equity resulted in a decrease of $862 million in 2019, an increase of $172 million in 2018, and a decrease of $915 million in 2017.

Results from Non-U.S. earnings

The following table presents the U.S. and non-U.S. components of income before income tax expense.

Year ended December 31, (in millions)	2019	2018	2017
U.S.	**$ 36,670**	$ 33,052	$ 27,103
Non-U.S.[(a)]	**7,875**	7,712	8,797
Income before income tax expense	**$ 44,545**	$ 40,764	$ 35,900

(a) For purposes of this table, non-U.S. income is defined as income generated from operations located outside the U.S.

Prior to December 31, 2017, U.S. federal income taxes had not been provided on the undistributed earnings of certain non-U.S. subsidiaries, to the extent that such earnings had been reinvested abroad for an indefinite period of time. The Firm is no longer maintaining the indefinite reinvestment assertion on the undistributed earnings of those non-U.S. subsidiaries in light of the enactment of the TCJA. The U.S. federal and state and local income taxes associated with the undistributed and previously untaxed earnings of those non-U.S. subsidiaries was included in the deemed repatriation charge recorded as of December 31, 2017. The Firm will recognize any taxes it may incur on global intangible low tax income as income tax expense in the period in which the tax is incurred.

Affordable housing tax credits

The Firm recognized $1.5 billion, $1.5 billion and $1.7 billion of tax credits and other tax benefits associated with investments in affordable housing projects within income tax expense for the years 2019, 2018 and 2017, respectively. The amount of amortization of such investments reported in income tax expense was $1.1 billion, $1.2 billion and $1.7 billion, respectively. The carrying value of these investments, which are reported in other assets on the Firm's Consolidated balance sheets, was $8.6 billion and $7.9 billion at December 31, 2019 and 2018, respectively. The amount of commitments related to these investments, which are reported in accounts payable and other liabilities on the Firm's Consolidated balance sheets, was $2.8 billion and $2.3 billion at December 31, 2019 and 2018, respectively.

Deferred taxes

Deferred income tax expense/(benefit) results from differences between assets and liabilities measured for financial reporting purposes versus income tax return purposes. Deferred tax assets are recognized if, in management's judgment, their realizability is determined to be more likely than not. If a deferred tax asset is determined to be unrealizable, a valuation allowance is established. The significant components of deferred tax assets and liabilities are reflected in the following table.

December 31, (in millions)	2019	2018
Deferred tax assets		
Allowance for loan losses	$ **3,400**	$ 3,433
Employee benefits	**1,039**	1,129
Accrued expenses and other	**2,767**	2,701
Non-U.S. operations	**949**	629
Tax attribute carryforwards	**605**	163
Gross deferred tax assets	**8,760**	8,055
Valuation allowance	**(557)**	(89)
Deferred tax assets, net of valuation allowance	$ **8,203**	$ 7,966
Deferred tax liabilities		
Depreciation and amortization	$ **2,852**	$ 2,533
Mortgage servicing rights, net of hedges	**2,354**	2,586
Leasing transactions	**5,598**	4,719
Other, net	**4,683**	3,713
Gross deferred tax liabilities	**15,487**	13,551
Net deferred tax (liabilities)/assets	$ **(7,284)**	$ (5,585)

JPMorgan Chase has recorded deferred tax assets of $605 million at December 31, 2019, in connection with U.S. federal and non-U.S. NOL carryforwards, foreign tax credit ("FTC") carryforwards, and state and local capital loss carryforwards. At December 31, 2019, total U.S. federal NOL carryforwards were $1.0 billion, non-U.S. NOL carryforwards were $80 million, FTC carryforwards were $329 million, and state and local capital loss carryforwards were $1.1 billion. If not utilized, a portion of the U.S. federal NOL carryforwards will expire between 2022 and 2036 whereas others have an unlimited carryforward period. Similarly, certain non-U.S. NOL carryforwards will expire between 2029 and 2037 whereas others have an unlimited carryforward period. The FTC carryforwards will expire in 2029 and the state and local capital loss carryforwards will expire between 2020 and 2022.

The valuation allowance at December 31, 2019, was due to the state and local capital loss carryforwards, FTC carryforwards, and certain non-U.S. deferred tax assets, including NOL carryforwards.

Unrecognized tax benefits

At December 31, 2019, 2018 and 2017, JPMorgan Chase's unrecognized tax benefits, excluding related interest expense and penalties, were $4.0 billion, $4.9 billion and $4.7 billion, respectively, of which $2.8 billion, $3.8 billion and $3.5 billion, respectively, if recognized, would reduce the annual effective tax rate. Included in the amount of unrecognized tax benefits are certain items that would not affect the effective tax rate if they were recognized in the Consolidated statements of income. These unrecognized items include the tax effect of certain temporary differences, the portion of gross state and local unrecognized tax benefits that would be offset by the benefit from associated U.S. federal income tax deductions, and the portion of gross non-U.S. unrecognized tax benefits that would have offsets in other jurisdictions. JPMorgan Chase is presently under audit by a number of taxing authorities, most notably by the Internal Revenue Service as summarized in the Tax examination status table below. As JPMorgan Chase is presently under audit by a number of taxing authorities, it is reasonably possible that over the next 12 months the resolution of these examinations may increase or decrease the gross balance of unrecognized tax benefits by as much as $0.5 billion. Upon settlement of an audit, the change in the unrecognized tax benefit would result from payment or income statement recognition.

The following table presents a reconciliation of the beginning and ending amount of unrecognized tax benefits.

Year ended December 31, (in millions)	2019	2018	2017
Balance at January 1,	$ **4,861**	$ 4,747	$ 3,450
Increases based on tax positions related to the current period	**871**	980	1,355
Increases based on tax positions related to prior periods	**10**	649	626
Decreases based on tax positions related to prior periods	**(706)**	(1,249)	(350)
Decreases related to cash settlements with taxing authorities	**(1,012)**	(266)	(334)
Balance at December 31,	$ **4,024**	$ 4,861	$ 4,747

After-tax interest expense/(benefit) and penalties related to income tax liabilities recognized in income tax expense were $(52) million, $192 million and $102 million in 2019, 2018 and 2017, respectively.

At December 31, 2019 and 2018, in addition to the liability for unrecognized tax benefits, the Firm had accrued $817 million and $887 million, respectively, for income tax-related interest and penalties.

Tax examination status

JPMorgan Chase is continually under examination by the Internal Revenue Service, by taxing authorities throughout the world, and by many state and local jurisdictions throughout the U.S. The following table summarizes the status of significant income tax examinations of JPMorgan Chase and its consolidated subsidiaries as of December 31, 2019.

	Periods under examination	Status
JPMorgan Chase – U.S.	2011 – 2013	Field Examination completed; JPMorgan Chase intends to file amended returns
JPMorgan Chase – U.S.	2014 - 2016	Field Examination
JPMorgan Chase – New York State	2012 - 2014	Field Examination
JPMorgan Chase – New York City	2012 - 2014	Field Examination
JPMorgan Chase – California	2011 – 2012	Field Examination
JPMorgan Chase – U.K.	2006 – 2017	Field examination of certain select entities

Note 26 – Restricted cash, other restricted assets and intercompany funds transfers

Restricted cash and other restricted assets

Certain of the Firm's cash and other assets are restricted as to withdrawal or usage. These restrictions are imposed by various regulatory authorities based on the particular activities of the Firm's subsidiaries.

The business of JPMorgan Chase Bank, N.A. is subject to examination and regulation by the OCC. The Bank is a member of the U.S. Federal Reserve System, and its deposits in the U.S. are insured by the FDIC, subject to applicable limits.

The Federal Reserve requires depository institutions to maintain cash reserves with a Federal Reserve Bank. The average required amount of reserve balances is deposited by the Firm's bank subsidiaries. In addition, the Firm is required to maintain cash reserves at certain non-US central banks.

The Firm is also subject to rules and regulations established by other U.S. and non U.S. regulators. As part of its compliance with the respective regulatory requirements, the Firm's broker-dealers (principally J.P. Morgan Securities LLC in the U.S and J.P. Morgan Securities plc in the U.K.) are subject to certain restrictions on cash and other assets.

The following table presents the components of the Firm's restricted cash:

December 31, (in billions)	2019	2018
Cash reserves – Federal Reserve Banks	$ 26.6	$ 22.1
Segregated for the benefit of securities and cleared derivative customers	16.0	14.6
Cash reserves at non-U.S. central banks and held for other general purposes	3.9	4.1
Total restricted cash[(a)]	$ 46.5	$ 40.8

(a) Comprises $45.3 billion and $39.6 billion in deposits with banks as of December 31, 2019 and 2018, respectively, and $1.2 billion in cash and due from banks as of December 31, 2019 and 2018, on the Consolidated balance sheets.

Also, as of December 31, 2019 and 2018, the Firm had the following other restricted assets:

- Cash and securities pledged with clearing organizations for the benefit of customers of $24.7 billion and $20.6 billion, respectively.
- Securities with a fair value of $8.8 billion and $9.7 billion, respectively, were also restricted in relation to customer activity.

Intercompany funds transfers

Restrictions imposed by U.S. federal law prohibit JPMorgan Chase & Co. ("Parent Company") and certain of its affiliates from borrowing from banking subsidiaries unless the loans are secured in specified amounts. Such secured loans provided by any banking subsidiary to the Parent Company or to any particular affiliate, together with certain other transactions with such affiliate (collectively referred to as "covered transactions"), are generally limited to 10% of the banking subsidiary's total capital, as determined by the risk-based capital guidelines; the aggregate amount of covered transactions between any banking subsidiary and all of its affiliates is limited to 20% of the banking subsidiary's total capital.

The Parent Company's two principal subsidiaries are JPMorgan Chase Bank, N.A. and JPMorgan Chase Holdings LLC, an intermediate holding company (the "IHC"). The IHC holds the stock of substantially all of JPMorgan Chase's subsidiaries other than JPMorgan Chase Bank, N.A. and its subsidiaries. The IHC also owns other assets and owes intercompany indebtedness to the holding company. The Parent Company is obligated to contribute to the IHC substantially all the net proceeds received from securities issuances (including issuances of senior and subordinated debt securities and of preferred and common stock).

The principal sources of income and funding for the Parent Company are dividends from JPMorgan Chase Bank, N.A. and dividends and extensions of credit from the IHC. In addition to dividend restrictions set forth in statutes and regulations, the Federal Reserve, the OCC and the FDIC have authority under the Financial Institutions Supervisory Act to prohibit or to limit the payment of dividends by the banking organizations they supervise, including the Parent Company and its subsidiaries that are banks or bank holding companies, if, in the banking regulator's opinion, payment of a dividend would constitute an unsafe or unsound practice in light of the financial condition of the banking organization. The IHC is prohibited from paying dividends or extending credit to the Parent Company if certain capital or liquidity "thresholds" are breached or if limits are otherwise imposed by the Parent Company's management or Board of Directors.

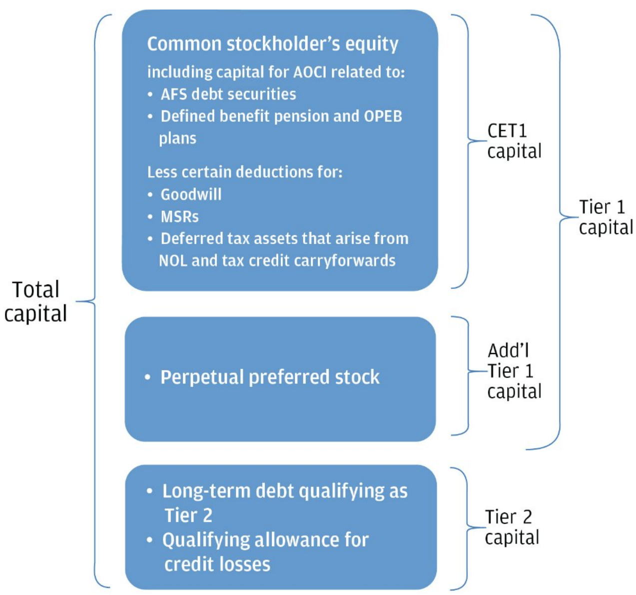
At January 1, 2020, the Parent Company's banking subsidiaries could pay, in the aggregate, approximately $9 billion in dividends to their respective bank holding companies without the prior approval of their relevant banking regulators. The capacity to pay dividends in 2020 will be supplemented by the banking subsidiaries' earnings during the year.

Note 27 – Regulatory capital

The Federal Reserve establishes capital requirements, including well-capitalized standards, for the consolidated financial holding company. The OCC establishes similar minimum capital requirements and standards for the Firm's IDI subsidiaries, including JPMorgan Chase Bank, N.A.

The capital rules under Basel III establish minimum capital ratios and overall capital adequacy standards for large and internationally active U.S. bank holding companies and banks, including the Firm and its IDI subsidiaries, including JPMorgan Chase Bank, N.A. Two comprehensive approaches are prescribed for calculating RWA: a standardized approach ("Basel III Standardized"), and an advanced approach ("Basel III Advanced"). Effective January 1, 2019, the capital adequacy of the Firm and JPMorgan Chase Bank, N.A. is evaluated against the fully phased-in measures under Basel III that represents the lower of the Standardized or Advanced approaches. During 2018, the required capital measures were subject to the transitional rules and as of December 31, 2018 were the same on a fully phased-in and on a transitional basis.

The three components of regulatory capital under the Basel III rules are as illustrated below:



Under the risk-based capital and leverage-based guidelines of the Federal Reserve, JPMorgan Chase is required to maintain minimum ratios for CET1, Tier 1, Total, Tier 1 leverage and the SLR. Failure to meet these minimum requirements could cause the Federal Reserve to take action. IDI subsidiaries are also subject to these capital requirements by their respective primary regulators.

The following table presents the minimum and well-capitalized ratios to which the Firm and its IDI subsidiaries were subject as of December 31, 2019.

	Minimum capital ratios		Well-capitalized ratios	
	BHC(a)(e)(f)	IDI(b)(e)(f)	BHC(c)	IDI(d)
Capital ratios				
CET1	10.5%	7.0%	N/A	6.5%
Tier 1	12.0	8.5	6.0	8.0
Total	14.0	10.5	10.0	10.0
Tier 1 leverage	4.0	4.0	N/A	5.0
SLR	5.0	6.0	N/A	6.0

Note: The table above is as defined by the regulations issued by the Federal Reserve, OCC and FDIC and to which the Firm and its IDI subsidiaries are subject.

(a) Represents the minimum capital ratios applicable to the Firm under Basel III. The CET1 minimum capital ratio includes a capital conservation buffer of 2.5% and GSIB surcharge of 3.5% as calculated under Method 2.
(b) Represents requirements for JPMorgan Chase's IDI subsidiaries. The CET1 minimum capital ratio includes a capital conservation buffer of 2.5% that is applicable to the IDI subsidiaries. The IDI subsidiaries are not subject to the GSIB surcharge.
(c) Represents requirements for bank holding companies pursuant to regulations issued by the Federal Reserve.
(d) Represents requirements for IDI subsidiaries pursuant to regulations issued under the FDIC Improvement Act.
(e) For the period ended December 31, 2018, the CET1, Tier 1, Total and Tier 1 leverage minimum capital ratios applicable to the Firm were 9.0%, 10.5%, 12.5%, and 4.0% and the CET1, Tier 1, Total and Tier 1 leverage minimum capital ratios applicable to the Firm's IDI subsidiaries were 6.375%, 7.875%, 9.875%, and 4.0%, respectively.
(f) Represents minimum SLR requirement of 3.0%, as well as, supplementary leverage buffers of 2.0% and 3.0% for BHC and IDI, respectively.

