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ANNUAL STATEMENT STUDIES

Industry Default Probabilities and Cash Flow Measures

2009
2010

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About RMA

Founded in 1914, The Risk Management Association is a not-for-profit, member-driven professional association whose sole purpose is to advance the use of sound risk principles in the financial services industry. RMA promotes an enterprise approach to risk management that focuses on credit risk, market risk, and operational risk.

Headquartered in Philadelphia, Pennsylvania, RMA has 3,000 institutional members that include banks of all sizes as well as nonbank financial institutions. They are represented in the Association by 20,000 risk management professionals who are chapter members in financial centers throughout North America, Europe, and Asia/Pacific. Visit RMA on the Web at www.rmahq.org.

About Moody's KMV

Moody's KMV is the world's leading provider of quantitative credit analysis tools to lenders, investors, and corporations. Moody's KMV helps clients enhance the economic returns in their businesses. Moody's KMV creates products and services based upon a sophisticated application of modern financial theory and statistical analysis. These tools transform vast amounts of financial data and knowledge into applied insight to manage credit.

Moody's MKV products are used by more than 2,000 leading commercial and investment banks, insurance companies, money management firms, and corporations in over 80 countries. Its products and services are used by most of the 100 largest financial institutions in the world. Moody's KMV has offices around the world to serve its global customer base.

Additional information about Moody's KMV and its RiskCalc® line of products is available through its Web site, www.moodyskmv.com.

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* General Industries Format means that a valid construction NAICS was assigned to the subject companies contained in the sample; however, the financial statements were prepared using a general or traditional manufacturing or service industries presentation of results versus using a percentage-of-completion method of accounting.

** The *RiskCalc*® EDF is not presented for the finance, insurance, and real estate industries.

Introduction to *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures, 2009-2010* and General Organization of Content

The notes below will explain the presentation of *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures,* show clearly how the book is organized, and answer most of your questions.

- **The Quality You Expect from the Risk Management Association (RMA):** RMA is the most respected source of objective, unbiased information on issues of importance to credit risk professionals. For over 88 years, RMA's *Annual Statement Studies*® has been the industry standard for comparison financial data. Material contained in today's *Annual Statement Studies* was first published in the March 1919 issue of the *Federal Reserve Bulletin*. In the days before computers, the *Annual Statement Studies* data was recorded in pencil on yellow ledger paper! Today, it features data for over 680 industries derived directly from more than 173,000 statements of financial institutions' borrowers and prospects.

- **Data That Comes Straight from the Original Source:** The more than 173,000 statements used to produce the composites presented here come directly from RMA member institutions and represent the financials from their commercial customers and prospects. RMA does not know the names of the individual entities. In fact, to ensure confidentiality, company names are removed before the data is even delivered to RMA. The raw data making up each composite is not available to any third party.

- **Organized by the NAICS for Ease of Use:** This edition is organized according to the North American Industry Classification System (NAICS), a product of the U.S. Office of Management and Budget. At the top of each page of data, you will find the NAICS.

- **Twenty Sections Outline Major Types of Businesses:** To provide further delineation, the book is divided into 20 sections outlining major lines of businesses. If you know the NAICS number you are loking for, use the NAICS-page guide provided in the front of this book. In general, the book is arranged in ascending NAICS numerical order. For your convenience, full descriptions of each NAICS are presented in this book. In addition, you will find a text-based index near the end of the book.

- **If You Do Not Know the NAICS Code You are Looking for...** Contact the Census Bureau at 1-888-75NAICS or naics@census.gov. Describe the activity of the establishment for which you need an industry code and you will receive a reply. Another source to help you assign the correct NAICS industry name and number can be found at www.census.gov/epcd/www/naics.html.

- **Cannot Find the Industry You Want?** There are a number of reasons you may not find the industry you are looking for (i.e., you know you need industry xxxxxx but it is not in the product). Many times we have information on an industry, but it is not published because the sample size was too small or there were significant questions concerning the data. (For an industry to be displayed in the *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures,* there must be at least 30 valid statements submitted to RMA.) In other instances, we simply do not have the data. Generally, most of what we receive is published.

