MORNINGSTAR®

Bank Credit Rating Methodology

Morningstar Credit Ratings, LLC
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Contents

Overview of Methodology

Morningstar Credit Ratings, LLC's bank credit rating methodology is based on the same key components, or pillars, as our methodology for nonfinancial corporations: Business Risk, Bank Solvency Score, Distance to Default, and a Stress Test Score, which is analogous to the Morningstar® Cash Flow Cushion™ for nonfinancial corporations. The methodology combines qualitative judgments with observable financial and market data to arrive at a model-derived credit score. However, the model score is only an input to the final rating. The final rating may diverge from the model score to account for trends in performance, anticipated company actions, macroeconomic developments, or other factors that may not be reflected in the model.

Scope: This methodology applies to publicly owned top holders of banks, typically bank holding companies, or BHCs, and their banking subsidiaries. The definition of bank varies from country to country but the common elements are: deposit taking, lending, transaction intermediation, and regulation by the national or subnational authorities that license the companies to operate as banks. The scope of this methodology includes commercial banks, savings banks, and those investment banks subject to regulation as banks but does not include banks under long-term government ownership. However, banks that have temporary government ownership or control may be included if, in Morningstar's judgment, the ownership or control is part of a recovery plan.

Morningstar bank credit ratings do not incorporate government support beyond the provision of limited deposit insurance. The parent BHC rating is an ordinal ranking of how likely national regulators are to force a BHC to "bail in" its senior unsecured bondholders by converting debt to equity, writing down the face value of the debt, or otherwise changing the terms of the debt such that the present value of the cash flows is reduced. The rating of the BHC's banking subsidiaries will be higher to the extent that their structural superiority or regulators' preferences in resolution provide them additional protections against default or conversion to equity. Ratings of bonds and other obligations at each level of the bank's legal structure will depend on their terms and the BHC or subsidiary issuer's rating.

There are many BHCs—particularly at the U.S. regional level—whose only assets are equity in their banking subsidiary and with little or no debt at the holding company level. In these cases, the ratings at the BHC and bank level will be the same. However, obligor and security ratings of a U.S. BHC's subsidiaries may be notched up from the BHC's Corporate Credit Rating to reflect the structural subordination of BHC debt to subsidiary bank debt and the "bail-in" risk to BHC plain-vanilla unsecured debt required by the Dodd-Frank Wall Street Reform and Consumer Protection Act and Federal Reserve regulations.

For expository convenience, we will use the term "bank" to refer to all top holders of banks our methodology covers, including both banks and bank holding companies, unless a specific distinction is made in the text.

Credit Methodology and Model

Analytical Foundation

Morningstar's bank credit rating methodology and credit scoring model are similar in concept to the capital adequacy, asset quality, management, earnings, liquidity, and sensitivity to market risk, or CAMELS, rating system used by U.S. bank regulators. The four key components of our bank rating methodology that drive the Morningstar credit scoring model are:

(1) Business Risk Score (25% weighting) encompasses various measures of business risk, as well as Morningstar's proprietary economic moat and Uncertainty assessments.
(2) Bank Solvency Score (25% weighting) is a ranking based on a bank's capital adequacy, asset quality, profitability, and liquidity profile.
(3) Stress Test Score (25% weighting) is an evaluation of a bank's potential to absorb loan losses while maintaining adequate capital levels.
(4) Distance to Default Score (25% weighting) is a quantitative model using market-based inputs that ranks banks based on their likelihood of financial distress.

The Bank Solvency Score measures a bank's most recent performance in areas corresponding to four CAMELS categories: capital adequacy, asset quality, earnings, and liquidity. The qualitative CAMELS factor of management is a component of the Business Risk score. Sensitivity to market risk is estimated with the Bank Stress Test Score and the Distance to Default Score.

The weighted average of a bank's score on all four pillars determines the model-driven credit rating for the parent entity. The model and the model-driven credit rating are important inputs to the credit rating process, but they should be viewed as tools for guiding the rating decision rather than as mathematical determinants of the final rating.

See Appendix for selected definitions of terms used in this methodology.

Peer Groups

Within the Solvency Score and Distance to Default pillars, which are built on relative rankings of banks, Morningstar will compare each bank against a group of appropriate peers.

We use these peer groups to accommodate the significant differences that exist across banks and to make comparisons more meaningful.

Banks operate with a wide array of business models. Large global banks tend to have diversified business models that may include investment banking as well as non-banking activities like asset management, wealth management or insurance. As a result, they tend to be more exposed to capital markets risk. Moreover, many of these businesses are not primarily deposit funded, so these banks tend to be more dependent on wholesale funding. In contrast, regional banks tend to be focused on on-

balance-sheet retail and commercial lending funded largely by the taking of deposits. They tend to have less exposure to capital markets but more exposure to local economic conditions or certain lending types.

The structure of the markets in which banks operate also varies significantly. Global banks tend to have large market shares across a variety of geographies and businesses, along with very actively traded equity. Global banks tend to be large but are few in number. In contrast, regional banks tend to be smaller and more geographically concentrated, and may experience significantly less trading in their shares. Regional banks tend to be small individually but may be large in number.

Because of these differences, comparisons across peers are more useful than comparisons across the universe of banks. For example, global banks tend to have more capital-light non-banking businesses, such as asset management, which mean that their capital levels, when measured against total assets, are systematically lower than those of regional banks. Moreover, the large number of regional banks relative to global banks means that their business model would be overweighed in a relative ranking of all banks.

We note that significant business model differences exist within peer groups, which can also make comparisons less useful. For example, the two large U.S. trust banks do not engage in a significant amount of traditional lending, so traditional measures of exposure to credit risk, such as allowance for loan losses / problem loans, may not appropriately capture the risks they face. We will consider these issues when assigning a final credit rating.

We have defined peer groups for large global banks and U.S. regional banks as follows and will define additional peer groups as the need arises.

- Global Peer Banks: Top-holder banks within well-developed banking markets that have been designated by the Basel Committee on Banking Supervision as G-SIBs or by national regulators as D-SIBs. G-SIBs and D-SIBs typically depend in part on capital market funding and maybe exposed to additional capital market risk through their trading and investment banking activities. Our global bank peer group includes approximately 90 banks.