The following tables present the risk-based and leverage-based capital metrics for JPMorgan Chase and JPMorgan Chase Bank, N.A. under both the Basel III Standardized and Basel III Advanced Approaches. As of December 31, 2019 and 2018, JPMorgan Chase and JPMorgan Chase Bank, N.A. were well-capitalized and met all capital requirements to which each was subject.

December 31, 2019 (in millions, except ratios)	Basel III Standardized Fully Phased-In JPMorgan Chase & Co.	Basel III Standardized Fully Phased-In JPMorgan Chase Bank, N.A.	Basel III Advanced Fully Phased-In JPMorgan Chase & Co.	Basel III Advanced Fully Phased-In JPMorgan Chase Bank, N.A.
Regulatory capital				
CET1 capital	**$ 187,753**	**$ 206,848**	**$ 187,753**	**$ 206,848**
Tier 1 capital	**214,432**	**206,851**	**214,432**	**206,851**
Total capital	**242,589**	**224,390**	**232,112**	**214,091**
Assets				
Risk-weighted	**1,515,869**	**1,457,689**	**1,397,878**	**1,269,991**
Adjusted average[(a)]	**2,730,239**	**2,353,432**	**2,730,239**	**2,353,432**
Capital ratios[(b)]				
CET1	**12.4%**	**14.2%**	**13.4%**	**16.3%**
Tier 1	**14.1**	**14.2**	**15.3**	**16.3**
Total	**16.0**	**15.4**	**16.6**	**16.9**
Tier 1 leverage[(c)]	**7.9**	**8.8**	**7.9**	**8.8**

December 31, 2018 (in millions, except ratios)	Basel III Standardized Transitional JPMorgan Chase & Co.	Basel III Standardized Transitional JPMorgan Chase Bank, N.A.[(d)]	Basel III Advanced Transitional JPMorgan Chase & Co.	Basel III Advanced Transitional JPMorgan Chase Bank, N.A.[(d)]
Regulatory capital				
CET1 capital	$ 183,474	$ 211,671	$ 183,474	$ 211,671
Tier 1 capital	209,093	211,671	209,093	211,671
Total capital	237,511	229,952	227,435	220,025
Assets				
Risk-weighted	1,528,916	1,446,529	1,421,205	1,283,146
Adjusted average[(a)]	2,589,887	2,250,480	2,589,887	2,250,480
Capital ratios[(b)]				
CET1	12.0%	14.6%	12.9%	16.5%
Tier 1	13.7	14.6	14.7	16.5
Total	15.5	15.9	16.0	17.1
Tier 1 leverage[(c)]	8.1	9.4	8.1	9.4

(a) Adjusted average assets, for purposes of calculating the Tier 1 leverage ratio, includes total quarterly average assets adjusted for on-balance sheet assets that are subject to deduction from Tier 1 capital, predominantly goodwill and other intangible assets.
(b) For each of the risk-based capital ratios, the capital adequacy of the Firm and JPMorgan Chase Bank, N.A. is evaluated against the lower of the two ratios as calculated under Basel III approaches (Standardized or Advanced).
(c) The Tier 1 leverage ratio is not a risk-based measure of capital.
(d) On May 18, 2019, Chase Bank USA, N.A. merged with and into JPMorgan Chase Bank, N.A., with JPMorgan Chase Bank, N.A as the surviving entity. The December 31, 2018 amounts reported for JPMorgan Chase Bank, N.A. retrospectively reflect the impact of the merger.

(in millions, except ratios)	December 31, 2019 Basel III Advanced Fully Phased-In JPMorgan Chase & Co.	December 31, 2019 Basel III Advanced Fully Phased-In JPMorgan Chase Bank, N.A.	December 31, 2018 Basel III Advanced Fully Phased-In JPMorgan Chase & Co.	December 31, 2018 Basel III Advanced Fully Phased-In JPMorgan Chase Bank, N.A.[(a)]
Total leverage exposure	**3,423,431**	**$ 3,044,509**	$ 3,269,988	$ 2,915,541
SLR	**6.3%**	**6.8%**	6.4%	7.3%

(a) On May 18, 2019, Chase Bank USA, N.A. merged with and into JPMorgan Chase Bank, N.A., with JPMorgan Chase Bank, N.A as the surviving entity. The December 31, 2018 amounts reported for JPMorgan Chase Bank, N.A. retrospectively reflect the impact of the merger.

Note 28 – Off-balance sheet lending-related financial instruments, guarantees, and other commitments

JPMorgan Chase provides lending-related financial instruments (e.g., commitments and guarantees) to address the financing needs of its customers and clients. The contractual amount of these financial instruments represents the maximum possible credit risk to the Firm should the customer or client draw upon the commitment or the Firm be required to fulfill its obligation under the guarantee, and should the customer or client subsequently fail to perform according to the terms of the contract. Most of these commitments and guarantees are refinanced, extended, cancelled, or expire without being drawn or a default occurring. As a result, the total contractual amount of these instruments is not, in the Firm's view, representative of its expected future credit exposure or funding requirements.

To provide for probable credit losses inherent in wholesale and certain consumer lending-commitments, an allowance for credit losses on lending-related commitments is maintained. Refer to Note 13 for further information regarding the allowance for credit losses on lending-related commitments. The following table summarizes the contractual amounts and carrying values of off-balance sheet lending-related financial instruments, guarantees and other commitments at December 31, 2019 and 2018. The amounts in the table below for credit card and home equity lending-related commitments represent the total available credit for these products. The Firm has not experienced, and does not anticipate, that all available lines of credit for these products will be utilized at the same time. The Firm can reduce or cancel credit card lines of credit by providing the borrower notice or, in some cases as permitted by law, without notice. In addition, the Firm typically closes credit card lines when the borrower is 60 days or more past due. The Firm may reduce or close HELOCs when there are significant decreases in the value of the underlying property, or when there has been a demonstrable decline in the creditworthiness of the borrower.

Off-balance sheet lending-related financial instruments, guarantees and other commitments

By remaining maturity at December 31, (in millions)	Contractual amount 2019 Expires in 1 year or less	Expires after 1 year through 3 years	Expires after 3 years through 5 years	Expires after 5 years	Total	2018 Total	Carrying value[g] 2019	2018
Lending-related								
Consumer, excluding credit card:								
Home equity	$ 680	$ 1,187	$ 2,548	$ 16,704	$ 21,119	$ 20,901	$ 12	$ 12
Residential mortgage[a]	9,086	—	—	12	9,098	5,481	—	—
Auto	8,296	600	197	195	9,288	8,011	2	2
Consumer & Business Banking	9,994	646	105	1,162	11,907	11,673	19	19
Total consumer, excluding credit card	28,056	2,433	2,850	18,073	51,412	46,066	33	33
Credit card	650,720	—	—	—	650,720	605,379	—	—
Total consumer[b]	678,776	2,433	2,850	18,073	702,132	651,445	33	33
Wholesale:								
Other unfunded commitments to extend credit[c]	58,645	129,414	168,400	10,791	367,250	351,490	938	852
Standby letters of credit and other financial guarantees[c]	15,919	11,127	5,117	1,745	33,908	33,498	618	521
Other letters of credit[c]	2,734	183	40	—	2,957	2,825	4	3
Total wholesale[b]	77,298	140,724	173,557	12,536	404,115	387,813	1,560	1,376
Total lending-related	$ 756,074	$ 143,157	$ 176,407	$ 30,609	$ 1,106,247	$1,039,258	$ 1,593	$ 1,409
Other guarantees and commitments								
Securities lending indemnification agreements and guarantees[d]	$ 204,827	$ —	$ —	$ —	$ 204,827	$ 186,077	$ —	$ —
Derivatives qualifying as guarantees	1,403	144	11,299	40,243	53,089	55,271	159	367
Unsettled resale and securities borrowed agreements	117,203	748	—	—	117,951	102,008	—	—
Unsettled repurchase and securities loaned agreements	72,790	561	—	—	73,351	57,732	—	—
Loan sale and securitization-related indemnifications:								
Mortgage repurchase liability	NA	NA	NA	NA	NA	NA	59	89
Loans sold with recourse	NA	NA	NA	NA	944	1,019	27	30
Exchange & clearing house guarantees and commitments[e]	206,432	—	—	—	206,432	58,960	—	—
Other guarantees and commitments [f]	2,684	841	293	3,399	7,217	8,183	(73)	(73)

(a) Includes certain commitments to purchase loans from correspondents.
(b) Predominantly all consumer and wholesale lending-related commitments are in the U.S.
(c) At December 31, 2019 and 2018, reflected the contractual amount net of risk participations totaling $76 million and $282 million, respectively, for other unfunded commitments to extend credit; $9.8 billion and $10.4 billion, respectively, for standby letters of credit and other financial guarantees; and $546 million and $385 million, respectively, for other letters of credit. In regulatory filings with the Federal Reserve these commitments are shown gross of risk participations.
(d) At December 31, 2019 and 2018, collateral held by the Firm in support of securities lending indemnification agreements was $216.2 billion and $195.6 billion, respectively. Securities lending collateral primarily consists of cash, G7 government securities, and securities issued by U.S. GSEs and government agencies.
(e) At December 31, 2019 and 2018, includes guarantees to the Fixed Income Clearing Corporation under the sponsored member repo program and commitments and guarantees associated with the Firm's membership in certain clearing houses.
(f) At December 31, 2019 and 2018, primarily includes letters of credit hedged by derivative transactions and managed on a market risk basis, and unfunded commitments related to institutional lending. Additionally, includes unfunded commitments predominantly related to certain tax-oriented equity investments.
(g) For lending-related products, the carrying value represents the allowance for lending-related commitments and the guarantee liability; for derivative-related products, the carrying value represents the fair value.

Other unfunded commitments to extend credit

Other unfunded commitments to extend credit generally consist of commitments for working capital and general corporate purposes, extensions of credit to support commercial paper facilities and bond financings in the event that those obligations cannot be remarketed to new investors, as well as committed liquidity facilities to clearing organizations. The Firm also issues commitments under multipurpose facilities which could be drawn upon in several forms, including the issuance of a standby letter of credit.

Guarantees

U.S. GAAP requires that a guarantor recognize, at the inception of a guarantee, a liability in an amount equal to the fair value of the obligation undertaken in issuing the guarantee. U.S. GAAP defines a guarantee as a contract that contingently requires the guarantor to pay a guaranteed party based upon: (a) changes in an underlying asset, liability or equity security of the guaranteed party; or (b) a third party's failure to perform under a specified agreement. The Firm considers the following off–balance sheet arrangements to be guarantees under U.S. GAAP: standby letters of credit and other financial guarantees, securities lending indemnifications, certain indemnification agreements included within third-party contractual arrangements, certain derivative contracts and the guarantees under the sponsored member repo program.

As required by U.S. GAAP, the Firm initially records guarantees at the inception date fair value of the obligation assumed (e.g., the amount of consideration received or the net present value of the premium receivable). For certain types of guarantees, the Firm records this fair value amount in other liabilities with an offsetting entry recorded in cash (for premiums received), or other assets (for premiums receivable). Any premium receivable recorded in other assets is reduced as cash is received under the contract, and the fair value of the liability recorded at inception is amortized into income as lending and deposit-related fees over the life of the guarantee contract. For indemnifications provided in sales agreements, a portion of the sale proceeds is allocated to the guarantee, which adjusts the gain or loss that would otherwise result from the transaction. For these indemnifications, the initial liability is amortized to income as the Firm's risk is reduced (i.e., over time or when the indemnification expires). Any contingent liability that exists as a result of issuing the guarantee or indemnification is recognized when it becomes probable and reasonably estimable. The contingent portion of the liability is not recognized if the estimated amount is less than the carrying amount of the liability recognized at inception (adjusted for any amortization). The contractual amount and carrying value of guarantees and indemnifications are included in the table on page 273. For additional information on the guarantees, see below.

Standby letters of credit and other financial guarantees

Standby letters of credit and other financial guarantees are conditional lending commitments issued by the Firm to guarantee the performance of a client or customer to a third party under certain arrangements, such as commercial paper facilities, bond financings, acquisition financings, trade and similar transactions.

The following table summarizes the contractual amount and carrying value of standby letters of credit and other financial guarantees and other letters of credit arrangements as of December 31, 2019 and 2018.

Standby letters of credit, other financial guarantees and other letters of credit

	2019		2018	
December 31, (in millions)	Standby letters of credit and other financial guarantees	Other letters of credit	Standby letters of credit and other financial guarantees	Other letters of credit
Investment-grade[(a)]	**$ 26,647**	**$ 2,136**	$ 26,420	$ 2,079
Noninvestment-grade[(a)]	**7,261**	**821**	7,078	746
Total contractual amount	**$ 33,908**	**$ 2,957**	$ 33,498	$ 2,825
Allowance for lending-related commitments	**$ 216**	**$ 4**	$ 167	$ 3
Guarantee liability	**402**	**–**	354	–
Total carrying value	**$ 618**	**$ 4**	$ 521	$ 3
Commitments with collateral	**$ 17,582**	**$ 726**	$ 17,400	$ 583

(a) The ratings scale is based on the Firm's internal risk ratings. Refer to Note 12 for further information on internal risk ratings.

Securities lending indemnifications
Through the Firm's securities lending program, counterparties' securities, via custodial and non-custodial arrangements, may be lent to third parties. As part of this program, the Firm provides an indemnification in the lending agreements which protects the lender against the failure of the borrower to return the lent securities. To minimize its liability under these indemnification agreements, the Firm obtains cash or other highly liquid collateral with a market value exceeding 100% of the value of the securities on loan from the borrower. Collateral is marked to market daily to help assure that collateralization is adequate. Additional collateral is called from the borrower if a shortfall exists, or collateral may be released to the borrower in the event of overcollateralization. If a borrower defaults, the Firm would use the collateral held to purchase replacement securities in the market or to credit the lending client or counterparty with the cash equivalent thereof.

The cash collateral held by the Firm may be invested on behalf of the client in indemnified resale agreements, whereby the Firm indemnifies the client against the loss of principal invested. To minimize its liability under these agreements, the Firm obtains collateral with a market value exceeding 100% of the principal invested.

Derivatives qualifying as guarantees
The Firm transacts in certain derivative contracts that have the characteristics of a guarantee under U.S. GAAP. These contracts include written put options that require the Firm to purchase assets upon exercise by the option holder at a specified price by a specified date in the future. The Firm may enter into written put option contracts in order to meet client needs, or for other trading purposes. The terms of written put options are typically five years or less.