- **Composite Data Not Shown?** When there are fewer than 10 financial statements in a particular asset or sales size category, the composite data is not shown because a sample this small is not considered representative and could be misleading. However, all the data for that industry is shown in the All Sizes column. The total number of statements for each size category is shown in bold print at the top of each column. In addition, the number of statements used in a ratio array will differ from the number of statements in a sample because certain elements of data may not be present in all financial statements. In these cases, the number of statements used is shown in parentheses to the left of the array.

- **Presentation of the Data on Each Page-Spread:** For all non-contracting spread statements, the data for a particular industry appears on both the left and right pages. The heading Current Data Sorted by Assets is in the five columns on the left side. The center section of the double-page presentation contains the

Comparative Historical Data, with the All Sizes column for the current year shown under the heading 4/1/xx-3/31/xx. Comparable data from past editions of the *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures* also appears in this section. Current Data Sorted by Sales is displayed in the five columns to the far right.

- **Companies with Less than $250 Million in Total Assets:** In our presentation, we used companies having less than $250 million in total assets. There is no upper limit placed on revenue size for any industry. Its information is found on only one page.

- **RiskCalc® EDF:** The *RiskCalc®* EDF is not presented for the finance, insurance, and real estate industries.

- **Page Headers:** The information shown at the top of each page includes the following: 1) the identity of the industry group; 2) its North American Industry Classification System (NAICS) number; 3) a breakdown by size categories of the types of financial statements reported; 4) the number of statements in each category; 5) the dates of the statements used; and 6) the size categories. For instance, 16 (4/1-9/30/08) means that 16 statements with fiscal dates between April 1 and September 30, 2008 make up part of the sample.

- **Recommended for Use as General Guidelines:** RMA recommends you use *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures* data only as general guidelines and not as absolute industry norms. There are several reasons why the data may not be fully representative of a given industry:

  1. **Data Not Random**—The financial statements used in the *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures* are not selected by any random or statistically reliable method. RMA member banks voluntarily submit the raw data they have available each year with no limitation on company size.

  2. **Categorized by Primary Product Only**—Many companies have varied product lines; however, the *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures* categorizes them by their primary product NAICS number only.

  3. **Small Samples**—Some of the industry samples are small in relation to the total number of firms for a given industry. A relatively small sample can increase the chances that some composites do not fully represent an industry.

  4. **Extreme Statements**—An extreme or outlier statement can occasionally be present in a sample, causing a disproportionate influence on the industry composite. This is particularly true in a relatively small sample.

  5. **Operational Differences**—Companies within the same industry may differ in their method of operations, which in turn can directly influence their financial statements. Since they are included in the sample, these statements can significantly affect the composite calculations.

  6. **Additional Considerations**—There are other considerations that can result in variations among different companies engaged in the same general line of business. These include differences in labor markets, geographical location, accounting methods, quality of products handled, sources and methods of financing, and terms of sale.

For these reasons, RMA does not recommend using the *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures* figures as absolute norms for a given industry. Rather, you should use the figures only as general guidelines and as a supplement to the other methods of financial analysis. RMA makes no claim regarding how representative the figures printed in this book are.