- U.S. Regional Peer Banks: Top-holder U.S. banks with total assets over $1 billion and that are not subject to the Dodd-Frank Stress Tests. This includes approximately 350 banks.

Pillar Descriptions

I. Business Risk Score

To determine the Business Risk Score for banks, which is similar to the scoring system used for nonbanks, Morningstar incorporates seven criteria: size, Morningstar Economic Moat™, Uncertainty assessment, geographic and business line concentration, management, funding stability ratio, and country risk score. Points are awarded according to the following scale:

Size (0–5 points): 10% of Business Risk Score

Historically, larger banks have been less likely to fail than smaller banks, presumably because of benefits of size such as portfolio diversification and better access to capital markets. We assign points based on adjusted asset size as follows:

Adjusted Asset Size	Points
> $1.00 trillion	5
$100.00 billion < $1.000 trillion	4
$50.00 billion < $100.00 billion	3
$10.00 billion < $50.00 billion	2
$1.00 billion < $10.00 billion	1
< $1.00 billion	0

Morningstar Economic Moat™ (0–4 points): 20% of Business Risk Score

The economic moat, which encapsulates our view of a company's sustainable competitive advantage and its ability to earn excess returns on capital compared with other companies in the same industry, is an essential part of our analysis.

Moat	Points
Wide	4
Narrow	2
None	0

Morningstar may adjust points assigned for the economic moat as part of our analysis of the sensitivity of the credit risk to potential changes in the economic moat. When an economic moat assessment is unavailable from Morningstar Research Services LLC (a subsidiary of Morningstar, Inc.), Morningstar will determine a score for the moat component of Business Risk based on our assessment of the bank's sustainable competitive advantage.

Uncertainty (0–4 points): 10% of Business Risk Score

Morningstar uses the Uncertainty assessment published by Morningstar Research Services as a measure of the predictability of a bank's future revenue and income. The Uncertainty assessment is based on the magnitude of the difference in the estimated economic value of a bank in upside and downside scenarios. It is a measure of the uncertainty of forecasts around a company's earnings. We use the following scale for the Uncertainty assessment.

Uncertainty	Points
Low	4
Medium	3
High	2
Very High	1
Extreme	0

Morningstar may adjust the points assigned for the Uncertainty assessment published by Morningstar Research Services as part of our analysis of the sensitivity of the credit risk to potential changes in the Uncertainty assessment. When an Uncertainty assessment is unavailable from Morningstar Research Services, Morningstar will determine an Uncertainty assessment based on the range of likely economic values for the bank.

Geographic and Business Line Concentration (0–4 points): 10% of Business Risk Score

An important factor in the stability of a company's future revenue and profits is the diversification of both its product portfolio and its customer base. Other things equal, a company with a wide variety of products and end markets is less subject to economic or regulatory shocks than a more focused company. Banks are awarded 1 point for the presence of each of the following diversification factors.

- Noninterest income (for example, deposit fees) makes up a significant percentage of net revenue
- Loan book diversified across several loan categories
- Loan book diversified geographically
- Nonbanking income (for example, payment processing, asset management, and so on) makes up a significant percentage of net revenue

Management Grade (0–4 points): 15% of Business Risk Score

The management grade captures our view of a company's management team as a steward of bondholder capital, transparency, board independence, incentives and ownership, investor friendliness, and regulatory and legal compliance.

Management	Points
Excellent	4
Above Average	3
Average	2
Below Average	1
Poor	0

Funding Stability Ratio (0–4 points): 25% of Business Risk Score

We score each company on its access to what we view as the most stable forms of funding. Because capital markets are inherently unpredictable, a bank whose capital structure is weighted heavily to short-term debt is more vulnerable to capital market disruptions than is a bank with substantial funding from equity and long-term debt. We approximate the stability of a bank's funding with the following ratio: (equity + deposits + long-term debt) / (adjusted total assets – cash). We deduct cash so that companies are not penalized for holding cash. We may adjust for other types of stable funding, such as covered bonds, or insurance reserves.

The ratio is similar in concept to but less granular than the Basel III net stable funding ratio and therefore easier to calculate with available data. The intent is to measure a bank's dependence on short-term funding. The following scale is used as a guide, but the input to the model may vary if we believe information not captured by the ratio suggests a different result.

Ratio	Points
> 100.0%	4
90.0% < 100.0%	3
80.0% < 90.0%	2
70.0% < 80.0%	1
<70.0%	0

Country Risk (0–4 points): 10% of Business Risk Score

No matter how solid a bank's finances, if it operates in an unstable political or economic environment, it deserves a lower credit rating than a similar bank operating under more benign conditions. For banks domiciled outside the United States, or that have significant foreign operations, we incorporate an evaluation of country risk where appropriate. We assign each country a score of 1 to 4 (with 4 the highest), based on the cost of its sovereign debt as well as Morningstar's assessment of potential credit implications from political instability, its legal system, interest rates, inflation stability, the robustness of the financial markets/strength of its banking system, and its credit history where relevant.

Sovereign credit risk is a useful proxy for a country's general business conditions and financial market liquidity and is a useful indicator of credit quality even in the absence of an assumption of government support.

Combining the Seven Scores

We multiply the point totals by their respective weightings and scale them to a final Business Risk Score ranging from 0.0 to 1.0. The final Business Risk Score makes up 25% of the final recommended credit score.

II. Bank Solvency Score

The Bank Solvency Score is a quantitative assessment of a bank's solvency based on eight accounting ratios, representing key areas of financial health: capital adequacy (two ratios), asset quality (three ratios), earnings power (two ratios), and liquidity (one ratio). The score for each ratio is the bank's percentile ranking with respect to that ratio when compared with all banks in the peer group. Morningstar calculates the Bank Solvency Score as a weighted average of the relative percentile rankings of the bank on each of the individual ratios.