Derivatives deemed to be guarantees also includes stable value contracts, commonly referred to as "stable value products", that require the Firm to make a payment of the difference between the market value and the book value of a counterparty's reference portfolio of assets in the event that market value is less than book value and certain other conditions have been met. Stable value products are transacted in order to allow investors to realize investment returns with less volatility than an unprotected portfolio. These contracts are typically longer-term or may have no stated maturity, but allow the Firm to elect to terminate the contract under certain conditions.

The notional value of derivatives guarantees generally represents the Firm's maximum exposure. However, exposure to certain stable value products is contractually limited to a substantially lower percentage of the notional amount.

The fair value of derivative guarantees reflects the probability, in the Firm's view, of whether the Firm will be required to perform under the contract. The Firm reduces exposures to these contracts by entering into offsetting transactions, or by entering into contracts that hedge the market risk related to the derivative guarantees.

The following table summarizes the derivatives qualifying as guarantees as of December 31, 2019 and 2018.

(in millions)	**December 31, 2019**	December 31, 2018
Notional amounts		
Derivative guarantees	**$ 53,089**	$ 55,271
Stable value contracts with contractually limited exposure	**28,877**	28,637
Maximum exposure of stable value contracts with contractually limited exposure	**2,967**	2,963
Fair value		
Derivative payables	**159**	367

In addition to derivative contracts that meet the characteristics of a guarantee, the Firm is both a purchaser and seller of credit protection in the credit derivatives market. Refer to Note 5 for a further discussion of credit derivatives.

Unsettled securities financing agreements
In the normal course of business, the Firm enters into resale and securities borrowed agreements. At settlement, these commitments result in the Firm advancing cash to and receiving securities collateral from the counterparty. The Firm also enters into repurchase and securities loaned agreements. At settlement, these commitments result in the Firm receiving cash from and providing securities collateral to the counterparty. Such agreements settle at a future date. These agreements generally do not meet the definition of a derivative, and therefore, are not recorded on the Consolidated balance sheets until settlement date. These agreements predominantly have regular-way settlement terms. Refer to Note 11 for a further discussion of securities financing agreements.

Loan sales- and securitization-related indemnifications
Mortgage repurchase liability
In connection with the Firm's mortgage loan sale and securitization activities with U.S. GSEs the Firm has made representations and warranties that the loans sold meet certain requirements, and that may require the Firm to repurchase mortgage loans and/or indemnify the loan purchaser if such representations and warranties are breached by the Firm. Further, although the Firm's securitizations are predominantly nonrecourse, the Firm does provide recourse servicing in certain limited cases where it agrees to share credit risk with the owner of the mortgage loans. To the extent that repurchase demands that are received relate to loans that the Firm purchased from third parties that remain viable, the Firm typically will have the right to seek a recovery of related repurchase losses from the third party. Generally, the maximum amount of future payments the Firm would be required to make for breaches of these representations and warranties would be equal to the unpaid principal balance of such loans that are deemed to have defects that were sold to purchasers (including securitization-related SPEs) plus, in certain circumstances, accrued interest on such loans and certain expenses.

Private label securitizations
The liability related to repurchase demands associated with private label securitizations is separately evaluated by the Firm in establishing its litigation reserves.

Refer to Note 30 for additional information regarding litigation.

Loans sold with recourse
The Firm provides servicing for mortgages and certain commercial lending products on both a recourse and nonrecourse basis. In nonrecourse servicing, the principal credit risk to the Firm is the cost of temporary servicing advances of funds (i.e., normal servicing advances). In recourse servicing, the servicer agrees to share credit risk with the owner of the mortgage loans, such as Fannie Mae or Freddie Mac or a private investor, insurer or guarantor. Losses on recourse servicing predominantly occur when foreclosure sales proceeds of the property underlying a defaulted loan are less than the sum of the outstanding principal balance, plus accrued interest on the loan and the cost of holding and disposing of the underlying property. The Firm's securitizations are predominantly nonrecourse, thereby effectively transferring the risk of future credit losses to the purchaser of the mortgage-backed securities issued by the trust. At December 31, 2019 and 2018, the unpaid principal balance of loans sold with recourse totaled $944 million and $1.0 billion, respectively. The carrying value of the related liability that the Firm has recorded in accounts payable and other liabilities on the Consolidated balance sheets, which is representative of the Firm's view of the likelihood it will have to perform under its recourse obligations, was $27 million and $30 million at December 31, 2019 and 2018, respectively.

Other off-balance sheet arrangements

Indemnification agreements – general
In connection with issuing securities to investors outside the U.S., the Firm may agree to pay additional amounts to the holders of the securities in the event that, due to a change in tax law, certain types of withholding taxes are imposed on payments on the securities. The terms of the securities may also give the Firm the right to redeem the securities if such additional amounts are payable. The Firm may also enter into indemnification clauses in connection with the licensing of software to clients ("software licensees") or when it sells a business or assets to a third party ("third-party purchasers"), pursuant to which it indemnifies software licensees for claims of liability or damages that may occur subsequent to the licensing of the software, or third-party purchasers for losses they may incur due to actions taken by the Firm prior to the sale of the business or assets. It is difficult to estimate the Firm's maximum exposure under these indemnification arrangements, since this would require an assessment of future changes in tax law and future claims that may be made against the Firm that have not yet occurred. However, based on historical experience, management expects the risk of loss to be remote.

Merchant charge-backs
Under the rules of payment networks, the Firm, in its role as a merchant acquirer, retains a contingent liability for disputed processed credit and debit card transactions that result in a charge-back to the merchant. If a dispute is resolved in the cardholder's favor, Merchant Services will (through the cardholder's issuing bank) credit or refund the amount to the cardholder and will charge back the transaction to the merchant. If Merchant Services is unable to collect the amount from the merchant, Merchant Services will bear the loss for the amount credited or refunded to the cardholder. Merchant Services mitigates this risk by withholding future settlements, retaining cash reserve accounts or obtaining other collateral. In addition, Merchant Services recognizes a valuation allowance that covers the payment or performance risk to the Firm related to charge-backs.

For the years ended December 31, 2019, 2018 and 2017, Merchant Services processed an aggregate volume of $1,511.5 billion, $1,366.1 billion, and $1,191.7 billion, respectively, and the related losses from merchant charge-backs were not material.

Clearing Services – Client Credit Risk
The Firm provides clearing services for clients by entering into securities purchases and sales and derivative contracts with CCPs, including ETDs such as futures and options, as well as OTC-cleared derivative contracts. As a clearing member, the Firm stands behind the performance of its clients, collects cash and securities collateral (margin) as well as any settlement amounts due from or to clients, and remits them to the relevant CCP or client in whole or part. There are two types of margin: variation margin is posted on a daily basis based on the value of clients' derivative contracts and initial margin is posted at inception of a derivative contract, generally on the basis of the potential changes in the variation margin requirement for the contract.

As a clearing member, the Firm is exposed to the risk of nonperformance by its clients, but is not liable to clients for the performance of the CCPs. Where possible, the Firm seeks to mitigate its risk to the client through the collection of appropriate amounts of margin at inception and throughout the life of the transactions. The Firm can also cease providing clearing services if clients do not adhere to their obligations under the clearing agreement. In the event of nonperformance by a client, the Firm would close out the client's positions and access available margin. The CCP would utilize any margin it holds to make itself whole, with any remaining shortfalls required to be paid by the Firm as a clearing member.

The Firm reflects its exposure to nonperformance risk of the client through the recognition of margin receivables from clients and margin payables to CCPs; the clients' underlying securities or derivative contracts are not reflected in the Firm's Consolidated Financial Statements.

It is difficult to estimate the Firm's maximum possible exposure through its role as a clearing member, as this would require an assessment of transactions that clients may execute in the future. However, based upon historical experience, and the credit risk mitigants available to the Firm, management believes it is unlikely that the Firm will have to make any material payments under these arrangements and the risk of loss is expected to be remote.

Refer to Note 5 for information on the derivatives that the Firm executes for its own account and records in its Consolidated Financial Statements.

Exchange & Clearing House Memberships
The Firm is a member of several securities and derivative exchanges and clearing houses, both in the U.S. and other countries, and it provides clearing services to its clients. Membership in some of these organizations requires the Firm to pay a pro rata share of the losses incurred by the organization as a result of the default of another member. Such obligations vary with different organizations. These obligations may be limited to the amount (or a multiple of the amount) of the Firm's contribution to the guarantee fund maintained by a clearing house or exchange as part of the resources available to cover any losses in the event of a member default. Alternatively, these obligations may also include a pro rata share of the residual losses after applying the guarantee fund. Additionally, certain clearing houses require the Firm as a member to pay a pro rata share of losses that may result from the clearing house's investment of guarantee fund contributions and initial margin, unrelated to and independent of the default of another member. Generally a payment would only be required should such losses exceed the resources of the clearing house or exchange that are contractually required to absorb the losses in the first instance. In certain cases, it is difficult to estimate the Firm's maximum possible exposure under these membership agreements, since this would require an assessment of future claims that may be made against the Firm that have not yet occurred. However, based on historical experience, management expects the risk of loss to the Firm to be remote. Where the Firm's maximum possible exposure can be estimated, the amount is disclosed in the table on page 273, in the Exchange & clearing house guarantees and commitments line.

Sponsored member repo program
In 2018 the Firm commenced the sponsored member repo program, wherein the Firm acts as a sponsoring member to clear eligible overnight resale and repurchase agreements through the Government Securities Division of the Fixed Income Clearing Corporation ("FICC") on behalf of clients that become sponsored members under the FICC's rules. The Firm also guarantees to the FICC the prompt and full payment and performance of its sponsored member clients' respective obligations under the FICC's rules. The Firm minimizes its liability under these overnight guarantees by obtaining a security interest in the cash or high-quality securities collateral that the clients place with the clearing house; therefore, the Firm expects the risk of loss to be remote. The Firm's maximum possible exposure, without taking into consideration the associated collateral, is included in the Exchange & clearing house guarantees and commitments line on page 273. Refer to Note 11 for additional information on credit risk mitigation practices on resale agreements and the types of collateral pledged under repurchase agreements.

Guarantees of subsidiaries
In the normal course of business, the Parent Company may provide counterparties with guarantees of certain of the trading and other obligations of its subsidiaries on a contract-by-contract basis, as negotiated with the Firm's counterparties. The obligations of the subsidiaries are included on the Firm's Consolidated balance sheets or are reflected as off-balance sheet commitments; therefore, the Parent Company has not recognized a separate liability for these guarantees. The Firm believes that the occurrence of any event that would trigger payments by the Parent Company under these guarantees is remote.

The Parent Company has guaranteed certain long-term debt and structured notes of its subsidiaries, including JPMorgan Chase Financial Company LLC ("JPMFC"), a 100%-owned finance subsidiary. All securities issued by JPMFC are fully and unconditionally guaranteed by the Parent Company. These guarantees, which rank on a parity with the Firm's unsecured and unsubordinated indebtedness, are not included in the table on page 273 of this Note. Refer to Note 20 for additional information.

Note 29 – Pledged assets and collateral

Pledged assets

The Firm pledges financial assets that it owns to maintain potential borrowing capacity at discount windows with Federal Reserve banks, various other central banks and FHLBs. Additionally, the Firm pledges assets for other purposes, including to collateralize repurchase and other securities financing agreements, to cover short sales and to collateralize derivative contracts and deposits. Certain of these pledged assets may be sold or repledged or otherwise used by the secured parties and are parenthetically identified on the Consolidated balance sheets as assets pledged.

The following table presents the Firm's pledged assets.

December 31, (in billions)	2019	2018
Assets that may be sold or repledged or otherwise used by secured parties	$ 125.2	$ 104.0
Assets that may not be sold or repledged or otherwise used by secured parties	80.2	83.7
Assets pledged at Federal Reserve banks and FHLBs	478.9	475.3
Total pledged assets	**$ 684.3**	$ 663.0

Total pledged assets do not include assets of consolidated VIEs; these assets are used to settle the liabilities of those entities. Refer to Note 14 for additional information on assets and liabilities of consolidated VIEs. Refer to Note 11 for additional information on the Firm's securities financing activities. Refer to Note 20 for additional information on the Firm's long-term debt. The significant components of the Firm's pledged assets were as follows.

December 31, (in billions)	2019	2018
Investment securities	$ 35.9	$ 59.5
Loans	460.4	440.1
Trading assets and other	188.0	163.4
Total pledged assets	**$ 684.3**	$ 663.0

Collateral

The Firm accepts financial assets as collateral that it is permitted to sell or repledge, deliver or otherwise use. This collateral is generally obtained under resale and other securities financing agreements, prime brokerage-related held-for-investment customer receivables and derivative contracts. Collateral is generally used under repurchase and other securities financing agreements, to cover short sales, and to collateralize derivative contracts and deposits.

The following table presents the fair value of collateral accepted.

December 31, (in billions)	2019	2018
Collateral permitted to be sold or repledged, delivered, or otherwise used	$ 1,282.5	$ 1,245.3
Collateral sold, repledged, delivered or otherwise used	1,000.5	998.3

Note 30 – Litigation

Contingencies

As of December 31, 2019, the Firm and its subsidiaries and affiliates are defendants, putative defendants or respondents in numerous legal proceedings, including private, civil litigations and regulatory/government investigations. The litigations range from individual actions involving a single plaintiff to class action lawsuits with potentially millions of class members. Investigations involve both formal and informal proceedings, by both governmental agencies and self-regulatory organizations. These legal proceedings are at varying stages of adjudication, arbitration or investigation, and involve each of the Firm's lines of business and several geographies and a wide variety of claims (including common law tort and contract claims and statutory antitrust, securities and consumer protection claims), some of which present novel legal theories.

The Firm believes the estimate of the aggregate range of reasonably possible losses, in excess of reserves established, for its legal proceedings is from $0 to approximately $1.3 billion at December 31, 2019. This estimated aggregate range of reasonably possible losses was based upon information available as of that date for those proceedings in which the Firm believes that an estimate of reasonably possible loss can be made. For certain matters, the Firm does not believe that such an estimate can be made, as of that date. The Firm's estimate of the aggregate range of reasonably possible losses involves significant judgment, given:

- the number, variety and varying stages of the proceedings, including the fact that many are in preliminary stages,
- the existence in many such proceedings of multiple defendants, including the Firm, whose share of liability (if any) has yet to be determined,
- the numerous yet-unresolved issues in many of the proceedings, including issues regarding class certification and the scope of many of the claims, and
- the attendant uncertainty of the various potential outcomes of such proceedings, including where the Firm has made assumptions concerning future rulings by the court or other adjudicator, or about the behavior or incentives of adverse parties or regulatory authorities, and those assumptions prove to be incorrect.

In addition, the outcome of a particular proceeding may be a result which the Firm did not take into account in its estimate because the Firm had deemed the likelihood of that outcome to be remote. Accordingly, the Firm's estimate of the aggregate range of reasonably possible losses will change from time to time, and actual losses may vary significantly.

Set forth below are descriptions of the Firm's material legal proceedings.