DEFINITION OF RATIOS
INTRODUCTION

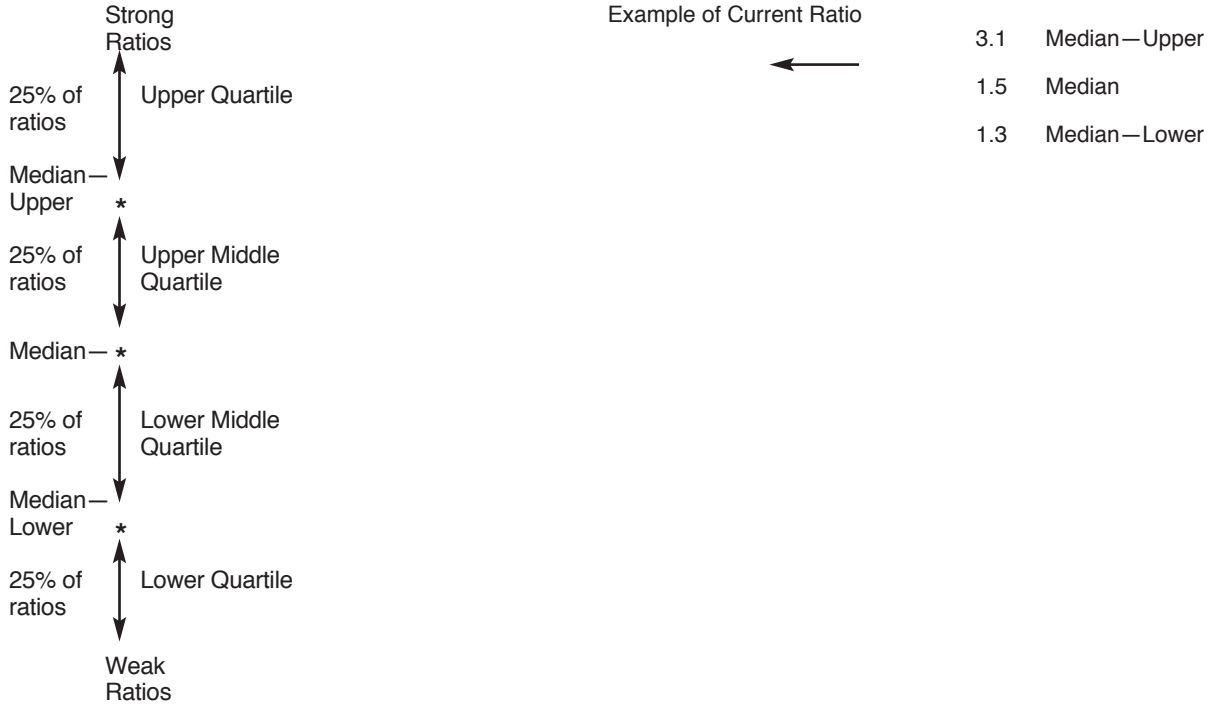
On each data page, below the common-size balance sheet and income statement, you will find a series of ratios computed from the financial statement data. Each ratio has three values: the upper quartile, median, and lower quartile.

Here is how these figures are calculated for any given ratio:

1. The value of the ratio is computed for each financial statement in the sample.
2. These values are arrayed (listed) in an order from the strongest to the weakest. Please note: In the case of the *RiskCalc*® expected default frequency (one- and five-year) and the funded debt/EBITDA ratio, the "strongest" is the lowest value and the "weakest" is the highest value.
3. The array of values is divided into four groups of equal size.

What Are Quartiles?

Each ratio has three points or "cutoff values" that divide an array of values into four equal-sized groups called quartiles, as shown below. The quartiles include the upper quartile, upper-middle quartile, lower-middle quartile, and the lower quartile. The upper quartile is the cut-off value where one-quarter of the array of ratios falls between it and the strongest ratio. The median is the midpoint; that is, it is the middle cutoff value where half of the array falls above it and half below it. The lower quartile is the point where one-quarter of the array falls between it and the weakest ratio. In many cases, the average of two values is used to arrive at the quartile value. You will find the median and quartile values on all *Annual Statement Studies* data pages in the order indicated in the chart provided below.



Why Use Medians/Quartiles Instead of the Average?

There are several reasons why medians and quartiles are used instead of an average. Medians and quartiles eliminate the influence an "outlier" (an extremely high or low value when compared to the rest of the values). They also more accurately reflect the ranges of ratio values than a straight averaging method would.

It is important to understand that the spread (range) between the upper and lower quartiles represents the middle 50% of all the companies in a sample. Therefore, ratio values greater than the upper quartile or less than the lower quartile may begin to approach "unusual" values.

Linear versus Nonlinear Ratios:

An array that is ordered in ascending sequence or in descending sequence is linear. An array that deviates from true ascending or true descending when its values change from positive to negative (low to high positive, followed by high to low negative) is nonlinear.

For example, the Funded Debt/EBITDA ratio is nonlinear. In other words, when the Funded Debt/EBITDA ratio is positive, then the top quartile would be represented by the *lowest positive* ratio. However, if the ratio is negative, the top quartile will be represented by the *highest negative* ratio! In a nonlinear array such as this, the median could be either positive or negative because it is whatever the middle value is in the particular array of numbers.