Capital Adequacy: 30% of Bank Solvency Score

Our Solvency methodology relies on two leverage ratios to measure capital adequacy:

1) Common equity Tier 1/risk-weighted assets (15%)
2) Tier 1 capital/adjusted total assets (15%)

Morningstar views these leverage metrics as the two best ways to measure the ratio of capital available to absorb losses to the total assets potentially subject to losses. Historically, there has been little controversy about calculating the numerator of a leverage ratio for banks. However, there is considerable divergence among banks, and among banks, regulators and market participants, over methods for calculating the appropriate denominator. In some jurisdictions, bank regulations emphasize risk-

weighted capital measures while in others, regulators place more emphasis on leverage measures based on accounting assets. Our methodology uses both risk-weighted and total asset denominators in order to capture the range of views on this credit metric.

- The Numerators: Common Equity Tier 1 and Tier 1 Equity

  Common equity Tier 1: Tangible common equity is the first layer of capital available to absorb losses. Tangible common equity is composed of common stockholders' equity less intangible assets such as goodwill (a historical accounting adjustment for acquisitions) and deferred tax assets (an estimate depending on future income). The global industry and regulatory standard for computing and reporting tangible common equity is "common equity Tier 1," and this is the measure of tangible common equity used throughout this methodology.

  Tier 1 Capital: While common equity Tier 1 typically provides the best cushion for losses, there are other types of equity capital such as preferred equity, deeply subordinated debt, and/or hybrid securities that can also absorb losses before a bank becomes insolvent. Under Basel III, some of these securities are called additional Tier 1, and include securities that regulators view as fully able to absorb losses on a going-concern basis. To qualify as additional Tier 1, securities must have fully discretionary coupons and be able to be written down or converted in to common equity Tier 1 capital (common equity) automatically should the company's common equity Tier 1 ratio fall to a prespecified level (at least 5.125% under European Union rules). Together, common equity Tier 1 and additional Tier 1 capital comprise the global industry and regulatory standard for Tier 1 capital, and we use the numbers reported by banks in our model and methodology.

- The Denominators: Risk-Weighted Assets and Adjusted Total Assets

  There is much more controversy about the appropriate measure of assets subject to loss than there is about common equity Tier 1 or Tier 1 capital. One common measure is risk-weighted assets, which is an attempt to measure credit risk, operational risk, and market risk in a standardized way across institutions. RWA measurements may be rule-based or model-based, depending on banks' data capabilities and applicable regulations. Credit risk is the primary driver of RWAs; banks calculate it by assigning "risk weights" to different types of assets. Risk weights can vary from zero for certain sovereign exposures to over 100% for the riskiest assets, such as unsecured past-due exposures. Models and regulations for calculating RWAs vary across banks and jurisdictions. Moreover, as historical loss experiences, which may not be indicative of future losses, drive RWA calculations, RWAs are an inherently imperfect measure of risk. As a result, measurements may vary across institutions.

  Because of the continuing controversy over RWA calculations, we measure capital using the ratio of Tier 1 capital/adjusted total assets. This metric is based on accounting total assets and makes no attempt to adjust for risk. For this calculation, as elsewhere in our methodology, we attempt to adjust banks' reported balances to account for divergence in accounting rules across jurisdictions. The most significant of these adjustments is to approximate the U.S. generally accepted accounting principles netting of derivatives for non-U.S. GAAP banks.

Earnings: 30% of Bank Solvency Score

Our methodology employs two ratios to measure earnings.

Earnings are the most volatile of the Bank Solvency Score metrics, as extraordinary items can heavily influence earnings measures. Our earnings metrics incorporate pretax net income as reported and do not adjust for extraordinary items, as we believe these adjustments would be inherently arbitrary. However, while our model-driven credit rating incorporates earnings from two six-month periods, we also consider earnings over longer periods of time. Our expectations for future earnings, as informed by historical earnings, rather than short-term volatility, drive our final credit ratings.

- Pretax Earnings/Average Adjusted Total Assets (15%)
  We measure banks' current earnings power with pretax earnings. Using pretax earnings helps reduce variation in earnings caused by tax-timing differences but considers current cyclical factors and business model differences in risk-taking. We average each bank's score over the last two six-month periods to reduce the impact of large one-time items and/or earnings management. We view these earnings as a key defense against losses. The higher a bank's earnings power, the more losses it is capable of absorbing without endangering its solvency. In this metric, we measure banks' profitability relative to their adjusted balance sheet assets, thereby eliminating any differences in profitability caused by divergence in RWA measurements.

- Pretax Earnings/Risk-Weighted Assets (15%)
  Banks can increase their profitability, at least temporarily, by taking on higher credit risks. In this measure of profitability, we measure banks' pretax profitability relative to risk-weighted assets. This helps to reduce any benefit banks may receive in our model by taking on additional risk.

Asset Quality: 30% of Bank Solvency Score

Our methodology includes three ratios to measure asset quality.

- Adjusted Tangible Assets/Problem Loans (10%)
  While disclosure varies across institutions and reporting regimes, problem loans typically include nonperforming loans, significantly past-due loans, restructured loans, and other criticized loans, which collectively represent the troubled portion of a bank's loan book. In gauging the scale of a bank's credit problems, we consider a bank's ratio of adjusted tangible assets relative to problem loans. In this case, the larger the multiple, the lower the institution's credit risk.

- Allowance for Loan Losses/Problem Loans (10%)
  A bank's allowance for loan losses represents its explicit reserves for absorbing expected loan losses. In general, the larger the allowance for loan losses relative to problem loans, the better.

- Common Equity Tier 1/Problem Loans (10%)
  This ratio measures a bank's ability to absorb unexpected losses not covered by reserves. In times of high stress, losses are challenging to forecast accurately, reducing the ability of a bank to establish adequate reserves. Common equity Tier 1 capital, a bank's highest-quality and most loss-absorbing capital, is a bank's strongest cushion against losses in excess of reserves. The more CET1 capital a bank holds relative to problem loans, the better.

Liquidity: 10% of Bank Solvency Score

Our methodology uses one ratio to measure liquidity.

- Deposits/Loans

  Deposits are typically the lowest-cost and most stable source of funding for a bank. The more deposits are used to fund loans, the less the bank will need to borrow from capital markets and the lower its interest expense will tend to be. The higher the proportion of deposits to loans, the better.