Federal Republic of Nigeria Litigation. JPMorgan Chase Bank, N.A. operated an escrow and depository account for the Federal Government of Nigeria ("FGN") and two major international oil companies. The account held approximately $1.1 billion in connection with a dispute among the clients over rights to an oil field. Following the settlement of the dispute, JPMorgan Chase Bank, N.A. paid out the monies in the account in 2011 and 2013 in accordance with directions received from its clients. In November 2017, the Federal Republic of Nigeria ("FRN") commenced a claim in the English High Court for approximately $875 million in payments made out of the accounts. The FRN, claiming to be the same entity as the FGN, alleges that the payments were instructed as part of a complex fraud not involving JPMorgan Chase Bank, N.A., but that JPMorgan Chase Bank, N.A. was or should have been on notice that the payments may be fraudulent. JPMorgan Chase Bank, N.A. applied for summary judgment and was unsuccessful. The claim is ongoing and no trial date has been set.

Foreign Exchange Investigations and Litigation. The Firm previously reported settlements with certain government authorities relating to its foreign exchange ("FX") sales and trading activities and controls related to those activities. FX-related investigations and inquiries by government authorities, including competition authorities, are ongoing, and the Firm is cooperating with and working to resolve those matters. In May 2015, the Firm pleaded guilty to a single violation of federal antitrust law. In January 2017, the Firm was sentenced, with judgment entered thereafter and a term of probation ending in January 2020. The term of probation has concluded, with the Firm remaining in good standing throughout the probation period. The Department of Labor has granted the Firm a five-year exemption of disqualification that allows the Firm and its affiliates to continue to rely on the Qualified Professional Asset Manager exemption under the Employee Retirement Income Security Act ("ERISA") until January 2023. The Firm will need to reapply in due course for a further exemption to cover the remainder of the ten-year disqualification period. In addition, the Firm has paid fines totaling approximately $265 million in connection with the settlement of FX-related investigations conducted by the European Commission and the Swiss Competition Commission which were announced in May 2019 and June 2019, respectively. Separately, in February 2017 the South Africa Competition Commission referred its FX investigation of the Firm and other banks to the South Africa Competition Tribunal, which is conducting civil proceedings concerning that matter.

In August 2018, the United States District Court for the Southern District of New York granted final approval to the Firm's settlement of a consolidated class action brought by U.S.-based plaintiffs, which principally alleged violations of federal antitrust laws based on an alleged conspiracy to manipulate foreign exchange rates and also sought damages on behalf of persons who transacted in FX futures and options on futures. Certain members of the settlement class filed requests to the Court to be excluded from the class, and certain of them filed a complaint against the Firm and a number of other foreign exchange dealers in November 2018. A number of these actions remain pending. Further, putative class actions have been filed against the Firm and a number of other foreign exchange dealers on behalf of certain consumers who purchased foreign currencies at allegedly inflated rates and purported indirect purchasers of FX instruments; these actions also remain pending in the District Court. In addition, some FX-related individual and putative class actions based on similar alleged underlying conduct have been filed outside the U.S., including in the U.K., Israel and Australia.

Interchange Litigation. Groups of merchants and retail associations filed a series of class action complaints alleging that Visa and Mastercard, as well as certain banks, conspired to set the price of credit and debit card interchange fees and enacted related rules in violation of antitrust laws. In 2012, the parties initially settled the cases for a cash payment, a temporary reduction of credit card interchange, and modifications to certain credit card network rules. In 2017, after the approval of that settlement was reversed on appeal, the case was remanded to the District Court for further proceedings consistent with the appellate decision.

The original class action was divided into two separate actions, one seeking primarily monetary relief and the other seeking primarily injunctive relief. In September 2018, the parties to the class action seeking monetary relief finalized an agreement which amends and supersedes the prior settlement agreement. Pursuant to this settlement, the defendants collectively contributed an additional $900 million to the approximately $5.3 billion previously held in escrow from the original settlement. In December 2019, the amended agreement was approved by the District Court. Certain merchants filed notices of appeal of the District Court's approval order. Based on the percentage of merchants that opted out of the amended class settlement, $700 million has been returned to the defendants from the settlement escrow in accordance with the settlement agreement. The class action seeking primarily injunctive relief continues separately.

In addition, certain merchants have filed individual actions raising similar allegations against Visa and Mastercard, as well as against the Firm and other banks, and those actions are proceeding.

LIBOR and Other Benchmark Rate Investigations and Litigation. JPMorgan Chase has responded to inquiries from various governmental agencies and entities around the world relating primarily to the British Bankers Association's London Interbank Offered Rate ("LIBOR") for various currencies and the European Banking Federation's Euro Interbank Offered Rate ("EURIBOR"). The Swiss Competition Commission's investigation relating to EURIBOR, to which the Firm and other banks are subject, continues. In December 2016, the European Commission issued a decision against the Firm and other banks finding an infringement of European antitrust rules relating to EURIBOR. The Firm has filed an appeal of that decision with the European General Court, and that appeal is pending.

In addition, the Firm has been named as a defendant along with other banks in a series of individual and putative class actions related to benchmarks, including U.S. dollar LIBOR during the period that it was administered by the BBA and, in a separate consolidated putative class action, during the period that it was administered by ICE Benchmark Administration. These actions have been filed, or consolidated for pre-trial purposes, in the United States District Court for the Southern District of New York. In these actions, plaintiffs make varying allegations that in various periods, starting in 2000 or later, defendants either individually or collectively manipulated various benchmark rates by submitting rates that were artificially low or high. Plaintiffs allege that they transacted in loans, derivatives or other financial instruments whose values are affected by changes in these rates and assert a variety of claims including antitrust claims seeking treble damages. These actions are in various stages of litigation.

In actions related to U.S. dollar LIBOR during the period that it was administered by the BBA, the District Court dismissed certain claims, including antitrust claims brought by some plaintiffs whom the District Court found did not have standing to assert such claims, and permitted certain claims to proceed, including antitrust, Commodity Exchange Act, Section 10(b) of the Securities Exchange Act and common law claims. The plaintiffs whose antitrust claims were dismissed for lack of standing have filed an appeal. The District Court granted class certification of antitrust claims related to bonds and interest rate swaps sold directly by the defendants and denied class certification motions filed by other plaintiffs. The Firm's settlements of putative class actions related to Swiss franc LIBOR, the Singapore Interbank Offered Rate and the Singapore Swap Offer Rate ("SIBOR"), the Australian Bank Bill Swap Reference Rate, and certain of the putative class actions related to U.S. dollar LIBOR remain subject to court approval. In the class actions related to SIBOR and Swiss franc LIBOR, the District Court concluded that the Court lacked subject matter jurisdiction, and plaintiffs' appeals of those decisions are pending.

Metals and U.S. Treasuries Investigations and Litigation and Related Inquiries. Various authorities, including the Department of Justice's Criminal Division, are conducting investigations relating to trading practices in the metals markets and related conduct. The Firm also is responding to related requests concerning similar trading-practices issues in markets for other financial instruments, such as U.S. Treasuries. The Firm continues to cooperate with these investigations and is currently engaged in discussions with various regulators about resolving their respective investigations. There is no assurance that such discussions will result in settlements. Several putative class action complaints have been filed in the United States District Court for the Southern District of New York against the Firm and certain former employees, alleging a precious metals futures and options price manipulation scheme in violation of the Commodity Exchange Act. Some of the complaints also allege unjust enrichment and deceptive acts or practices under the General Business Law of the State of New York. The Court consolidated these putative class actions in February 2019. The Firm is also a defendant in a consolidated action filed in the United States District Court for the Southern District of New York alleging monopolization of silver futures in violation of the Sherman Act.

Wendel. Since 2012, the French criminal authorities have been investigating a series of transactions entered into by senior managers of Wendel Investissement (“Wendel”) during the period from 2004 through 2007 to restructure their shareholdings in Wendel. JPMorgan Chase Bank, N.A., Paris branch provided financing for the transactions to a number of managers of Wendel in 2007. JPMorgan Chase has cooperated with the investigation. The investigating judges issued an *ordonnance de renvoi* in November 2016, referring JPMorgan Chase Bank, N.A. to the French *tribunal correctionnel* for alleged complicity in tax fraud. No date for trial has been set by the court. In January 2018, the Paris Court of Appeal issued a decision cancelling the *mise en examen* of JPMorgan Chase Bank, N.A. The Court of Cassation, France’s highest court, ruled in September 2018 that a *mise en examen* is a prerequisite for an *ordonnance de renvoi* and in January 2020 ordered the annulment of the *ordonnance de renvoi* referring JPMorgan Chase Bank, N.A. to the French *tribunal correctionnel*. In addition, a number of the managers have commenced civil proceedings against JPMorgan Chase Bank, N.A. The claims are separate, involve different allegations and are at various stages of proceedings.

* * *

In addition to the various legal proceedings discussed above, JPMorgan Chase and its subsidiaries are named as defendants or are otherwise involved in a substantial number of other legal proceedings. The Firm believes it has meritorious defenses to the claims asserted against it in its currently outstanding legal proceedings and it intends to defend itself vigorously. Additional legal proceedings may be initiated from time to time in the future.

The Firm has established reserves for several hundred of its currently outstanding legal proceedings. In accordance with the provisions of U.S. GAAP for contingencies, the Firm accrues for a litigation-related liability when it is probable that such a liability has been incurred and the amount of the loss can be reasonably estimated. The Firm evaluates its outstanding legal proceedings each quarter to assess its litigation reserves, and makes adjustments in such reserves, upwards or downward, as appropriate, based on management’s best judgment after consultation with counsel. The Firm’s legal expense/(benefit) was $239 million, $72 million and $(35) million for the years ended December 31, 2019, 2018 and 2017, respectively. There is no assurance that the Firm’s litigation reserves will not need to be adjusted in the future.

In view of the inherent difficulty of predicting the outcome of legal proceedings, particularly where the claimants seek very large or indeterminate damages, or where the matters present novel legal theories, involve a large number of parties or are in early stages of discovery, the Firm cannot state with confidence what will be the eventual outcomes of the currently pending matters, the timing of their ultimate resolution or the eventual losses, fines, penalties or consequences related to those matters. JPMorgan Chase believes, based upon its current knowledge and after consultation with counsel, consideration of the material legal proceedings described above and after taking into account its current litigation reserves and its estimated aggregate range of possible losses, that the other legal proceedings currently pending against it should not have a material adverse effect on the Firm’s consolidated financial condition. The Firm notes, however, that in light of the uncertainties involved in such proceedings, there is no assurance that the ultimate resolution of these matters will not significantly exceed the reserves it has currently accrued or that a matter will not have material reputational consequences. As a result, the outcome of a particular matter may be material to JPMorgan Chase’s operating results for a particular period, depending on, among other factors, the size of the loss or liability imposed and the level of JPMorgan Chase’s income for that period.

Note 31 – International operations

The following table presents income statement and balance sheet-related information for JPMorgan Chase by major international geographic area. The Firm defines international activities for purposes of this footnote presentation as business transactions that involve clients residing outside of the U.S., and the information presented below is based predominantly on the domicile of the client, the location from which the client relationship is managed, booking location or the location of the trading desk. However, many of the Firm's U.S. operations serve international businesses.

As the Firm's operations are highly integrated, estimates and subjective assumptions have been made to apportion revenue and expense between U.S. and international operations. These estimates and assumptions are consistent with the allocations used for the Firm's segment reporting as set forth in Note 32.

The Firm's long-lived assets for the periods presented are not considered by management to be significant in relation to total assets. The majority of the Firm's long-lived assets are located in the U.S.

As of or for the year ended December 31, (in millions)	Revenue[c]	Expense[d]	Income before income tax expense	Net income	Total assets
2019					
Europe/Middle East/Africa	**$ 15,902**	**$ 9,977**	**$ 5,925**	**$ 4,084**	**$ 388,353** [e]
Asia-Pacific	**7,270**	**5,014**	**2,256**	**1,511**	**183,408**
Latin America/Caribbean	**2,411**	**1,561**	**850**	**613**	**47,836**
Total international	**25,583**	**16,552**	**9,031**	**6,208**	**619,597**
North America[a]	**90,044**	**54,530**	**35,514**	**30,223**	**2,067,782**
Total	**$ 115,627**	**$ 71,082**	**$ 44,545**	**$ 36,431**	**$ 2,687,379**
2018[b]					
Europe/Middle East/Africa	$ 16,468	$ 10,033	$ 6,435	$ 4,583	$ 426,129 [e]
Asia-Pacific	6,997	4,877	2,120	1,491	171,637
Latin America/Caribbean	2,365	1,301	1,064	745	43,870
Total international	25,830	16,211	9,619	6,819	641,636
North America[a]	83,199	52,054	31,145	25,655	1,980,896
Total	$ 109,029	$ 68,265	$ 40,764	$ 32,474	$ 2,622,532
2017[b]					
Europe/Middle East/Africa	$ 15,505	$ 9,235	$ 6,270	$ 4,320	$ 409,204 [e]
Asia-Pacific	5,835	4,523	1,312	725	163,823
Latin America/Caribbean	1,959	1,527	432	274	42,403
Total international	23,299	15,285	8,014	5,319	615,430
North America[a]	77,406	49,520	27,886	19,122	1,918,170
Total	$ 100,705	$ 64,805	$ 35,900	$ 24,441	$ 2,533,600

(a) Substantially reflects the U.S.
(b) The prior period amounts have been revised to conform with the current period presentation.
(c) Revenue is composed of net interest income and noninterest revenue.
(d) Expense is composed of noninterest expense and the provision for credit losses.
(e) Total assets for the U.K. were approximately $305 billion, $297 billion, and $310 billion at December 31, 2019, 2018 and 2017, respectively.

Note 32 – Business segments

The Firm is managed on an LOB basis. There are four major reportable business segments – Consumer & Community Banking, Corporate & Investment Bank, Commercial Banking and Asset & Wealth Management. In addition, there is a Corporate segment. The business segments are determined based on the products and services provided, or the type of customer served, and they reflect the manner in which financial information is currently evaluated by the Firm's Operating Committee. Segment results are presented on a managed basis. Refer to Segment results of this footnote for a further discussion of JPMorgan Chase's business segments.

The following is a description of each of the Firm's business segments, and the products and services they provide to their respective client bases.

Consumer & Community Banking

Consumer & Community Banking offers services to consumers and businesses through bank branches, ATMs, digital (including mobile and online) and telephone banking. CCB is organized into Consumer & Business Banking (including Consumer Banking/Chase Wealth Management and Business Banking), Home Lending (including Home Lending Production, Home Lending Servicing and Real Estate Portfolios) and Card, Merchant Services & Auto. Consumer & Business Banking offers deposit and investment products and services to consumers, and lending, deposit, and cash management and payment solutions to small businesses. Home Lending includes mortgage origination and servicing activities, as well as portfolios consisting of residential mortgages and home equity loans. Card, Merchant Services & Auto issues credit cards to consumers and small businesses, offers payment processing services to merchants, and originates and services auto loans and leases.