Nonlinear Ratios
Funded Debt/EBITDA

Linear Ratios
RiskCalc EDF (1 yr)
RiskCalc EDF (5 yr) with Moody's EDF rating
Cash from Trading
Cash after Operations
Net Cash after Operations
Cash after Debt Amortization
Debt Service P&I Coverage
Interest Coverage (Operating Cash)
Change in Inventory
Total Current Assets (TCA)
Total Assets (TA)
Retained Earnings (RE)
Net Sales (NS)
Cost of Goods Sold (CGS)
Profit before Interest & Taxes (PBIT)
Depreciation/Depletion/Amortization (DDA)
Sustainable Growth Rate

Important Notes
Whenever there were fewer than 10 statements in a sample, the ratio values have been omitted throughout. Occasionally, the number of statements used in a ratio array will differ from the number of statements in a sample because certain elements of data may not be present in all financial statements. In these cases, the number of statements used is shown in parentheses to the left of the array.

Inventory presentations are based on point-in-time balances at the end of the fiscal year, not averages. In addition, the data that we capture does not permit us to know what method of inventory accounting (LIFO or FIFO, for instance) was used.

The following ratios are contained in the *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures:*

Within the data pages, Δ stands for percent change from year to year.

***RiskCalc*® Expected Default Frequency Measure:**
The *RiskCalc*® algorithm is used to create the industry-level probabilities of default. This algorithm employs 10 financial ratios, including firm size. The output is then mapped into an *Expected Default Frequency* (EDF) at one- and five-year horizons.

Cash Flow and Debt Service Ratios:

All of the following cash flow composite figures are expressed as a percentage of net sales. This is the standard presentation we use for balance sheet and income statement figures. So, in the text of this document you will see a series of figures (quartiles), each of which represents a percentage of net sales for that respective cash flow line item. For example:

	20	⇦	The upper quartile is 20% of
Cash after Operations/Sales	15		net sales.
	10		

At the bottom of each page, the sum of sales and total assets for all the financial statements in each size category are shown.

1. Cash from Trading

How to Calculate: Subtract cash production costs from cash from sales.

(Cash from sales (Net sales + Change in current receivables)
– Cash production costs (CGS + Change in inventories + Change in accounts payable))/Sales

How to Interpret: This is the money left over after a company produces its goods for sale. In other words, it is the portion of the present year's sales collected in the present year, *plus* any amounts from previous years' sales collected during the year, *minus* the cash expended during the present year to produce goods for sale (manufacturer) or to acquire merchandise (wholesaler or retailer).

2. Cash after Operations

How to Calculate: Subtract cash operating costs from cash from trading.

(Cash from trading – Cash operating costs (selling, general, & administrative expenses + other operation expenses + changes in prepaids + change in accrued expenses + change in other current assets/liabilities))/Sales

How to Interpret: This ratio shows how efficiently the industry operates**.** In other words, it is the cash derived from trading *minus* the actual cash spent during the present year for selling, general, and administrative expenses.

3. Net Cash after Operations

How to Calculate: Add changes in income taxes to changes in miscellaneous assets and liabilities. Then, subtract from cash after operations.

(Cash after operations – Taxes paid & other Inc/Exp (Other income (exp) + change in other liabilities + income tax expense + change in deferred income taxes + change in income taxes payable))/Sales

How to Interpret: This ratio reflects the amount of cash available for servicing interest on bank debt. In other words, it adjusts the cash after operations to reflect net cash outflows or inflows arising from changes in income taxes and miscellaneous assets and liabilities.

4. Cash after Debt Amortization

How to Calculate: Subtract the current maturities of debt outstanding at the end of the previous year from net cash income.

(Cash after financing costs – Current portion of long-term debt (dividends or owners' withdrawals + change in dividends payable + interest exp. + change in interest payable))/Sales

How to Interpret: If there is a positive figure after this deduction, it means a company has generated sufficient cash from its internal operations to meet all its obligations to bank lenders, including interest and principal payments on its bank debt. On the other hand, if the figure is negative, the company must resort to external sources of financing to meet these obligations as well as to make any capital expenditure payments.

5. Debt Service P&I Coverage

How to Calculate: Divide net cash after operations by the sum of current debt obligations.