  However, the quality of banks' deposits and other stable funding can vary widely across institutions. Banks' reported deposits can include sources of funding, such as brokered deposits, that resemble wholesale funding. In certain jurisdictions, banks' funding typically includes the proceeds from issuing covered bonds. This low-cost form of funding can be stable and low-cost, like deposit funding. We may also consider the sensitivity of a bank's rating to adjustments to the measurement of deposits.

Calculating the Bank Solvency Score

A bank's relative ranking in each category calculated as a percentile and then weighted according to the category's assigned weight. The Bank Solvency Score is the sum of these outputs and can range from a minimum of 0.0 to a maximum of 1.0, with higher being better.

Exhibit 1 gives an example of a Bank Solvency Score calculation, with historical trends.

Exhibit 1 Bank Solvency Score

Six-month period ending:	Dec. 31, 2014	Jun. 30, 2015	Dec. 31, 2015	Jun. 30, 2016
Ratios				
CET1 Capital/Risk-Weighted Assets (%)	11.2	10.7	11.1	11.1
Tier 1 Capital/Adjusted Total Assets (%)	10.8	10.6	10.6	10.4
Adjusted Tangible Assets/Problem Loans (x)	176.0	173.0	180.0	132.0
Allowance/Problem Loans (%)	150.0	145.0	155.0	109.0
CET1 Capital/Problem Loans (x)	18.0	18.0	19.0	13.0
Deposits/Loans (%)	87.0	84.0	84.0	85.0
Pretax Income/Avg. Adjusted Assets (%)	0.75	0.75	0.75	0.70
Pretax Income/Risk-Weighted Assets (%)	0.80	0.80	0.80	0.75
Percentile Rankings				
CET1 Capital/Risk-Weighted Assets (%)	41	31	32	33
Tier 1 Capital/Adjusted Total Assets (%)	95	96	94	90
Adjusted Tangible Assets/Problem Loans (%)	76	72	76	65
Allowance/Problem Loans (%)	90	84	91	86
CET1 Capital/Problem Loans (%)	87	85	88	82
Deposits/Loans (%)	94	90	88	90
Pretax Income/Avg. Adjusted Assets (%)	74	72	78	69
Pretax Income/Risk-Weighted Assets (%)	46	25	29	20
Solvency Score	**0.73**	**0.67**	**0.69**	**0.64**

Source: Morningstar Credit Ratings, LLC

In this example, the bank's Solvency Score falls to 0.64 from 0.73 over an 18-month period between Dec. 31, 2014, and June 30, 2016. The primary cause of the drop is a fall in profitability in the period ended

June 2016 as compared with prior periods. Pretax income/average adjusted assets fell to 0.68% from 0.77%, which caused a fall in the percentile rankings to 69% from 74%. Pretax income over risk-weighted assets fell to 0.72% from 0.82%, which caused a fall in the percentile rankings to 20% from 46%.

The fall in the Solvency Score over this period is also caused by a drop in common equity Tier 1 capital/risk-weighted assets, which fell to 10.7% in the period ended June 2015 from 11.2% in the period ended December 2014. As a result, it also declined in the percentile rankings to 31% from 41%. The ratio gradually improved to 11.1% through the period ended June 2016. Interestingly, however, the bank's position in the percentile rankings did not improve significantly, as its peers were also increasing their capital ratios over this period.

III. Bank Stress Test Score

The Morningstar Bank Stress Test Score evaluates a bank's capacity to handle additional losses in its loan and securities portfolios during a period of macroeconomic stress. This ability depends on the company's initial capital position, its potential to boost its equity base with earnings over the stress test projection period (two years), and on the level of its losses over the same period. Morningstar deducts potential losses from initial capital and adds potential earnings. Morningstar bases its Stress Test Score on a bank's expected capital position at the end of this two-year period of hypothetical elevated losses. As an absolute measure of capital, the Stress Test Score stands in contrast to the relative ranking of capital position when computing the Bank Solvency Score.

Morningstar calculates the Stress Test Score on a rolling basis following the most recent reporting period. Thus, it continually measures a bank's ability to handle additional stress beyond any already recognized losses. We believe this reduces the need to forecast precise turning points in the credit cycle, given that the rolling test incorporates an assumption of two years of elevated losses.

Potential Stress Losses

Morningstar applies potential loss rates in various loan and security categories to a bank's most recent reported asset balances, and we subtract the resulting total losses in the severely adverse scenario from the bank's common equity tier 1 capital. Following the example of the Federal Reserve Board's Dodd-Frank Act Stress Test Methodology, which stresses banks over a nine-quarter period, we assume losses over a two-year period. Our potential loss rates, like those of the Federal Reserve Board, are the losses assumed over the entire stress period and should not be interpreted as annualized rates. To be comparable, the European Banking Authority stress test calculates losses discussed below similarly; losses are cumulative over a two-year stress period.

Exhibit 2 Stress-Test Loan-Loss Rates (%)

	Loss Category Rating				
	1	2	3	4	5
Loans					
Commercial Real Estate	5.0	8.0	9.0	11.0	20.0
Commercial and Industrial	3.0	4.0	5.0	7.0	10.0
Residential Mortgages	1.0	2.5	3.5	6.5	9.5
Retail Credit Cards and Other Retail Unsecured	5.0	8.0	12.5	15.0	20.0
Retail, Other	1.0	2.0	3.0	4.5	6.0
Loans Collateralized by Securities	0.0	0.0	0.1	0.5	1.0
Loans to Banks	0.0	0.0	0.1	0.5	1.0
Loans to Public Entities	0.0	0.0	0.1	0.5	1.0
Morningstar Estimates					
Net At-Risk Securities	2.5	5.0	10.0		
Pretax Preprovision Income Decline	5.0	15.0	25.0		

Source: Morningstar Credit Ratings, LLC

Stress test loss rates take into account loan types and historical loss rates across geographies and borrower types and are influenced by loss rates applied in regulatory stress tests. Within each broad loan category, we assign each loan portfolio a loss category between 1 and 5, which determines the loss rate applied by the stress test. We may assign appropriate loss rates to loan types that do not fit into these predefined categories. Loss rates contemplate potential losses under adverse circumstances that may or may not occur; they should not be interpreted as explicit projections.