Corporate & Investment Bank

The Corporate & Investment Bank, which consists of Banking and Markets & Securities Services, offers a broad suite of investment banking, market-making, prime brokerage, and treasury and securities products and services to a global client base of corporations, investors, financial institutions, government and municipal entities. Banking offers a full range of investment banking products and services in all major capital markets, including advising on corporate strategy and structure, capital-raising in equity and debt markets, as well as loan origination and syndication. Banking also includes Treasury Services, which provides transaction services, consisting of cash management and liquidity solutions. Markets & Securities Services is a global market-maker in cash securities and derivative instruments, and also offers sophisticated risk management solutions, prime brokerage, and research. Markets & Securities Services also includes Securities Services, a leading global custodian which provides custody, fund accounting and administration, and securities lending products principally for asset managers, insurance companies and public and private investment funds.

Commercial Banking

Commercial Banking provides comprehensive financial solutions, including lending, treasury services, investment banking and asset management products across three primary client segments: Middle Market Banking, Corporate Client Banking and Commercial Real Estate Banking. Other includes amounts not aligned with a primary client segment.

Middle Market Banking covers small business and midsized corporations, local governments and nonprofit clients.

Corporate Client Banking covers large corporations.

Commercial Real Estate Banking covers investors, developers, and owners of multifamily, office, retail, industrial and affordable housing properties.

Asset & Wealth Management

Asset & Wealth Management, with client assets of $3.2 trillion, is a global leader in investment and wealth management. AWM clients include institutions, high-net-worth individuals and retail investors in major markets throughout the world. AWM offers investment management across most major asset classes including equities, fixed income, alternatives and money market funds. AWM also offers multi-asset investment management, providing solutions for a broad range of clients' investment needs. For Wealth Management clients, AWM also provides retirement products and services, brokerage and banking services including trusts and estates, loans, mortgages and deposits. The majority of AWM's client assets are in actively managed portfolios.

Corporate

The Corporate segment consists of Treasury and Chief Investment Office and Other Corporate, which includes corporate staff functions and expense that is centrally managed. Treasury and CIO is predominantly responsible for measuring, monitoring, reporting and managing the Firm's liquidity, funding, capital, structural interest rate and foreign exchange risks. The major Other Corporate functions include Real Estate, Technology, Legal, Corporate Finance, Human Resources, Internal Audit, Risk Management, Compliance, Control Management, Corporate Responsibility and various Other Corporate groups.

Segment results

The following table provides a summary of the Firm's segment results as of or for the years ended December 31, 2019, 2018 and 2017, on a managed basis. The Firm's definition of managed basis starts with the reported U.S. GAAP results and includes certain reclassifications to present total net revenue for the Firm (and each of the reportable business segments) on an FTE basis. Accordingly, revenue from investments that receive tax credits and tax-exempt securities is presented in the managed results on a basis comparable to taxable investments and securities. This allows management to assess the comparability of revenue from year-to-year arising from both taxable and tax-exempt sources. The corresponding income tax impact related to tax-exempt items is recorded within income tax expense/(benefit). These adjustments have no impact on net income as reported by the Firm as a whole or by the LOBs.

Business segment capital allocation

Each business segment is allocated capital by taking into consideration a variety of factors including capital levels of similarly rated peers and applicable regulatory capital requirements. ROE is measured and internal targets for expected returns are established as key measures of a business segment's performance.

The Firm's allocation methodology incorporates Basel III Standardized RWA, Basel III Advanced RWA, leverage, the GSIB surcharge, and a simulation of capital in a severe stress environment. Periodically, the assumptions and methodologies used to allocate capital are assessed and as a result, the capital allocated to the LOBs may change.

Segment results and reconciliation

(Table continued on next page)

As of or for the year ended December 31, (in millions, except ratios)	Consumer & Community Banking			Corporate & Investment Bank			Commercial Banking			Asset & Wealth Management		
	2019	2018	2017	**2019**	2018	2017	**2019**	2018	2017	**2019**	2018	2017
Noninterest revenue	**$ 18,642**	$ 16,260	$ 14,710	**$ 29,142**	$ 26,968	$ 24,539	**$ 2,430**	$ 2,343	$ 2,522	**$ 10,816**	$ 10,539	$ 10,456
Net interest income	**37,241**	35,819	31,775	**9,156**	9,480	10,118	**6,554**	6,716	6,083	**3,500**	3,537	3,379
Total net revenue	**55,883**	52,079	46,485	**38,298**	36,448	34,657	**8,984**	9,059	8,605	**14,316**	14,076	13,835
Provision for credit losses	**4,952**	4,753	5,572	**277**	(60)	(45)	**296**	129	(276)	**61**	53	39
Noninterest expense	**28,896**	27,835	26,062	**21,519**	20,918	19,407	**3,500**	3,386	3,327	**10,515**	10,353	10,218
Income/(loss) before income tax expense/(benefit)	**22,035**	19,491	14,851	**16,502**	15,590	15,295	**5,188**	5,544	5,554	**3,740**	3,670	3,578
Income tax expense/(benefit)	**5,394**	4,639	5,456	**4,580**	3,817	4,482	**1,264**	1,307	2,015	**907**	817	1,241
Net income/(loss)	**$ 16,641**	$ 14,852	$ 9,395	**$ 11,922**	$ 11,773	$ 10,813	**$ 3,924**	$ 4,237	$ 3,539	**$ 2,833**	$ 2,853	$ 2,337
Average equity	**$ 52,000**	$ 51,000	$ 51,000	**$ 80,000**	$ 70,000	$ 70,000	**$ 22,000**	$ 20,000	$ 20,000	**$ 10,500**	$ 9,000	$ 9,000
Total assets	**539,090**	557,441	552,601	**908,153**	903,051	826,384	**220,514**	220,229	221,228	**182,004**	170,024	151,909
Return on equity	**31%**	28%	17%	**14%**	16%	14%	**17%**	20%	17%	**26%**	31%	25%
Overhead ratio	**52**	53	56	**56**	57	56	**39**	37	39	**73**	74	74

(Table continued from previous page)

As of or for the year ended December 31, (in millions, except ratios)	Corporate			Reconciling Items[(a)]			Total		
	2019	2018	2017	**2019**	2018	2017	**2019**	2018	2017
Noninterest revenue	**$ (114)**	$ (263)	$ 1,085	**$ (2,534)**	$ (1,877)	$ (2,704) (b)	**$ 58,382**	$ 53,970	$ 50,608
Net interest income	**1,325**	135	55	**(531)**	(628)	(1,313)	**57,245**	55,059	50,097
Total net revenue	**1,211**	(128)	1,140	**(3,065)**	(2,505)	(4,017)	**115,627**	109,029	100,705
Provision for credit losses	**(1)**	(4)	–	**–**	–	–	**5,585**	4,871	5,290
Noninterest expense	**1,067**	902	501	**–**	–	–	**65,497**	63,394	59,515
Income/(loss) before income tax expense/(benefit)	**145**	(1,026)	639	**(3,065)**	(2,505)	(4,017)	**44,545**	40,764	35,900
Income tax expense/(benefit)	**(966)**	215	2,282	**(3,065)**	(2,505)	(4,017) (b)	**8,114**	8,290	11,459
Net income/(loss)	**$ 1,111**	$ (1,241)	$ (1,643)	**$ –**	$ –	$ –	**$ 36,431**	$ 32,474	$ 24,441
Average equity	**$ 68,407**	$ 79,222	$ 80,350	**$ –**	$ –	$ –	**$ 232,907**	$ 229,222	$ 230,350
Total assets	**837,618**	771,787	781,478	**NA**	NA	NA	**2,687,379**	2,622,532	2,533,600
Return on equity	**NM**	NM	NM	**NM**	NM	NM	**15%**	13%	10%
Overhead ratio	**NM**	NM	NM	**NM**	NM	NM	**57**	58	59

(a) Segment results on a managed basis reflect revenue on a FTE basis with the corresponding income tax impact recorded within income tax expense/(benefit). These adjustments are eliminated in reconciling items to arrive at the Firm's reported U.S. GAAP results.
(b) Included $375 million related to tax-oriented investments as a result of the enactment of the TCJA.

Note 33 – Parent Company

The following tables present Parent Company-only financial statements.

Statements of income and comprehensive income

Year ended December 31, (in millions)	2019	2018	2017
Income			
Dividends from subsidiaries and affiliates:			
Bank and bank holding company	**$ 26,000**	$ 32,501	$ 13,000
Non-bank[a]	**—**	2	540
Interest income from subsidiaries	**223**	216	72
Other interest income	**—**	—	41
Other income from subsidiaries:			
Bank and bank holding company	**2,738**	515	1,553
Non-bank	**197**	(444)	(88)
Other income	**(1,731)**	888	(623)
Total income	**27,427**	33,678	14,495
Expense			
Interest expense to subsidiaries and affiliates[a]	**(5,303)**	2,291	400
Other interest expense	**13,246**	4,581	5,202
Noninterest expense	**1,992**	1,793	(1,897)
Total expense	**9,935**	8,665	3,705
Income before income tax benefit and undistributed net income of subsidiaries	**17,492**	25,013	10,790
Income tax benefit	**2,033**	1,838	1,007
Equity in undistributed net income of subsidiaries	**16,906**	5,623	12,644
Net income	**$ 36,431**	$ 32,474	$ 24,441
Other comprehensive income, net	**3,076**	(1,476)	1,056
Comprehensive income	**$ 39,507**	$ 30,998	$ 25,497

Balance sheets

December 31, (in millions)	2019	2018
Assets		
Cash and due from banks	**$ 32**	$ 55
Deposits with banking subsidiaries	**5,309**	5,315
Trading assets	**3,011**	3,304
Advances to, and receivables from, subsidiaries:		
Bank and bank holding company	**2,358**	3,334
Non-bank	**84**	74
Investments (at equity) in subsidiaries and affiliates:		
Bank and bank holding company	**471,207**	449,628
Non-bank	**1,044**	1,077
Other assets	**10,699**	10,478
Total assets	**$ 493,744**	$ 473,265
Liabilities and stockholders' equity		
Borrowings from, and payables to, subsidiaries and affiliates[a]	**$ 23,410**	$ 20,017
Short-term borrowings	**2,616**	2,672
Other liabilities	**9,288**	8,821
Long-term debt[b][c]	**197,100**	185,240
Total liabilities[c]	**232,414**	216,750
Total stockholders' equity	**261,330**	256,515
Total liabilities and stockholders' equity	**$ 493,744**	$ 473,265

Statements of cash flows

Year ended December 31, (in millions)	2019	2018	2017
Operating activities			
Net income	**$ 36,431**	$ 32,474	$ 24,441
Less: Net income of subsidiaries and affiliates[a]	**42,906**	38,125	26,185
Parent company net loss	**(6,475)**	(5,651)	(1,744)
Cash dividends from subsidiaries and affiliates[a]	**26,000**	32,501	13,540
Other operating adjustments	**9,862**	(4,400)	4,635
Net cash provided by/(used in) operating activities	**29,387**	22,450	16,431
Investing activities			
Net change in:			
Other changes in loans, net	**—**	—	78
Advances to and investments in subsidiaries and affiliates, net	**(6)** [e]	8,036	(280)
All other investing activities, net	**71**	63	49
Net cash provided by/(used in) investing activities	**65**	8,099	(153)
Financing activities			
Net change in:			
Borrowings from subsidiaries and affiliates[a]	**2,941**	(2,273)	13,862
Short-term borrowings	**(56)**	(678)	(481)
Proceeds from long-term borrowings	**25,569**	25,845	25,855
Payments of long-term borrowings	**(21,226)**	(21,956)	(29,812)
Proceeds from issuance of preferred stock	**5,000**	1,696	1,258
Redemption of preferred stock	**(4,075)**	(1,696)	(1,258)
Treasury stock repurchased	**(24,001)**	(19,983)	(15,410)
Dividends paid	**(12,343)**	(10,109)	(8,993)
All other financing activities, net	**(1,290)**	(1,526)	(1,361)
Net cash used in financing activities	**(29,481)**	(30,680)	(16,340)
Net decrease in cash and due from banks and deposits with banking subsidiaries	**(29)**	(131)	(62)
Cash and due from banks and deposits with banking subsidiaries at the beginning of the year	**5,370**	5,501	5,563
Cash and due from banks and deposits with banking subsidiaries at the end of the year	**$ 5,341**	$ 5,370	$ 5,501
Cash interest paid	**$ 7,957**	$ 6,911	$ 5,426
Cash income taxes paid, net[d]	**3,910**	1,782	1,775

(a) Affiliates include trusts that issued guaranteed capital debt securities ("issuer trusts").
(b) At December 31, 2019, long-term debt that contractually matures in 2020 through 2024 totaled $16.4 billion, $20.4 billion, $12.7 billion, $18.6 billion, and $18.2 billion, respectively.
(c) Refer to Notes 20 and 28 for information regarding the Parent Company's guarantees of its subsidiaries' obligations.
(d) Represents payments, net of refunds, made by the Parent Company to various taxing authorities and includes taxes paid on behalf of certain of its subsidiaries that are subsequently reimbursed. The reimbursements were $6.4 billion, $1.2 billion, and $4.1 billion for the years ended December 31, 2019, 2018, and 2017, respectively.
(e) As a result of the merger of Chase Bank USA, N.A. with and into JPMorgan Chase Bank, N.A., JPMorgan Chase Bank, N.A. distributed $13.5 billion to the Parent company as a return of capital, which the Parent company contributed to the IHC.