Net cash after operations (current period) / (Interest + noncash interest + current portion LTD & current portion of capital leases)

How to Interpret: This ratio is a measure of a firm's ability to service its debt with internally generated cash flow. It helps you determine whether a business can meet all its operating needs and has sufficient funds remaining to meet principal and interest debt-service requirements and to cover dividends. If the ratio is less than 1:1, this indicates a company must borrow funds to meet some or all of its financing obligations.

6. Interest Coverage (Operating Cash)

How to Calculate: Divide net cash after operations by cash and noncash interest expenses.

Net cash after operations (current period) / (Interest expense + noncash interest expense)

How to Interpret: This ratio is a measure of a firm's ability to service debt by generating cash to meet interest payments. It is an alternative to the earnings coverage return. This ratio also serves as an indicator of a company's capacity to incur additional debt.

Yearly Change in Selected Balance Sheet and Income Statement Accounts:

(Note: Within the data pages, Δ stands for percent change from year-to-year.)

1. Δ Inventory

How to Calculate: Subtract prior period's inventory from the current period's inventory. Then, divide by the inventory for the prior period.

(Inventory current period – inventory prior period) / Inventory prior period

How to Interpret: Inventory is anything constituting inventory for the firm. Inventory presentations are based on point-in-time balances at the end of the fiscal year, not averages. In addition, the data that we capture does not permit us to know what method of inventory accounting (LIFO or FIFO, for instance) was used. The figures presented are the yearly percent change in the inventory level of the industry.

2. Δ Total Current Assets (TCA)

How to Calculate: Subtract the prior period's total current assets from the current period's total current assets. Then, divide by those for the prior period.

(TCA current period – TCA prior period) / TCA prior period

How to Interpret: TCA includes cash and equivalents, trade receivables (net), inventory, and all other current assets excluding prepaid items. The figures presented are the yearly percent change in total current asset level of the industry.

3. Δ Total Assets (TA)

How to Calculate: Subtract the prior period's total assets from the current period's total assets. Then, divide by those for the prior period.

(TA current period – TA prior period) / TA prior period

How to Interpret: Total assets includes *total current assets* as well as fixed assets (net), intangibles (net), and all other noncurrent assets. The figures presented are the yearly percent change in the total asset level of the industry.

4. Δ Retained Earnings (RE)

How to Calculate: Subtract the prior period's retained earnings from the current period's retained earnings. Then, divide by those for the prior period.

(RE current period – RE prior period) / RE prior period

How to Interpret: Retained earnings are profits that have not been distributed to shareholders. The figures presented are the yearly percent change in the retained earnings of the industry.

5. Δ Net Sales (NS)

How to Calculate: Subtract the prior period's net sales from the current period's net sales. Then, divide by those for the prior period.

(NS current period – NS prior period) / NS prior period

How to Interpret: Net sales equals gross sales minus returns and discounts allowed, if there are any. The figures presented are the yearly percent change in the net sales of the industry. Although a firm's advertising and pricing policies affect the variability of sales, the major cause is the industry in which the firm operates. Sales in a cyclical industry will be volatile over the business cycle compared to sales of a firm in a noncyclical industry.

6. Δ Cost of Goods Sold (CGS)

How to Calculate: Subtract the cost of goods sold for the prior period from those for the current period. Then, divide by cost of goods sold for the prior period.

(CGS current period – CGS prior period) / CGS prior period

How to Interpret: CGS is the actual amount it takes to produce the good or service. The figures presented are the yearly percent change in the industry's cost of goods sold.

7. Δ Profit Before Interest & Taxes (PBIT)

How to Calculate: Subtract the prior period's profit before interest and taxes from the current period's. Then, divide by the profit before interest and taxes for the prior period.

(PBIT current period – PBIT prior period) / PBIT prior period

How to Interpret: The figures presented are the yearly percent change in the profit before interest and taxes of the industry.

8. Δ Depreciation/Depletion/Amortization (DDA)

How to Calculate: Subtract the prior period's depreciation/depletion/amortization from the current period's. Then, divide by the depreciation/depletion/amortization for the prior period.

(DDA current period – DDA prior period) / DDA prior period

How to Interpret: DDA is the sum of all such noncash expenses incurred during the year covered by the statement. The figures presented are the yearly percent change in the DDA of the industry.