Commercial Real Estate

Commercial real estate loans are generally stressed with cumulative loss rates ranging from 5.0% to 20.0%, with a median loss rate of 9.0%.

Commercial real estate loans are often among the riskiest elements of a bank's loan portfolio, as commercial real estate prices typically fluctuate significantly through the economic cycle. Moreover, commercial mortgages are often collateralized solely by the underlying property. Should the value of the property fall below the value of the loan, the lender may be unable to recoup the full value of the loan in the event of a default.

Commercial real estate losses vary significantly across geographies and cycles. For example, commercial real estate prices in the U.S. fell 40% between their peak at the end of 2007 and their lowest point in March 2010[1]. More extreme drops occurred in Ireland, where the capital value of commercial real estate fell approximately 70% from peak to trough during the financial crisis.[2] However, the cycle in the eurozone was more muted; prices fell only 7% between their peak in March 2008 and their trough in June 2010[3]. Bank losses on commercial real estate loans are much lower than pricing falls, as loan-to-value ratios are typically capped at 75%–80% for construction loans and lower for undeveloped land. When assigning stress loss rates, we consider factors such as portfolio diversity, recent pricing and

1 Bank for International Settlements, Commercial Property Price Statistics, Commercial Property Prices, All Prices, Quarterly Index, 2010=100.

2 European Systemic Risk Board, "Report on commercial real estate and financial stability in the EU", Dec. 2015.

3 Bank for International Settlements, Commercial Property Price Statistics, Commercial Property Prices, All Prices, Index, 2011=100.

volume changes in local commercial real estate markets, recent and historical market volatility, and the bank's historical underwriting strength.

In the U.S. 2016 Dodd-Frank Act Stress Test, cumulative domestic commercial real estate losses were 7.0% in the severely adverse scenario. The European Banking Authority's 2016 EU-Wide Stress Test did not specifically stress commercial real estate.

Commercial and Industrial

Commercial and industrial loans are generally stressed with cumulative loss rates ranging from 3.0% to 10.0%, with a median loss rate of 5.0%.

Commercial and industrial lending is a broad category, typically encompassing most non-real-estate lending to businesses. In certain jurisdictions, it may also include commercial real estate lending. The risks within these portfolios can vary significantly. Global banks tend to have broadly diversified loan portfolios, for example, while regional banks often have concentrated exposures to certain geographies, industries, or borrower types. Risk may also vary by business model and the depth of local bond markets. Some bank commercial lending is short term, such as funding working capital needs or financing investments in hard assets. In other cases, lending can be longer term in nature and include lower-risk lending. When assigning loss rates, we consider factors such as portfolio concentration and duration, industry and geographic exposures, and historical underwriting performance. We typically assign certain categories with histories of low losses, such as lease finance, low loss categories, and assign others, like leveraged loans or lending in concentrated risky sectors, higher categories. In the U.S., annualized commercial and industrial loan losses averaged 0.8% between 1985 and mid-2016 and peaked at 2.6% at the end of 2009, according to data from the Federal Reserve.

In the U.S. 2016 Dodd-Frank Act Stress Test, cumulative commercial and industrial loan losses were 6.3% in the severely adverse scenario. In the European Banking Authority's 2016 EU-Wide Stress Test, impairments on corporate lending were generally around 1.5%, while impairments on specialized lending and small and medium-sized entities lending tended to be higher and more variable.

Loans Collateralized by Securities

We generally stress loans collateralized by securities with cumulative loss rates ranging from 0% to 1.0%, with a median loss rate of 0.1%.

Loans collateralized by securities is a narrow, historically low-risk category. It can include lending to retail, private banking, corporate and/or institutional clients, and loans in this category are typically collateralized by cash or marketable securities. If the value of the collateral falls, typically the customer will be required to either post additional collateral or repay the loan.

Losses on loans collateralized by securities have historically been minimal, even during the 2008–10 period. However, we believe that losses may be possible in certain circumstances, such as a large, rapid decline in security prices. Neither the Dodd-Frank Act Stress Test nor the European Banking Authority's EU-Wide Stress Test specifically stresses this loan category.

Loans to Banks

Loans to banks are generally stressed with cumulative loss rates ranging from 0% to 1.0%, with a median loss rate of 0.1%.

Loans to banks are typically low-risk, short-duration (often overnight) loans to other financial institutions and are an important part of liquidity management for many banks.

Losses on loans to banks have historically been minimal, even during the 2008–10 period. However, we believe that losses may be possible in certain circumstances, such as extreme stress in the interbank funding market. Neither the Dodd-Frank Act Stress Test nor the European Banking Authority's EU-Wide Stress Test specifically stresses this loan category.

Loans to Public Entities

We generally stress loans to public entities with cumulative loss rates ranging from 0% to 1.0%, with a median loss rate of 0.1%.

Loans to public entities are typically low-risk as they are extended to public entities that may benefit from having taxing authority or guarantees from entities with taxing authority. Loans to public entities are more common in certain geographies. Local public projects in Europe, for example, are more likely to be funded with bank loans than local public projects in the U.S., which are often funded through the issuance of municipal bonds.

Losses on loans to public entities have historically been minimal, even during the 2008–10 period. However, we believe that losses may be possible in certain circumstances, such as an extreme downturn in a local economy. Neither the Dodd-Frank Act Stress Test nor the European Banking Authority's EU-Wide Stress Test specifically stresses this loan category.

Residential Mortgages

Residential mortgage lending is generally stressed with cumulative loss rates ranging from 1.0% to 9.5%, with a median loss rate of 3.5%.

Residential mortgages are typically fairly low risk, as they are collateralized by the home itself, but potential losses can vary greatly depending on bank lending standards, other liens against the home, borrower credit quality, local bankruptcy laws, and market-specific structural factors. For example, banks may specialize in lending to specific customer types, such as those with large down payments (which would typically lead to lower loss rates) or those with poor credit histories (which would typically lead to higher loss rates). In some countries, risks may be minimal. (For example, if regulators require large down payments and housing prices have not outpaced inflation.) In others, risks may be larger—for example, if there are signs that an overheated credit cycle has led to relaxed credit standards and falling housing prices.