Selected quarterly financial data (unaudited)

As of or for the period ended (in millions, except per share, ratio, headcount data and where otherwise noted)	2019 4th quarter	2019 3rd quarter	2019 2nd quarter	2019 1st quarter	2018 4th quarter	2018 3rd quarter	2018 2nd quarter	2018 1st quarter
Selected income statement data								
Total net revenue	$ 28,331	$ 29,341	$ 28,832	$ 29,123	$ 26,109	$ 27,260	$ 27,753	$ 27,907
Total noninterest expense	16,339	16,422	16,341	16,395	15,720	15,623	15,971	16,080
Pre-provision profit	11,992	12,919	12,491	12,728	10,389	11,637	11,782	11,827
Provision for credit losses	1,427	1,514	1,149	1,495	1,548	948	1,210	1,165
Income before income tax expense	10,565	11,405	11,342	11,233	8,841	10,689	10,572	10,662
Income tax expense	2,045	2,325	1,690	2,054	1,775	2,309	2,256	1,950
Net income	$ 8,520	$ 9,080	$ 9,652	$ 9,179	$ 7,066	$ 8,380	$ 8,316	$ 8,712
Earnings per share data								
Net income: Basic	$ 2.58	$ 2.69	$ 2.83	$ 2.65	$ 1.99	$ 2.35	$ 2.31	$ 2.38
Diluted	2.57	2.68	2.82	2.65	1.98	2.34	2.29	2.37
Average shares: Basic	3,140.7	3,198.5	3,250.6	3,298.0	3,335.8	3,376.1	3,415.2	3,458.3
Diluted	3,148.5	3,207.2	3,259.7	3,308.2	3,347.3	3,394.3	3,434.7	3,479.5
Market and per common share data								
Market capitalization	$ 429,913	$ 369,133	$ 357,479	$ 328,387	$ 319,780	$ 375,239	$ 350,204	$ 374,423
Common shares at period-end	3,084.0	3,136.5	3,197.5	3,244.0	3,275.8	3,325.4	3,360.9	3,404.8
Book value per share	75.98	75.24	73.88	71.78	70.35	69.52	68.85	67.59
TBVPS[(a)]	60.98	60.48	59.52	57.62	56.33	55.68	55.14	54.05
Cash dividends declared per share	0.90	0.90	0.80	0.80	0.80	0.80	0.56	0.56
Selected ratios and metrics								
ROE[(b)]	14%	15%	16%	16%	12%	14%	14%	15%
ROTCE[(a)(b)]	17	18	20	19	14	17	17	19
ROA[(b)]	1.22	1.30	1.41	1.39	1.06	1.28	1.28	1.37
Overhead ratio	58	56	57	56	60	57	58	58
Loans-to-deposits ratio	61	62	63	64	67	65	65	63
LCR (average)[(c)]	116	115	113	111	113	115	115	115
CET1 capital ratio[(d)]	12.4	12.3	12.2	12.1	12.0	12.0	12.0	11.8
Tier 1 capital ratio[(d)]	14.1	14.1	14.0	13.8	13.7	13.6	13.6	13.5
Total capital ratio[(d)]	16.0	15.9	15.8	15.7	15.5	15.4	15.5	15.3
Tier 1 leverage ratio[(d)]	7.9	7.9	8.0	8.1	8.1	8.2	8.2	8.2
SLR[(e)]	6.3	6.3	6.4	6.4	6.4	6.5	6.5	6.5
Selected balance sheet data (period-end)								
Trading assets	$ 411,103	$ 495,875	$ 523,373	$ 533,402	$ 413,714	$ 419,827	$ 418,799	$ 412,282
Investment Securities	398,239	394,251	307,264	267,365	$ 261,828	231,398	233,015	238,188
Loans	959,769	945,218	956,889	956,245	$ 984,554	954,318	948,414	934,424
Core loans	916,144	899,572	908,971	905,943	931,856	899,006	889,433	870,536
Average core loans	903,707	900,567	905,786	916,567	907,271	894,279	877,640	861,089
Total assets	2,687,379	2,764,661	2,727,379	2,737,188	2,622,532	2,615,183	2,590,050	2,609,785
Deposits	1,562,431	1,525,261	1,524,361	1,493,441	1,470,666	1,458,762	1,452,122	1,486,961
Long-term debt	291,498	296,472	288,869	290,893	282,031	270,124	273,114	274,449
Common stockholders' equity	234,337	235,985	236,222	232,844	230,447	231,192	231,390	230,133
Total stockholders' equity	261,330	264,348	263,215	259,837	256,515	258,956	257,458	256,201
Headcount	256,981	257,444	254,983	255,998	256,105	255,313	252,942	253,707
Credit quality metrics								
Allowance for credit losses	$ 14,314	$ 14,400	$ 14,295	$ 14,591	$ 14,500	$ 14,225	$ 14,367	$ 14,482
Allowance for loan losses to total retained loans	1.39%	1.42%	1.39%	1.43%	1.39%	1.39%	1.41%	1.44%
Allowance for loan losses to retained loans excluding purchased credit-impaired loans[(f)]	1.31	1.32	1.28	1.28	1.23	1.23	1.22	1.25
Nonperforming assets	$ 4,497	$ 5,343	$ 5,260	$ 5,616	$ 5,190	$ 5,034	$ 5,767	$ 6,364
Net charge-offs	1,494	1,371	1,403	1,361	1,236	1,033	1,252	1,335
Net charge-off rate	0.63%	0.58%	0.60%	0.58%	0.52%	0.43%	0.54%	0.59%

(a) TBVPS and ROTCE are non-GAAP financial measures. Refer to Explanation and Reconciliation of the Firm's Use of Non-GAAP Financial Measures and Key Performance Measures on pages 57–59 for further discussion of these measures.
(b) Quarterly ratios are based upon annualized amounts.
(c) The percentage represents the Firm's reported average LCR.
(d) The Basel III capital rules became fully phased-in effective January 1, 2019. Prior to this date, the required capital measures were subject to the transitional rules which, as of December 31, 2018 and September 30, 2018, were the same on a fully phased-in and transitional basis. Refer to Capital Risk Management on pages 85–92 for additional information on these measures.
(e) The Basel III rule for the SLR became fully phased-in effective January 1, 2018. Refer to Capital Risk Management on pages 85–92 for additional information on these measures.
(f) This ratio is a non-GAAP financial measure as it excludes the impact of residential real estate PCI loans. Refer to Explanation and Reconciliation of the Firm's Use of Non-GAAP Financial Measures and Key Performance Measures on pages 57–59, and the Allowance for credit losses on pages 116–117 for further discussion of this measure.

Distribution of assets, liabilities and stockholders' equity; interest rates and interest differentials

Consolidated average balance sheets, interest and rates

Provided below is a summary of JPMorgan Chase's consolidated average balances, interest and rates on a taxable-equivalent basis for the years 2017 through 2019. Income computed on a taxable-equivalent basis is the income reported in the Consolidated statements of income, adjusted to present interest income and rates earned on assets exempt from income taxes (i.e., federal taxes) on a basis comparable with other taxable investments. The incremental tax rate used for calculating the taxable-equivalent adjustment was approximately 24% in both 2019 and 2018, and 37% in 2017.

(Table continued on next page)

(Unaudited)	2019		
Year ended December 31, (Taxable-equivalent interest and rates; in millions, except rates)	Average balance	Interest[h]	Rate
Assets			
Deposits with banks	$ 280,004	$ 3,887	1.39%
Federal funds sold and securities purchased under resale agreements	275,429	6,146	2.23
Securities borrowed[a]	131,291	1,574	1.20
Trading assets – debt instruments[a]	334,269	10,848	3.25
Taxable securities	284,127	7,962	2.80
Non-taxable securities[b]	35,748	1,655	4.63
Total investment securities	319,875	9,617	3.01 [j]
Loans	954,539	50,532 [i]	5.29
All other interest-earning assets[a][c]	50,084	1,967	3.93
Total interest-earning assets[a]	2,345,491	84,571	3.61
Allowance for loan losses	(13,331)		
Cash and due from banks	20,645		
Trading assets – equity and other instruments[a]	114,323		
Trading assets – derivative receivables	53,786		
Goodwill, MSRs and other intangible assets	53,683		
All other noninterest-earning assets	167,244		
Total assets	$ 2,741,841		
Liabilities			
Interest-bearing deposits[a]	$ 1,115,848	$ 8,957	0.80%
Federal funds purchased and securities loaned or sold under repurchase agreements	227,994	4,630	2.03
Short-term borrowings[a][d]	52,426	1,248	2.38
Trading liabilities – debt and all other interest-bearing liabilities[a][e][f]	182,105	2,585	1.42
Beneficial interests issued by consolidated VIEs	22,501	568	2.52
Long-term debt[a]	247,968	8,807	3.55
Total interest-bearing liabilities[a]	1,848,842	26,795	1.45
Noninterest-bearing deposits[a]	407,219		
Trading liabilities – equity and other instruments[a][f]	31,085		
Trading liabilities – derivative payables	42,560		
All other liabilities, including the allowance for lending-related commitments[a]	151,717		
Total liabilities	2,481,423		
Stockholders' equity			
Preferred stock	27,511		
Common stockholders' equity	232,907		
Total stockholders' equity	260,418 [g]		
Total liabilities and stockholders' equity	$ 2,741,841		
Interest rate spread[a]			2.16%
Net interest income and net yield on interest-earning assets[a]		$ 57,776	2.46

(a) In the second quarter of 2019, the Firm implemented certain presentation changes that impacted interest income and interest expense, but had no effect on net interest income. These changes were made to align the accounting treatment between the balance sheet and the related interest income or expense, primarily by offsetting interest income and expense for certain prime brokerage-related held-for-investment customer receivables and payables that are currently presented as a single margin account on the balance sheet. In addition, the Firm reclassified balances related to certain instruments and structured notes from interest-earning/bearing to noninterest-earning/bearing assets and liabilities as the associated returns are recorded in principal transactions revenue and not in net interest income. These changes were applied retrospectively and, accordingly, prior period amounts were revised to conform with the current presentation.
(b) Represents securities that are tax-exempt for U.S. federal income tax purposes.
(c) Includes prime brokerage-related held-for-investment customer receivables, which are classified in accrued interest and accounts receivable, and all other interest-earning assets, which are classified in other assets on the Consolidated Balance Sheets.
(d) Includes commercial paper.
(e) All other interest-bearing liabilities include prime brokerage-related customer payables.

Within the Consolidated average balance sheets, interest and rates summary, the principal amounts of nonaccrual loans have been included in the average loan balances used to determine the average interest rate earned on loans. Refer to Note 12 for additional information on nonaccrual loans, including interest accrued.

(Table continued from previous page)

2018			2017		
Average balance	Interest[h]	Rate	Average balance	Interest[h]	Rate
$ 405,514	$ 5,907	1.46%	$ 439,663	$ 4,238	0.96%
217,150	3,819	1.76	191,820	2,327	1.21
115,082	913	0.79	95,324	94	0.10
244,771	8,763	3.58	227,588	7,714	3.39
194,232	5,653	2.91	223,592	5,534	2.48
42,456	1,987	4.68	45,086	2,769	6.14
236,688	7,640	3.23 [j]	268,678	8,303	3.09 [j]
944,885	47,796 [i]	5.06	906,397	41,296 [i]	4.56
48,818	1,890	3.87	41,504	1,312	3.16
2,212,908	76,728	3.47	2,170,974	65,284	3.01
(13,269)			(13,453)		
21,694			20,432		
118,152			125,530		
60,734			59,588		
54,669			53,999		
154,010			138,992		
$ 2,608,898			$ 2,556,062		
$ 1,045,037	$ 5,973	0.57%	$ 1,006,184	$ 2,857	0.28%
189,282	3,066	1.62	187,386	1,611	0.86
54,993	1,144	2.08	38,095	481	1.26
177,788	2,387	1.34	171,731	1,669	0.97
21,079	493	2.34	32,457	503	1.55
243,246	7,978	3.28	263,928	6,753	2.56
1,731,425	21,041	1.22	1,699,781	13,874	0.82
411,424			411,202		
34,667			21,104		
43,075			44,122		
132,836			123,291		
2,353,427			2,299,500		
26,249			26,212		
229,222			230,350		
255,471 [g]			256,562 [g]		
$ 2,608,898			$ 2,556,062		
		2.25%			2.19%
	$ 55,687	2.52		$ 51,410	2.37

(f) The combined balance of trading liabilities – debt and equity instruments was $101.0 billion, $107.0 billion and $90.7 billion for the years ended December 31, 2019, 2018 and 2017, respectively.
(g) The ratio of average stockholders' equity to average assets was 9.5%, 9.8% and 10.0% for the years ended December 31, 2019, 2018 and 2017, respectively. The return on average stockholders' equity, based on net income, was 14.0%, 12.7% and 9.5% for the years ended December 31, 2019, 2018 and 2017, respectively.
(h) Interest includes the effect of related hedging derivatives. Taxable-equivalent amounts are used where applicable.
(i) Fees and commissions on loans included in loan interest amounted to $1.2 billion each for the years ended December 31, 2019 and 2018, and $1.0 billion for 2017.
(j) The annualized rate for securities based on amortized cost was 3.05%, 3.25% and 3.13% for the years ended December 31, 2019, 2018 and 2017, respectively, and does not give effect to changes in fair value that are reflected in AOCI.

Interest rates and interest differential analysis of net interest income – U.S. and non-U.S.

Presented below is a summary of interest and rates segregated between U.S. and non-U.S. operations for the years 2017 through 2019. The segregation of U.S. and non-U.S. components is based on the location of the office recording the transaction. Intercompany funding generally consists of dollar-denominated deposits originated in various locations that are centrally managed by Treasury and CIO.

(Table continued on next page)

(Unaudited) Year ended December 31, (Taxable-equivalent interest and rates; in millions, except rates)	2019 Average balance	 Interest	 Rate
Interest-earning assets			
Deposits with banks:			
U.S.	$ 165,066	$ 3,588	2.17%
Non-U.S.	114,938	299	0.26
Federal funds sold and securities purchased under resale agreements:			
U.S.	150,205	4,068	2.71
Non-U.S.	125,224	2,078	1.66
Securities borrowed:(a)			
U.S.	92,625	1,423	1.54
Non-U.S.	38,666	151	0.39
Trading assets – debt instruments:			
U.S.	223,270	7,125	3.19
Non-U.S.	110,999	3,723	3.35
Investment securities:			
U.S.	287,961	8,963	3.11
Non-U.S.	31,914	654	2.05
Loans:			
U.S.	875,869	48,097	5.49
Non-U.S.	78,670	2,435	3.10
All other interest-earning assets, predominantly U.S.(a)	50,084	1,967	3.93
Total interest-earning assets(a)	2,345,491	84,571	3.61
Interest-bearing liabilities			
Interest-bearing deposits:			
U.S.	850,493	6,896	0.81
Non-U.S.	265,355	2,061	0.78
Federal funds purchased and securities loaned or sold under repurchase agreements:			
U.S.	164,284	3,989	2.43
Non-U.S.	63,710	641	1.01
Trading liabilities – debt, short-term and all other interest-bearing liabilities:(a)(b)			
U.S.	147,247	2,574	1.75
Non-U.S.	87,284	1,259	1.44
Beneficial interests issued by consolidated VIEs, predominantly U.S.	22,501	568	2.52
Long-term debt:			
U.S.	241,914	8,766	3.62
Non-U.S.	6,054	41	0.68
Intercompany funding:			
U.S.	(42,947)	(1,414)	–
Non-U.S.	42,947	1,414	–
Total interest-bearing liabilities(a)	1,848,842	26,795	1.45
Noninterest-bearing liabilities(c)	496,649		
Total investable funds	$ 2,345,491	$ 26,795	1.14%
Net interest income and net yield:		$ 57,776	2.46%
U.S.		52,217	2.86
Non-U.S.		5,559	1.07
Percentage of total assets and liabilities attributable to non-U.S. operations:			
Assets			24.5
Liabilities			22.1

(a) In the second quarter of 2019, the Firm implemented certain presentation changes that impacted interest income and interest expense, but had no effect on net interest income. These changes were made to align the accounting treatment between the balance sheet and the related interest income or expense, primarily by offsetting interest income and expense for certain prime brokerage-related held-for-investment customer receivables and payables that are currently presented as a single margin account on the balance sheet. These changes were applied retrospectively and, accordingly, prior period amounts were revised to conform with the current presentation.
(b) Includes commercial paper.
(c) Represents the amount of noninterest-bearing liabilities funding interest-earning assets.

Refer to the "Net interest income" discussion in Consolidated Results of Operations on pages 48–51 for further information.