Other Ratios:

The following ratios should be interpreted in conjunction with all other analytical ratios to supplement and highlight different aspects of the company's financial condition. They should not be used alone as the sole indicator of the industries' status.

1. Sustainable Growth Rate

How to Calculate: Follow the formula below to compute the SGR.

SGR = p(1-d) (1+L) / t - [p(1-d) (1-L)], where

p = Net Income/Total Sales
d = (Cash Dividends + Stock Dividends) / Net Income
L = Total Liabilities / (Net Worth – Intangibles)
t = Total Assets / Total Sales

How to Interpret: The Sustainable Growth Rate (SGR) is a single number representing the annual percentage increase in sales that is consistent with a stable debt and capital structure (i.e., where total debt/net worth ratios do not change significantly or materially, from year to year). If a company's sales expand at a rate greater than the SGR, the company's debt/worth ratio will rise and result in an "out-of-equilibrium situation." When this happens, the firm approaches an over-leveraged position that raises the possibility of liquidity and debt repayment problems.

2. Funded Debt/EBITDA

How to Calculate: Follow the formula below to compute this measure of a firm's ability to service its debt.

((Notes Payable + Current Maturities LTD + LTD) / (Profit Before Taxes + Interest Expense + Depreciation, Depletion, Amortization Expense))

How to Interpret: This ratio is a general measure of a firm's ability to retire its funded debt with earnings. As the calculated ratio grows larger, it may indicate that a borrower would have more difficulty in meeting the debt obligations. The use of EBITDA ratios without consideration of other factors can be misleading.

Please note — The Funded Debt/EBITDA ratio is a nonlinear array—in other words, an array that is NOT ordered from highest positive to highest negative as is the case for linear arrays. The values for the Funded Debt/EBITDA ratio are arrayed from the lowest to highest positive, undefined, and then from the lowest to highest negative.

If the Funded Debt/EBITDA ratio is positive, then the top quartile would be represented by the *lowest positive* ratio. If the ratio is negative, the top quartile will be represented by the *lowest negative* ratio! In a nonlinear array such as this ratio, the median could be either positive or negative because it is whatever the middle value is in the particular array of numbers.

Non-Conventional Values:

For some ratio values, you will occasionally see an entry that is other than a conventional number. These entries are defined as follows:

(1) UND—This stands for "undefined," the results of the denominator in a ratio calculation approaching zero.

(2) NM—It stands for "no meaning" in cases where the dispersion is so small that any interpretation is meaningless.

Introduction to Moody's KMV *RiskCalc*® and Industry Probabilities of Default

How the Expected Default Frequency (EDF) Measures Were Generated:

The probabilities of default produced in RMA's *Annual Statement Studies: Industry Default Probabilities and Cash Flow Measures* were generated using Moody's KMV's *RiskCalc*® default models for U.S. and Canadian private firms. We obtained the Expected Default Frequency (EDF) credit measures by submitting in batch form to the *RiskCalc*® model, the financial statements received from our member institutions. The model produced one- and five-year EDF credit measures, which we then aggregated by assets and sales size using the same methods and aggregation categories we use to produce the financial statistics in our *Annual Statement Studies: Financial Ratio Benchmarks* publication.

Quartiles and the EDF:

This publication lists the upper quartile, second quartile (or median), and lower quartile one- and five-year EDF measures, or probabilities of default, by each industry and sales size for which sufficient information was available. For any given industry's probability of default, these figures are calculated by first computing the probability of default for each financial statement in the sample. These values are then "listed" in an order from the lowest to the highest.

A quartile is determined by three points or "cutoff values" that divide an array of values into four equal-sized groups as shown below. The quartiles include the upper quartile, the median, and the lower quartile. The upper quartile is the cutoff value where one-quarter of the array of ratios falls between it and the strongest EDF. The median is the mid-point, that is, the middle cutoff value where half of the array falls above it and half below it. The lower quartile is the point where three-quarters of the array falls between it and the strongest EDF. In many cases, the average of two values is used to arrive at the quartile value.