Bank losses on residential mortgages have historically varied significantly. In the U.S., annualized charge-offs on single-family residential mortgages averaged 0.49% between 1991 and mid-2016, with a peak of 2.78% in late 2009, according to data from the Federal Reserve. We base our cumulative median 3.5% potential loss rate around a diversified portfolio of conforming U.S. mortgages.

In the U.S. 2016 Dodd-Frank Act Stress Test, first-lien domestic mortgage cumulative losses averaged 3.2% in the severely adverse scenario. Cumulative losses on junior liens and home equity lines of credit, or HELOCs, averaged 8.1%. In the European Banking Authority's 2016 EU-Wide Stress Test, cumulative impairments on retail lending secured by real estate property were generally around 0.5%, with losses tending to be 0.1%–0.2% at northern European banks, and losses closer to 2.0% at banks with troubled Irish or non-European exposures.

Retail Credit Cards and Other Retail Unsecured Debt

We generally stress retail credit cards and other retail unsecured with cumulative loss rates ranging from 5.0% to 20%, with a median loss rate of 12.5%.

Retail credit cards and other unsecured retail lending tend to experience relatively high and cyclical credit losses, although these losses are offset by the higher interest rates charged on these products. In the U.S., annualized credit card charge-offs averaged 4.5% between 1985 and mid-2016 and peaked at 10.8% in mid-2010 according to data from the Federal Reserve. Various factors can affect the credit quality of a portfolio. For example, store-branded credit cards tend to have higher loss rates than bank-branded cards, and countries with stricter insolvency (bankruptcy) regimes tend to experience lower retail credit losses than those with looser regimes.

In the U.S. 2016 Dodd-Frank Act Stress Test, cumulative credit card losses averaged 13.4% in the severely adverse scenario. In the European Banking Authority's 2016 EU-Wide Stress Test, cumulative impairments on qualifying revolving retail lending varied widely, averaging 3%–4%, and peaking near 25%.

Retail, Other

We generally stress other retail lending with cumulative loss rates ranging from 1.0% to 6.0%, with a median loss rate of 3.0%.

The other retail lending category is typically used for exposures like auto loans (loans that are secured by assets other than real estate) or student loans (which benefit from special bankruptcy protection). In the U.S., charge-off rates on other retail loans averaged an annualized 0.6% between 1985 and mid-2016 and peaked at 3.2% in mid-2009, according to data from the Federal Reserve.

In the U.S. 2016 Dodd-Frank Act Stress Test, cumulative other retail losses averaged 5.7% in the severely adverse scenario. In the European Banking Authority's 2016 EU-Wide Stress Test, cumulative impairments on qualifying revolving retail averaged 4.2%, peaking around 5.3%.

Securities

We apply securities loss rates the portfolios of securities on a bank's balance sheet. We typically exclude securities issued or backed by certain public entities, such as sovereign bonds, and securities issued or backed by government-sponsored enterprises like Fannie Mae and Freddie Mac in the U.S. from the balances subjected to losses. For banks outside of the U.S., we typically exclude derivative assets to account for the netting derivative liability balances; under U.S. GAAP, derivative balances are reported on a net basis. The standardized securities loss rates are based on the International Monetary Fund's estimates of bank losses during the financial crisis. As with loan-loss rates, Morningstar takes into

account the bank's underwriting practices and portfolio composition in assigning the appropriate securities loss rate.

Morningstar will assign appropriate loss rates for loan and/or security types that do not fit into the above categories. For example, Morningstar may assign loans covered by FDIC loss-sharing agreements loss rates below the standard loss rates.

Potential Stress Earnings

The Bank Stress Test Score adjusts Morningstar's base-case estimates of future pretax, preprovision earnings, and expenses for individual banks to reflect the reduced earnings to be expected during a recession. In reporting periods other than the final period of the fiscal year, we prorate annual forecasts over the appropriate time period. We reduce our prestress estimates of pretax, preprovision earnings (net interest income plus noninterest income minus operating expenses) by 5%, 15%, or 25% depending on how resilient the company's income is.

These three haircut rates are in line with how banks have fared in past crises. For example, an institution with a healthy mix of interest and fee income will usually see little or no decline in preprovision revenue during a crisis. In contrast, a bank that largely depends on its interest income may experience a much more pronounced decline in its top line as more loans enter nonaccrual status during a crisis. Similarly, a bank with a large markets-based business may see large declines in revenue because of lower client activity or lower revenue from asset-based fees.

Reserves for Loan Losses

We generally assume that banks are required to exit the stress period with loan-loss reserves equal to their initial reserves, but Morningstar may assume a bank will build or reduce allowances for loan loss if appropriate. In this case, we add or subtract changes in the allowance for loan losses as necessary to the haircut potential earnings.

Calculating the Stress Test Score

The Stress Test Score compares the estimated poststress capital ratios (CET1/RWA and CET1/ATA) with the ratios we expect of the best capitalized banks: 12% for CET1/RWA and 8% for CET1/ATA.

To calculate the Stress Test Score, Morningstar starts with prestress CET1 capital, adds estimated pretax preprovision earnings (or subtracts estimated losses), and subtracts the estimated stress loan and securities losses. The result is Morningstar's estimate for poststress CET1 capital. The following example illustrates the concept for a hypothetical bank with $100.00 billion in RWA and $10.00 billion in CET1 at the beginning of the stress test.

Exhibit 3 Stress Test Poststress Capital Calculation

	CET1 ($b)	RWA ($b)	CET1/RWA (%)
Prestress Capital	10	100	10
Less: Stress Losses	-3	0	
Plus: Income Over Stress Period	2	0	
Poststress Capital	9	100	9

Source: Morningstar Credit Ratings, LLC

This poststress CET1 is used to calculate a poststress CET1/RWA ratio and a poststress CET1/ATA ratio. Morningstar uses prestress RWAs and ATAs in the denominators in these ratios to avoid inconsistencies related to projecting changes to these figures during the stress period. Morningstar then divides each poststress ratio by its respective target to produce a ratio between 0 and 1 (0% and 100% of target). The two ratios are averaged to produce a raw pillar score between 0 and 1, where 1 is better. The following example illustrates the calculation for a bank with a post stress CET1/RWA of 8% and a CET1/ATA of 5%.