(Table continued from previous page)

2018			2017		
Average balance	Interest	Rate	Average balance	Interest	Rate
$ 305,117	$ 5,703	1.87%	$ 366,814	$ 4,093	1.12%
100,397	204	0.20	72,849	145	0.20
102,144	2,427	2.38	90,879	1,360	1.50
115,006	1,392	1.21	100,941	967	0.96
77,027	825	1.07	68,110	65	0.11
38,055	88	0.23	27,214	29	0.11
140,221	5,068	3.61	128,157	4,186	3.27
104,550	3,695	3.53	99,431	3,528	3.55
200,883	6,943	3.46	223,140	7,490	3.36
35,805	697	1.95	45,538	813	1.79
864,149	45,395	5.25	832,608	39,439	4.74
80,736	2,401	2.97	73,789	1,857	2.52
48,818	1,890	3.87	41,504	1,312	3.16
2,212,908	76,728	3.47	2,170,974	65,284	3.01
802,786	4,562	0.57	769,596	2,223	0.29
242,251	1,411	0.58	236,588	634	0.27
117,754	2,562	2.18	115,574	1,349	1.17
71,528	504	0.70	71,812	262	0.37
147,512	2,225	1.51	134,826	927	0.69
85,269	1,306	1.53	75,000	1,223	1.63
21,079	493	2.34	32,457	503	1.55
239,718	7,954	3.32	262,817	6,745	2.57
3,528	24	0.68	1,111	8	0.72
(51,933)	(746)	–	(2,874)	(25)	–
51,933	746	–	2,874	25	–
1,731,425	21,041	1.22	1,699,781	13,874	0.82
481,483			471,193		
$ 2,212,908	$ 21,041	0.95%	$ 2,170,974	$ 13,874	0.64%
	$ 55,687	2.52%		$ 51,410	2.37%
	50,236	2.95		46,059	2.69
	5,451	1.05		5,351	1.16
		24.7			22.5
		22.3			21.1

Changes in net interest income, volume and rate analysis

The table below presents an attribution of net interest income between volume and rate. The attribution between volume and rate is calculated using annual average balances for each category of assets and liabilities shown in the table and the corresponding annual rates (refer to pages 288–292 for more information on average balances and rates). In this analysis, when the change cannot be isolated to either volume or rate, it has been allocated to volume. The annual rates include the impact of changes in market rates, as well as the impact of any change in composition of the various products within each category of asset or liability. This analysis is calculated separately for each category without consideration of the relationship between categories (for example, the net spread between the rates earned on assets and the rates paid on liabilities that fund those assets). As a result, changes in the granularity or groupings considered in this analysis would produce a different attribution result, and due to the complexities involved, precise allocation of changes in interest rates between volume and rates is inherently complex and judgmental.

(Unaudited) Year ended December 31, (On a taxable-equivalent basis; in millions)	2019 versus 2018 Increase/(decrease) due to change in: Volume	Rate	Net change	2018 versus 2017 Increase/(decrease) due to change in: Volume	Rate	Net change
Interest-earning assets						
Deposits with banks:						
U.S.	**$ (3,030)**	**$ 915**	**$ (2,115)**	$ (1,141)	$ 2,751	$ 1,610
Non-U.S.	**35**	**60**	**95**	59	–	59
Federal funds sold and securities purchased under resale agreements:						
U.S.	**1,304**	**337**	**1,641**	267	800	1,067
Non-U.S.	**168**	**518**	**686**	173	252	425
Securities borrowed:[(a)]						
U.S.	**236**	**362**	**598**	106	654	760
Non-U.S.	**2**	**61**	**63**	26	33	59
Trading assets – debt instruments:						
U.S.	**2,646**	**(589)**	**2,057**	446	436	882
Non-U.S.	**216**	**(188)**	**28**	187	(20)	167
Investment securities:						
U.S.	**2,723**	**(703)**	**2,020**	(770)	223	(547)
Non-U.S.	**(79)**	**36**	**(43)**	(189)	73	(116)
Loans:						
U.S.	**628**	**2,074**	**2,702**	1,710	4,246	5,956
Non-U.S.	**(71)**	**105**	**34**	212	332	544
All other interest-earning assets, predominantly U.S.[(a)]	**48**	**29**	**77**	283	295	578
Change in interest income[(a)]	**4,826**	**3,017**	**7,843**	1,369	10,075	11,444
Interest-bearing liabilities						
Interest-bearing deposits:						
U.S.	**407**	**1,927**	**2,334**	184	2,155	2,339
Non-U.S.	**165**	**485**	**650**	44	733	777
Federal funds purchased and securities loaned or sold under repurchase agreements:						
U.S.	**1,133**	**294**	**1,427**	46	1,167	1,213
Non-U.S.	**(85)**	**222**	**137**	5	237	242
Trading liabilities – debt, short-term and all other interest-bearing liabilities: [(a)(b)]						
U.S.	**(5)**	**354**	**349**	203	1,095	1,298
Non-U.S.	**30**	**(77)**	**(47)**	158	(75)	83
Beneficial interests issued by consolidated VIEs, predominantly U.S.	**37**	**38**	**75**	(266)	256	(10)
Long-term debt:						
U.S.	**93**	**719**	**812**	(762)	1,971	1,209
Non-U.S.	**17**	**–**	**17**	16	–	16
Intercompany funding:						
U.S.	**293**	**(961)**	**(668)**	(704)	(17)	(721)
Non-U.S.	**(293)**	**961**	**668**	704	17	721
Change in interest expense[(a)]	**1,792**	**3,962**	**5,754**	(372)	7,539	7,167
Change in net interest income	**$ 3,034**	**$ (945)**	**$ 2,089**	$ 1,741	$ 2,536	$ 4,277

(a) In the second quarter of 2019, the Firm implemented certain presentation changes that impacted interest income and interest expense, but had no effect on net interest income. These changes were made to align the accounting treatment between the balance sheet and the related interest income or expense, primarily by offsetting interest income and expense for certain prime brokerage-related held-for-investment customer receivables and payables that are currently presented as a single margin account on the balance sheet. These changes were applied retrospectively and, accordingly, prior period amounts were revised to conform with the current presentation.
(b) Includes commercial paper.

2019 Form 10-K: Annual report on Form 10-K for year ended December 31, 2019, filed with the U.S. Securities and Exchange Commission.

ABS: Asset-backed securities

AFS: Available-for-sale

ALCO: Asset Liability Committee

AWM: Asset & Wealth Management

AOCI: Accumulated other comprehensive income/(loss)

ARM: Adjustable rate mortgage(s)

AUC: Assets under custody

AUM: "Assets under management": Represent assets managed by AWM on behalf of its Private Banking, Institutional and Retail clients. Includes "Committed capital not Called."

Auto loan and lease origination volume: Dollar amount of auto loans and leases originated.

Beneficial interests issued by consolidated VIEs: Represents the interest of third-party holders of debt, equity securities, or other obligations, issued by VIEs that JPMorgan Chase consolidates.

Benefit obligation: Refers to the projected benefit obligation for pension plans and the accumulated postretirement benefit obligation for OPEB plans.

BHC: Bank holding company

Card Services includes the Credit Card and Merchant Services businesses.

CB: Commercial Banking

CBB: Consumer & Business Banking

CCAR: Comprehensive Capital Analysis and Review

CCB: Consumer & Community Banking

CCO: Chief Compliance Officer

CCP: "Central counterparty" is a clearing house that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer and thereby ensuring the future performance of open contracts. A CCP becomes a counterparty to trades with market participants through novation, an open offer system, or another legally binding arrangement.

CDS: Credit default swaps

CECL: Current Expected Credit Losses

CEO: Chief Executive Officer

CET1 Capital: Common equity Tier 1 capital

CFTC: Commodity Futures Trading Commission

CFO: Chief Financial Officer

CFP: Contingency funding plan

Chase Bank USA, N.A.: Chase Bank USA, National Association

CIB: Corporate & Investment Bank

CIO: Chief Investment Office

Client assets: Represent assets under management as well as custody, brokerage, administration and deposit accounts.

Client deposits and other third-party liabilities: Deposits, as well as deposits that are swept to on-balance sheet liabilities (e.g., commercial paper, federal funds purchased and securities loaned or sold under repurchase agreements) as part of client cash management programs.

CLO: Collateralized loan obligations

CLTV: Combined loan-to-value

Collateral-dependent: A loan is considered to be collateral-dependent when repayment of the loan is expected to be provided solely by the underlying collateral, rather than by cash flows from the borrower's operations, income or other resources.

Commercial Card: provides a wide range of payment services to corporate and public sector clients worldwide through the commercial card products. Services include procurement, corporate travel and entertainment, expense management services, and business-to-business payment solutions.

Core loans: Represents loans central to the Firm's ongoing businesses; core loans exclude loans classified as trading assets, runoff portfolios, discontinued portfolios and portfolios the Firm has an intent to exit.

Credit cycle: A period of time over which credit quality improves, deteriorates and then improves again (or vice versa). The duration of a credit cycle can vary from a couple of years to several years.

Credit derivatives: Financial instruments whose value is derived from the credit risk associated with the debt of a third-party issuer (the reference entity) which allow one party (the protection purchaser) to transfer that risk to another party (the protection seller). Upon the occurrence of a credit event by the reference entity, which may include, among other events, the bankruptcy or failure to pay its obligations, or certain restructurings of the debt of the reference entity, neither party has recourse to the reference entity. The protection purchaser has recourse to the protection seller for the difference between the face value of the CDS contract and the fair value at the time of settling the credit derivative contract. The determination as to whether a credit event has occurred is generally made by the relevant International Swaps and Derivatives Association ("ISDA") Determinations Committee.

Criticized: Criticized loans, lending-related commitments and derivative receivables that are classified as special mention, substandard and doubtful categories for regulatory purposes.

CRO: Chief Risk Officer

CRSC: Conduct Risk Steering Committee

CTC: CIO, Treasury and Corporate

CVA: Credit valuation adjustment

Debit and credit card sales volume: Dollar amount of card member purchases, net of returns.

Deposit margin/deposit spread: Represents net interest income expressed as a percentage of average deposits.

Distributed denial-of-service attack: The use of a large number of remote computer systems to electronically send a high volume of traffic to a target website to create a service outage at the target. This is a form of cyberattack.

Dodd-Frank Act: Wall Street Reform and Consumer Protection Act

DVA: Debit valuation adjustment

EC: European Commission

Eligible LTD: Long-term debt satisfying certain eligibility criteria

Embedded derivatives: are implicit or explicit terms or features of a financial instrument that affect some or all of the cash flows or the value of the instrument in a manner similar to a derivative. An instrument containing such terms or features is referred to as a “hybrid.” The component of the hybrid that is the non-derivative instrument is referred to as the “host.” For example, callable debt is a hybrid instrument that contains a plain vanilla debt instrument (i.e., the host) and an embedded option that allows the issuer to redeem the debt issue at a specified date for a specified amount (i.e., the embedded derivative). However, a floating rate instrument is not a hybrid composed of a fixed-rate instrument and an interest rate swap.

ERISA: Employee Retirement Income Security Act of 1974

EPS: Earnings per share

ETD: “Exchange-traded derivatives”: Derivative contracts that are executed on an exchange and settled via a central clearing house.

EU: European Union

Fannie Mae: Federal National Mortgage Association

FASB: Financial Accounting Standards Board

FCA: Financial Conduct Authority

FCC: Firmwide Control Committee

FDIA: Federal Depository Insurance Act

FDIC: Federal Deposit Insurance Corporation

Federal Reserve: The Board of the Governors of the Federal Reserve System

FFIEC: Federal Financial Institutions Examination Council

FHA: Federal Housing Administration

FHLB: Federal Home Loan Bank

FICC: The Fixed Income Clearing Corporation

FICO score: A measure of consumer credit risk provided by credit bureaus, typically produced from statistical models by Fair Isaac Corporation utilizing data collected by the credit bureaus.

Firm: JPMorgan Chase & Co.

Forward points: Represents the interest rate differential between two currencies, which is either added to or subtracted from the current exchange rate (i.e., “spot rate”) to determine the forward exchange rate.

FRC: Firmwide Risk Committee

Freddie Mac: Federal Home Loan Mortgage Corporation

Free standing derivatives: a derivative contract entered into either separate and apart from any of the Firm’s other financial instruments or equity transactions. Or, in conjunction with some other transaction and is legally detachable and separately exercisable.

FSB: Financial Stability Board

FTE: Fully taxable equivalent

FVA: Funding valuation adjustment

FX: Foreign exchange

G7: Group of Seven nations: Countries in the G7 are Canada, France, Germany, Italy, Japan, the U.K. and the U.S.

G7 government bonds: Bonds issued by the government of one of the G7 nations.

Ginnie Mae: Government National Mortgage Association

GSIB: Global systemically important banks

Headcount-related expense: Includes salary and benefits (excluding performance-based incentives), and other noncompensation costs related to employees.

HELOAN: Home equity loan

HELOC: Home equity line of credit

Home equity – senior lien: Represents loans and commitments where JPMorgan Chase holds the first security interest on the property.

Home equity – junior lien: Represents loans and commitments where JPMorgan Chase holds a security interest that is subordinate in rank to other liens.

Households: A household is a collection of individuals or entities aggregated together by name, address, tax identifier and phone number.

HQLA: High-quality liquid assets

HTM: Held-to-maturity

IBOR: Interbank Offered Rate

ICAAP: Internal capital adequacy assessment process

IDI: Insured depository institutions

IHC: JPMorgan Chase Holdings LLC, an intermediate holding company

Impaired loan: Impaired loans are loans measured at amortized cost, for which it is probable that the Firm will be unable to collect all amounts due, including principal and interest, according to the contractual terms of the agreement. Impaired loans include the following:

- All wholesale nonaccrual loans
- All TDRs (both wholesale and consumer), including ones that have returned to accrual status

Investment-grade: An indication of credit quality based on JPMorgan Chase's internal risk assessment. The Firm considers ratings of BBB-/Baa3 or higher as investment-grade.

IPO: Initial public offering

ISDA: International Swaps and Derivatives Association

JPMorgan Chase: JPMorgan Chase & Co.

JPMorgan Chase Bank, N.A.: JPMorgan Chase Bank, National Association

JPMorgan Securities: J.P. Morgan Securities LLC

Loan-equivalent: Represents the portion of the unused commitment or other contingent exposure that is expected, based on historical portfolio experience, to become drawn prior to an event of a default by an obligor.

LCR: Liquidity coverage ratio

LDA: Loss Distribution Approach

LGD: Loss given default

LIBOR: London Interbank Offered Rate

LLC: Limited Liability Company

LOB: Line of business

LOB CROs: Line of Business and CTC Chief Risk Officers

Loss emergence period: Represents the time period between the date at which the loss is estimated to have been incurred and the ultimate realization of that loss.

LTIP: Long-term incentive plan

LTV: "Loan-to-value": For residential real estate loans, the relationship, expressed as a percentage, between the principal amount of a loan and the appraised value of the collateral (i.e., residential real estate) securing the loan.

Origination date LTV ratio
The LTV ratio at the origination date of the loan. Origination date LTV ratios are calculated based on the actual appraised values of collateral (i.e., loan-level data) at the origination date.

Current estimated LTV ratio
An estimate of the LTV as of a certain date. The current estimated LTV ratios are calculated using estimated collateral values derived from a nationally recognized home price index measured at the metropolitan statistical area ("MSA") level. These MSA-level home price indices consist of actual data to the extent available and forecasted data where actual data is not available. As a result, the estimated collateral values used to calculate these ratios do not represent actual appraised loan-level collateral values; as such, the resulting LTV ratios are necessarily imprecise and should therefore be viewed as estimates.