How to Use This Data:

This data may provide some insight into the relative default risk and credit quality for various industries and the firms that operate in that industry. Note that these statistics are based on estimates from the model and the data provided by our member institutions. No warranty, expressed or implied, is given regarding these statistics or the information provided as input to the model. Please read the Disclaimer of Warranty, Copyright, Ordering, Licensing, and Use of Data Information that accompanies this publication.

Expected Default Frequency:

RiskCalc® calculates an Expected Default Frequency (EDF), which is the probability of default for each obligor. The following table maps the *RiskCalc*® EDF credit measures to implied ratings, or historical bond default rates:

Moody's KMV.edf Ratings	*RiskCalc*® EDF ranges					
	RiskCalc version 1 5-year EDF		RiskCalc version 3.1 1-year EDF		Risk Calc version 3.1 5-year EDF	
	Low	High	Low	High	Low	High
Aaa.edf	0.00%	0.27%	0.00%	0.019%	0.00%	0.28%
Aa1.edf	0.28%	0.39%	0.020%	0.031%	0.29%	0.38%
Aa2.edf	0.40%	0.49%	0.032%	0.051%	0.39%	0.52%
Aa3.edf	0.50%	0.57%	0.052%	0.086%	0.53%	0.70%
A1.edf	0.58%	0.60%	0.087%	0.143%	0.71%	0.86%
A2.edf	0.61%	0.68%	0.144%	0.179%	0.87%	1.00%
A3.edf	0.69%	1.04%	0.180%	0.223%	1.01%	1.35%
Baa1.edf	1.05%	1.38%	0.224%	0.279%	1.36%	2.00%
Baa2.edf	1.39%	2.08%	0.280%	0.429%	2.01%	2.97%
Baa3.edf	2.09%	4.34%	0.43%	0.66%	2.98%	4.37%
Ba1.edf	4.35%	6.55%	0.67%	1.10%	4.38%	5.90%
Ba2.edf	6.56%	10.20%	1.11%	1.65%	5.91%	7.66%
Ba3.edf	10.21%	14.77%	1.66%	2.48%	7.67%	9.96%
B1.edf	14.78%	17.49%	2.49%	3.71%	9.97%	12.95%
B2.edf	17.50%	21.51%	3.72%	5.57%	12.96%	16.84%
B3.edf	21.52%	26.00%	5.58%	8.35%	16.85%	21.89%
Caa1/C.edf	>26.00%		>8.35%		>21.89%	

*Note: Version 1 *RiskCalc*® models only mapped the five-year EDF credit measures to a historical bond rating.

How Do EDF Credit Measures and Dot EDF (.edf) Ratings Relate to Moody's Long-Term Bond Ratings?

RiskCalc® EDF credit measures and Moody's long-term bond ratings are not directly comparable. They are two different, though related, credit risk measures. Exhibit 1 compares various aspects of the two systems, highlighting similarities and differences.

Exhibit 1: Similarities and Differences Between EDF Credit Measures and Moody's Long-Term Bond Ratings

Characteristic	*RiskCalc*® default probabilities	Moody's Long-Term Bond Ratings
Unit of Study	Obligor	Obligation and/or Obligor
Time Horizon	Specific, one to five years	Non-specific, long term
Risk Dimension	One dimensional: Probability of default	Multi-dimensional: Probability of default & severity of loss
Information Requirements	Large, reliable, electronic datasets	Flexible as situation may require; Robust to poor quality or missing data
Obligor Participation	None	Generally
Volatility	High	Low—maintained through the cycle
Scale	Continuous/Absolute	21 Risk Buckets/Relative
Scope of Influence	Private, available via subscription	Available to all users of public market information
Structure	Simple, codified analysis of few variables	Flexible as situation may require

Important Notes:

Despite the important differences between *RiskCalc*® EDF credit measures and Moody's long-term bond ratings, some users of one or both risk nomenclatures find it helpful to compare them. Moody's bond default study provides a basis for such a comparison. This study rigorously correlates Moody's long-term corporate bond ratings (Aaa, Aa1, etc.) with ex-post default frequencies, allowing us to calculate historical average bond default rates for each rating category. By mapping a firm's *RiskCalc*® default probabilities into the historical average bond default rates, we create dot-EDF ratings (e.g., Aaa.edf, Aa1.edf, Aa2.edf, ..., Caa2.edf, Caa3.edf, Ca.edf, C.edf), which facilitate comparison with long-term bond ratings.