Exhibit 4 Stress Test Score Calculation

	Ratio (%)	Target (%)	Ratio/Target
Poststress CET1/Risk-Weighted Assets	9.0	12.0	0.75
Poststress CET1/Adjusted Total Assets	4.0	8.0	0.50
Stress Test Pillar Score			0.63

Source: Morningstar Credit Ratings, LLC

Occasionally, estimated poststress CET1 capital may fall below zero, in which case the stress test pillar score will be zero. In other cases, the poststress capital ratios may exceed our targets of 12% for CET1/RWA and 8% for CET1/ATA. In these cases, Morningstar will assign a pillar score of 1, but we will give no additional credit for scores above our targets, as we believe this incremental capital provides minimal incremental risk reduction.

IV. Bank Distance to Default Score

The Distance to Default Score incorporates equity market data into our analysis to measure the market equity "cushion" between the accounting value of the company and the market value of the company and the market's level of confidence around that assessment. Each quarter we examine the ratio of market price/book value of equity and the one-year equity volatility for each of the banks for a group of peer banks with publicly traded equity.

Step one is determining each company's percentile ranking within its peer group for price/book and for equity volatility.

Step two is multiplying each of these rankings to create an interaction term. The interaction term provides a way to incorporate the codependence between price/book and equity volatility and account for its impact on our predictor variable, DtD. The interaction term has the effect of damping the signaling effect of one input variable when the other input variable does not provide the same magnitude or

direction of signal. Additionally, the interaction term will increase the likelihood of the observed signal if both input variables are directionally consistent even if those signals are relatively weak.

Step three is computing the equal (one-third) weighted average of each of the three metrics and calculating the percentile ranking of each company with respect to that average score. We then subtract that percentile ranking from 1 to create a Distance to Default Pillar Score between 0.0 and 1.0 in which higher is better, in accordance with the other raw pillar scores.

If a company does not have publicly traded equity, Morningstar will compile a set of publicly traded similar companies and use their DtDs to create a proxy DtD for the company.

Combining the Components of the Model Score

To be consistent with Morningstar's credit rating scoring systems in other industries, where a lower score is better, each component's raw score (in which higher is better) is subtracted from 1.0 (to create a metric where lower is better).

We equally weight the resulting four components and add the results together to achieve a final combined score on a scale from 0.0 to 1.0, where lower is better. We then translate the numerical score into a model-recommended letter grade rating according to the following scale.

Exhibit 5 Credit Rating Scale

Minimum		Rating		Maximum
N/A	0.000	AAA	0.000	N/A
N/A	0.000	AA+	0.000	N/A
0.000	<=	AA	<	0.100
0.100	<=	AA-	<	0.200
0.200	<=	A+	<	0.250
0.250	<=	A	<	0.300
0.300	<=	A-	<	0.350
0.350	<=	BBB+	<	0.450
0.450	<=	BBB	<	0.550
0.550	<=	BBB-	<	0.650
0.650	<=	BB	<	0.750
0.750	<=	B	<	0.850
0.850	<=	CCC	<	0.950
0.950	<=	CC	<=	1.000

Source: Morningstar Credit Ratings, LLC

The highest model recommended rating for a bank is AA, indicating a "very strong ability to make timely interest and principal payments." In general, we expect financial institutions to score lower than nonfinancial companies, owing to their higher leverage and dependence on potentially unstable funding arrangements. Morningstar may assign a final rating higher than AA to account for factors that are not captured by the model.

The rating definitions and rating scale for banks are the same as Morningstar assigns to nonfinancial corporations and structured-finance transaction. Details can be found in Morningstar Credit Ratings Definitions and Other Related Opinions and Identifiers. To view the full document, visit our website www.morningstarcreditratings.com, then select the Ratings/Surveillance tab, and the Methodologies section.

Assigning Ratings to Bank Subsidiaries and to Individual BHC and Bank Securities

The Bank Credit Rating may be interpreted as the credit rating of the top-holder's plain-vanilla, senior unsecured debt. For the purposes of this section, we will refer to all top-holders of banks as BHCs, as BHCs are typically (but not always) the top holders of banking companies. Our Bank Credit Rating is directly comparable to the Consolidated Corporate Credit Rating of nonfinancial corporations rated by Morningstar. In cases where the only material asset of the BHC is equity in its banking subsidiary and the BHC has no material debt, then the obligor rating of the BHC and its principal banking subsidiary are likely to be the same and the same as the senior unsecured rating of the banking subsidiary's debt.

In cases where both the BHC and its banking subsidiary have material debt obligations and assets, it is necessary to distinguish between the BHC and the bank obligor ratings and therefore between the ratings of the debt issues of the BHC and its principal banking subsidiary.

The financial crisis of 2008 led banking regulators around the world to develop resolution plans to restructure economically significant banking institutions without disrupting the functioning of financial markets such as that which occurred in 2008 and 2009. These plans typically contemplate that the top-tier BHC or bank would be allowed to default, and that equity and debt that can be written down or converted into equity would be used to recapitalize the BHC's primary operating subsidiaries.[4] The funds available for such a recapitalization are called total loss absorbing capacity and include common equity Tier 1 capital, additional Tier 1 capital, and Tier 2 capital.

In this scenario, the subsidiaries would continue to function normally, while stockholders, TLAC creditors, and management at the parent company would bear the costs of restructuring. Furthermore, regulators will attempt to restructure distressed banks before the point of insolvency so that the parent company TLAC will be sufficient to recapitalize the subsidiaries. The priority regulators give to preserving confidence in the subsidiaries implies that there will be substantial differentiation of ratings at the parent and subsidiary level, and between debt securities with different priorities for repayment, write down, or conversion to equity.