Combined LTV ratio
The LTV ratio considering all available lien positions, as well as unused lines, related to the property. Combined LTV ratios are used for junior lien home equity products.

Managed basis: A non-GAAP presentation of Firmwide financial results that includes reclassifications to present revenue on a fully taxable-equivalent basis. Management also uses this financial measure at the segment level, because it believes this provides information to enable investors to understand the underlying operational performance and trends of the particular business segment and facilitates a comparison of the business segment with the performance of competitors.

Master netting agreement: A single agreement with a counterparty that permits multiple transactions governed by that agreement to be terminated or accelerated and settled through a single payment in a single currency in the event of a default (e.g., bankruptcy, failure to make a required payment or securities transfer or deliver collateral or margin when due).

Measurement alternative: Measures equity securities without readily determinable fair values at cost less impairment (if any), plus or minus observable price changes from an identical or similar investment of the same issuer.

MBS: Mortgage-backed securities

MD&A: Management's discussion and analysis

Merchant Services: is a business that primarily processes transactions for merchants.

Moody's: Moody's Investor Services

Mortgage origination channels:

Retail – Borrowers who buy or refinance a home through direct contact with a mortgage banker employed by the Firm using a branch office, the Internet or by phone. Borrowers are frequently referred to a mortgage banker by a banker in a Chase branch, real estate brokers, home builders or other third parties.

Correspondent – Banks, thrifts, other mortgage banks and other financial institutions that sell closed loans to the Firm.

Mortgage product types:

Alt-A
Alt-A loans are generally higher in credit quality than subprime loans but have characteristics that would disqualify the borrower from a traditional prime loan. Alt-A lending characteristics may include one or more of the following: (i) limited documentation; (ii) a high CLTV ratio; (iii) loans secured by non-owner occupied properties; or (iv) a debt-to-income ratio above normal limits. A substantial proportion of the Firm's Alt-A loans are those where a borrower does not provide complete documentation of his or her assets or the amount or source of his or her income.

Option ARMs
The option ARM real estate loan product is an adjustable-rate mortgage loan that provides the borrower with the option each month to make a fully amortizing, interest-only or minimum payment. The minimum payment on an option ARM loan is based on the interest rate charged during the introductory period. This introductory rate is usually significantly below the fully indexed rate. The fully indexed rate is calculated using an index rate plus a margin. Once the introductory period ends, the contractual interest rate charged on the loan increases to the fully indexed rate and adjusts monthly to reflect movements in the index. The minimum payment is typically insufficient to cover interest accrued in the prior month, and any unpaid interest is deferred and added to the principal balance of the loan. Option ARM loans are subject to payment recast, which converts the loan to a variable-rate fully amortizing loan upon meeting specified loan balance and anniversary date triggers.

Prime
Prime mortgage loans are made to borrowers with good credit records who meet specific underwriting requirements, including prescriptive requirements related to income and overall debt levels. New prime mortgage borrowers provide full documentation and generally have reliable payment histories.

Subprime
Subprime loans are loans that, prior to mid-2008, were offered to certain customers with one or more high risk characteristics, including but not limited to: (i) unreliable or poor payment histories; (ii) a high LTV ratio of greater than 80% (without borrower-paid mortgage insurance); (iii) a high debt-to-income ratio; (iv) an occupancy type for the loan is other than the borrower's primary residence; or (v) a history of delinquencies or late payments on the loan.

MSA: Metropolitan statistical areas

MSR: Mortgage servicing rights

Multi-asset: Any fund or account that allocates assets under management to more than one asset class.

NA: Data is not applicable or available for the period presented.

NAV: Net Asset Value

Net Capital Rule: Rule 15c3-1 under the Securities Exchange Act of 1934.

Net charge-off/(recovery) rate: Represents net charge-offs/(recoveries) (annualized) divided by average retained loans for the reporting period.

Net interchange income includes the following components:

- **Interchange income**: Fees earned by credit and debit card issuers on sales transactions.
- **Reward costs**: The cost to the Firm for points earned by cardholders enrolled in credit card rewards programs.
- **Partner payments**: Payments to co-brand credit card partners based on the cost of loyalty program rewards earned by cardholders on credit card transactions.

Net mortgage servicing revenue: Includes operating revenue earned from servicing third-party mortgage loans, which is recognized over the period in which the service is provided; changes in the fair value of MSRs; the impact of risk management activities associated with MSRs; and gains and losses on securitization of excess mortgage servicing. Net mortgage servicing revenue also includes gains and losses on sales and lower of cost or fair value adjustments of certain repurchased loans insured by U.S. government agencies.

Net production revenue: Includes fees and income recognized as earned on mortgage loans originated with the intent to sell, and the impact of risk management activities associated with the mortgage pipeline and warehouse loans. Net production revenue also includes gains and losses on sales and lower of cost or fair value adjustments on mortgage loans held-for-sale (excluding certain repurchased loans insured by U.S. government agencies), and changes in the fair value of financial instruments measured under the fair value option.

Net revenue rate: Represents Card Services net revenue (annualized) expressed as a percentage of average loans for the period.

Net yield on interest-earning assets: The average rate for interest-earning assets less the average rate paid for all sources of funds.

NM: Not meaningful

NOL: Net operating loss

Nonaccrual loans: Loans for which interest income is not recognized on an accrual basis. Loans (other than credit card loans and certain consumer loans insured by U.S. government agencies) are placed on nonaccrual status when full payment of principal and interest is not expected, regardless of delinquency status, or when principal and interest have been in default for a period of 90 days or more unless the loan is both well-secured and in the process of collection. Collateral-dependent loans are typically maintained on nonaccrual status.

Nonperforming assets: Nonperforming assets include nonaccrual loans, nonperforming derivatives and certain assets acquired in loan satisfaction, predominantly real estate owned and other commercial and personal property.

NOW: Negotiable Order of Withdrawal

OAS: Option-adjusted spread

OCC: Office of the Comptroller of the Currency

OCI: Other comprehensive income/(loss)

OPEB: Other postretirement employee benefit

OTTI: Other-than-temporary impairment

Over-the-counter ("OTC") derivatives: Derivative contracts that are negotiated, executed and settled bilaterally between two derivative counterparties, where one or both counterparties is a derivatives dealer.

Over-the-counter cleared ("OTC-cleared") derivatives: Derivative contracts that are negotiated and executed bilaterally, but subsequently settled via a central clearing house, such that each derivative counterparty is only exposed to the default of that clearing house.

Overhead ratio: Noninterest expense as a percentage of total net revenue.

Parent Company: JPMorgan Chase & Co.

Participating securities: Represents unvested share-based compensation awards containing nonforfeitable rights to dividends or dividend equivalents (collectively, "dividends"), which are included in the earnings per share calculation using the two-class method. JPMorgan Chase grants RSUs to certain employees under its share-based compensation programs, which entitle the recipients to receive nonforfeitable dividends during the vesting period on a basis equivalent to the dividends paid to holders of common stock. These unvested awards meet the definition of participating securities. Under the two-class method, all earnings (distributed and undistributed) are allocated to each class of common stock and participating securities, based on their respective rights to receive dividends.

PCA: Prompt corrective action

PCI: "Purchased credit-impaired" loans represents certain loans that were acquired and deemed to be credit-impaired on the acquisition date in accordance with the guidance of the FASB. The guidance allows purchasers to aggregate credit-impaired loans acquired in the same fiscal quarter into one or more pools, provided that the loans have common risk characteristics(e.g., product type, LTV ratios, FICO scores, past due status, geographic location). A pool is then accounted for as a single asset with a single composite interest rate and an aggregate expectation of cash flows.

PD: Probability of default

PRA: Prudential Regulation Authority

Pre-provision profit/(loss): Represents total net revenue less noninterest expense. The Firm believes that this financial measure is useful in assessing the ability of a lending institution to generate income in excess of its provision for credit losses.

Pretax margin: Represents income before income tax expense divided by total net revenue, which is, in management's view, a comprehensive measure of pretax performance derived by measuring earnings after all costs are taken into consideration. It is one basis upon which management evaluates the performance of AWM against the performance of their respective competitors.

Principal transactions revenue: Principal transactions revenue is driven by many factors, including:

- the bid-offer spread, which is the difference between the price at which a market participant is willing and able to sell an instrument to the Firm and the price at which another market participant is willing and able to buy it from the Firm, and vice versa; and
- realized and unrealized gains and losses on financial instruments and commodities transactions, including those accounted for under the fair value option, primarily used in client-driven market-making activities, and on private equity investments.
  - Realized gains and losses result from the sale of instruments, closing out or termination of transactions, or interim cash payments.
  - Unrealized gains and losses result from changes in valuation.

In connection with its client-driven market-making activities, the Firm transacts in debt and equity instruments, derivatives and commodities, including physical commodities inventories and financial instruments that reference commodities.

Principal transactions revenue also includes realized and unrealized gains and losses related to:

- derivatives designated in qualifying hedge accounting relationships, primarily fair value hedges of commodity and foreign exchange risk;
- derivatives used for specific risk management purposes, primarily to mitigate credit risk and foreign exchange risk.

PSUs: Performance share units

REIT: "Real estate investment trust": A special purpose investment vehicle that provides investors with the ability to participate directly in the ownership or financing of real-estate related assets by pooling their capital to purchase and manage income property (i.e., equity REIT) and/or mortgage loans (i.e., mortgage REIT). REITs can be publicly or privately held and they also qualify for certain favorable tax considerations.

Regulatory VaR: Daily aggregated VaR calculated in accordance with regulatory rules.

REO: Real estate owned

Reported basis: Financial statements prepared under U.S.

GAAP, which excludes the impact of taxable-equivalent adjustments.

Retained loans: Loans that are held-for-investment (i.e., excludes loans held-for-sale and loans at fair value).

Revenue wallet: Proportion of fee revenue based on estimates of investment banking fees generated across the industry (i.e., the revenue wallet) from investment banking transactions in M&A, equity and debt underwriting, and loan syndications. Source: Dealogic, a third-party provider of investment banking competitive analysis and volume-based league tables for the above noted industry products.

RHS: Rural Housing Service of the U.S. Department of Agriculture

Risk-rated portfolio: Credit loss estimates are based on estimates of the probability of default ("PD") and loss severity given a default. The probability of default is the likelihood that a borrower will default on its obligation; the loss given default ("LGD") is the estimated loss on the loan that would be realized upon the default and takes into consideration collateral and structural support for each credit facility.

ROA: Return on assets

ROE: Return on equity

ROTCE: Return on tangible common equity

ROU assets: Right-of-use assets

RSU(s): Restricted stock units

RWA: "Risk-weighted assets": Basel III establishes two comprehensive approaches for calculating RWA (a Standardized approach and an Advanced approach) which include capital requirements for credit risk, market risk, and in the case of Basel III Advanced, also operational risk. Key differences in the calculation of credit risk RWA between the Standardized and Advanced approaches are that for Basel III Advanced, credit risk RWA is based on risk-sensitive approaches which largely rely on the use of internal credit models and parameters, whereas for Basel III Standardized, credit risk RWA is generally based on supervisory risk-weightings which vary primarily by counterparty type and asset class. Market risk RWA is calculated on a generally consistent basis between Basel III Standardized and Basel III Advanced.

S&P: Standard and Poor's 500 Index

SAR(s): Stock appreciation rights

Scored portfolio: The scored portfolio predominantly includes residential real estate loans, credit card loans and certain auto and business banking loans where credit loss estimates are based on statistical analysis of credit losses over discrete periods of time. The statistical analysis uses portfolio modeling, credit scoring and decision-support tools.

SEC: Securities and Exchange Commission

Securities financing agreements: Include resale, repurchase, securities borrowed and securities loaned agreements

Seed capital: Initial JPMorgan capital invested in products, such as mutual funds, with the intention of ensuring the fund is of sufficient size to represent a viable offering to clients, enabling pricing of its shares, and allowing the manager to develop a track record. After these goals are achieved, the intent is to remove the Firm's capital from the investment.

Shelf Deals: Shelf offerings are SEC provisions that allow issuers to register for new securities without selling the entire issuance at once. Since these issuances are filed with the SEC but are not yet priced in the market, they are not included in the league tables until the actual securities are issued.

Single-name: Single reference-entities

SLR: Supplementary leverage ratio

SMBS: Stripped mortgage-backed securities

SOFR: Secured Overnight Financing Rate

SPEs: Special purpose entities

Structural interest rate risk: Represents interest rate risk of the non-trading assets and liabilities of the Firm.

Structured notes: Structured notes are financial instruments whose cash flows are linked to the movement in one or more indexes, interest rates, foreign exchange rates, commodities prices, prepayment rates, or other market variables. The notes typically contain embedded (but not separable or detachable) derivatives. Contractual cash flows for principal, interest, or both can vary in amount and timing throughout the life of the note based on non-traditional indexes or non-traditional uses of traditional interest rates or indexes.

Taxable-equivalent basis: In presenting results on a managed basis, the total net revenue for each of the business segments and the Firm is presented on a tax-equivalent basis. Accordingly, revenue from investments that receive tax credits and tax-exempt securities is presented in managed basis results on a level comparable to taxable investments and securities; the corresponding income tax impact related to tax-exempt items is recorded within income tax expense.

TBVPS: Tangible book value per share

TCE: Tangible common equity

TDR: "Troubled debt restructuring" is deemed to occur when the Firm modifies the original terms of a loan agreement by granting a concession to a borrower that is experiencing financial difficulty.

TLAC: Total loss-absorbing capacity

U.K.: United Kingdom

Unaudited: Financial statements and information that have not been subjected to auditing procedures sufficient to permit an independent certified public accountant to express an opinion.

U.S.: United States of America

U.S. government agencies: U.S. government agencies include, but are not limited to, agencies such as Ginnie Mae and FHA, and do not include Fannie Mae and Freddie Mac which are U.S. government-sponsored enterprises ("U.S. GSEs"). In general, obligations of U.S. government agencies are fully and explicitly guaranteed as to the timely payment of principal and interest by the full faith and credit of the U.S. government in the event of a default.

U.S. GAAP: Accounting principles generally accepted in the U.S.

U.S. GSE(s): "U.S. government-sponsored enterprises" are quasi-governmental, privately-held entities established or chartered by the U.S. government to serve public purposes as specified by the U.S. Congress to improve the flow of credit to specific sectors of the economy and provide certain essential services to the public. U.S. GSEs include Fannie Mae and Freddie Mac, but do not include Ginnie Mae or FHA. U.S. GSE obligations are not explicitly guaranteed as to the timely payment of principal and interest by the full faith and credit of the U.S. government.

U.S. LCR: Liquidity coverage ratio under the final U.S. rule.

U.S. Treasury: U.S. Department of the Treasury

VA: U.S. Department of Veterans Affairs

VaR: "Value-at-risk" is a measure of the dollar amount of potential loss from adverse market moves in an ordinary market environment.

VCG: Valuation Control Group

VGF: Valuation Governance Forum

VIEs: Variable interest entities

Warehouse loans: Consist of prime mortgages originated with the intent to sell that are accounted for at fair value and classified as trading assets.