Resolution plans and capital regulations are evolving, and these guidelines may need to be revised to reflect ongoing developments. We note evolving requirements for intermediate holding companies in the U.S. and Europe[5]. Our methodology implicitly assumes a single-point-of-entry resolution, as it is the stated preference of U.S. regulators, and we believe it is preferred by regulators in many developed banking markets. However, recent developments regarding requirements for intermediate holding

4 In the U.S., the Dodd-Frank Wall Street Reform and Consumer Protection Act requires bank holding companies with total assets of $50 billion or more and certain nonbank financial companies to submit resolution plans annually to the Federal Reserve and the FDIC. These plans are commonly known as living wills. In Europe, the Bank Recovery and Resolution Directive created a framework for dealing with bank failures both at a national and cross-border level. The directive specifies that certain levels of capital will be "bailed-in" (will absorb losses) contractually.

5 In the U.S., the Federal Reserve requires non-U.S. banks with consolidated assets of $50 billion or more to house these assets within a U.S. regulated, separately capitalized intermediate holding company. In Europe, in November 2016 the European Commission proposed that non-EU globally systemically important banks be required to hold their EU assets within an intermediate holding company.

companies seem to imply that regulators may consider resolution below the top holding company level in certain circumstances. We believe that single-point-of-entry resolution and international cooperation are the most likely paths to the resolution of large, complex banking organizations, but we may revisit this issue as regulations evolve.

Morningstar's guidelines for notching of ratings to reflect these differences in potential default and recovery risks are shown in the tables below. These guidelines are an application of Methodology for Rating Parents, Subsidiaries, and Issues published on Morningstar's public website. To view the full document, visit www.morningstarcreditratings.com, then select the Ratings/Surveillance tab and the Methodologies section. Hybrid securities, such as contingent convertible notes and preferred stock, may be notched lower than BHC subordinated, depending on their terms. As noted above, where the only asset of a BHC is equity in its banking subsidiary, and the BHC has no material debt, then the obligor ratings of the BHC and its principal banking subsidiary will be the same. This will often be the case with smaller, regional BHCs.

Exhibit 6 Obligor and Issue Ranking

Obligor	Issue	Notching from BHC	Priority of Payment	Example
Bank Holding Company	BHC Senior Unsecured	0	3	A
	BHC Subordinated	–1	4	A–
Subsidiary Bank	Bank Senior Unsecured	+2	1	AA–
	Bank Subordinate	+1	2	A+

Source: Morningstar Credit Ratings, LLC

Appendix: Selected Definitions

Adjusted Tangible Assets: Adjusted total assets minus goodwill and other intangible assets. Morningstar does not subtract quasi-intangible assets, such as mortgage-servicing rights and deferred tax assets.

Adjusted Total Assets: Total assets from the consolidated balance sheet. For banks that do not report under U.S. GAAP, Morningstar adjusts reported derivatives (typically, derivative assets are subtracted) to approximate the netting of derivatives under U.S. GAAP.

Adjusted Total Liabilities: Total liabilities from the consolidated balance sheet. For banks that do not report under U.S. GAAP, Morningstar adjusted reported derivatives (typically, derivative assets are subtracted) to approximate the netting of derivatives under U.S. GAAP.

Common Equity Tier 1 Capital: A bank's capital identified as the most loss-absorbing by the Basel Committee on Banking Supervision of the Bank for International Settlements. Local regulatory authorities then adopt and implement this regulatory framework, commonly known as Basel III; variations in implementation (typically minor) may occur. Common equity Tier 1 capital, which the bank calculates and reports, includes common stock and other paid-in capital, retained earnings, and certain accumulated other comprehensive income. Morningstar typically excludes goodwill, deferred tax assets dependent on future earnings, and other intangible assets. Regulators phase-in Common equity Tier 1 calculations, particularly exclusions, over time. We use common equity Tier 1 capital under in-force regulations in our credit analysis and also consider the implications of common equity Tier 1 capital under fully phased-in regulations.

Morningstar® Economic Moat™ Assessment: The economic moat assessment as assigned by Morningstar Research Services. Economic Moat assessments reflect Morningstar's view of the company's structural competitive advantages, if any, that will allow it to earn excess profits over a long period of time. A narrow moat assessment reflects Morningstar's opinion that that company is "more likely than not to achieve normalized excess returns for at least the next 10 years." A wide moat assessment reflects Morningstar's opinion that excess returns are highly likely over the next 10 years and "excess returns more likely than not to remain for at least 20 years."

Funding Stability Ratio: This ratio provides a rough measurement of a bank's dependence on capital markets. It is typically calculated as (Equity + Deposits + Long Term Debt) / (Adjusted Total Assets – Cash). We may adjust for other types of stable funding and/or other types of extremely stable assets.

Problem Loans: Troubled loans as stated by the company. Problem loans typically include nonperforming loans, loans past due 90 or more days, restructured loans, and other troubled loans. Where possible, Morningstar calculates problem loans on a gross basis.

Risk-Weighted Assets: Banks calculate their regulatory assets by adjusting each of their asset classes for risk (with higher-risk assets being given higher weights and lower-risk assets lower ones) to attempt to calculate their exposure to potential losses. Like capital figures, RWA calculations are covered by the Basel regulatory framework as adopted and implemented by local regulators. At the discretion of a bank and/or local regulators, RWA calculations may be rule-based, model-driven, or a combination of the two methods. Academic studies have found significant variation across how individual banks would model risk-weights for the same set of assets. Regulators phase-in RWA calculations over time. We use RWAs as reported by banks under in-force regulations in our credit analysis and also consider the implications of RWAs under fully phased-in regulations.

Tier 1 Capital (Tier 1): Like common equity Tier 1 capital, Tier 1 is defined in the Basel III regulatory framework, which is then adopted and implemented by local regulators. Similarly, variations in implementation may occur. Tier 1 capital, which the company calculates and reports, typically includes common equity Tier 1 capital plus other types of highly loss-absorbing, perpetual capital-like contingent convertible or hybrid securities that can be written down or converted into equity under certain predefined circumstances. In the U.S., Tier 1 capital includes noncumulative perpetual preferred stock. Regulators phase-in Tier 1 calculations, particularly exclusions, over time. We use Tier 1 capital under in-force regulations in our credit analysis and also consider the implications of Tier 1 capital under fully phased-in regulations.

Uncertainty Assessment: The Uncertainty assessment as assigned by Morningstar Research Services. This assessment (low, medium, high, very high, or extreme) is assigned according to the range of likely potential values for the company's equity.

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