Dot-EDF ratings carry no additional information beyond the default probabilities and are not long-term bond ratings for all of the reasons highlighted in Exhibit 1. They are, rather, a restatement of the EDF measures and provide a shorthand nomenclature for default probabilities. For example, for many, the difference between two companies with 0.0075 and 0.0131 probabilities of default is not as easily understood as the difference between an A3.pd company and a Baa1.pd company.

The correlation between dot-EDF ratings and long-term bond ratings is also imperfect because they are derived through different processes and are based on different datasets. EDF measures are produced by a multi-factor model that empirically relates selected financial ratio values to default probabilities. Long-term bond ratings are based on a wide variety of qualitative and quantitative factors that include accounting and market information, data on industry and competitive trends, and generally, input from the obligor. The information is then distilled by an analyst and a rating committee with sector-specific expertise and in-depth understanding of an issuer's competitive position and strategic direction. The intent of Moody's KMV *RiskCalc*® models is not to predict Moody's bond ratings. They are designed to calculate probabilities of default for defined time horizons. Recovery models such as Moody's KMV *LossCalc*™ are used to calculate loss in the event of default. The output of these models, combined with correlation estimates, will facilitate quantification of risk at the obligor and portfolio level. Despite the structural difficulties in directly comparing EDF credit measures with long-term bond ratings, many of our customers will find the systems complementary and valuable in different ways as part of a risk management solution.

Moody's KMV RiskCalc® EDF Models:

Managers of capital market debt portfolios have long benefited from the availability of widely accepted rating opinions from the major rating agencies. The lack of a similar benchmark for private counter-parties has contributed to the relative lack of liquidity of private debt portfolios. Recognizing the importance of such a benchmark, Moody's KMV has committed significant resources to create models-based credit ratings for the capital markets.

Moody's KMV has developed its *RiskCalc*® network of private default probability models to:

- Add liquidity to an institution's debt portfolio by accelerating the growth of private market securitizations;
- Reduce the cost of loan originations by reducing the time needed to analyze credits;
- Reduce the cost of portfolio monitoring by enabling financial institutions' staff to periodically re-rate counter-parties and automatically detect significant credit quality deteriorations; and
- Increase the probability that risk-based capital allocation will be extended to private debt portfolios.

An Introduction to *Moody's KMV RiskCalc*® version 3.1

The *RiskCalc*® v3.1 model introduces the next generation default prediction technology for private, middle market companies. *RiskCalc*® v3.1 incorporates financial statement data and equity market based information to produce EDF credit measures that reflect a forward-looking assessment of credit risk.

The *RiskCalc*® v3.1 model for U.S. and Canadian firms both use 11 financial ratios (including firm size), adjusts these inputs to linearize the problem, and then estimates the final collection of transformed inputs within a probit model. A Credit Cycle Adjustment (CCA) is incorporated to adjust the EDF for the current stage of the credit cycle, allowing the user to determine the susceptibility of a firm to an economic downturn. A final mapping to Moody's bond default rates is provided for the one- and five-year EDF. A term structure is also included to provide EDF measures for any point between one and five years.

Each *RiskCalc*® model is developed and tested on native middle market borrowers. It is not intended for finance, insurance, not-for-profits, and real estate firms.

Two key facts underlie the usefulness of *RiskCalc*®:

- It is specifically designed for private firms.
- It ties credit scores directly to probabilities of default, a critical component for determining pricing and enabling securitization.

RiskCalc® is a statistically powerful model for private-firm default modeling because it is estimated on private rather than public firms. Public and private firms are different in important ways. Private firms are typically smaller and have lower leverage, higher retained earnings, higher short-term debt, higher current ratios, and lower inventories than do public firms with similar risk. While models fit to public companies can be useful when applied to private firms, the relationships between certain ratios and default probability display markedly different behavior between public and private firms.

Tying *RiskCalc*® to a default probability allows quantitative tools to not only monitor trends but to affect pricing directly and enable securitization. Further, the fact that the mean default rate for the entire middle-market segment, as determined by the model, is Ba2 as opposed to B2 implies substantial opportunities for balance-sheet collateralized loan obligations (CLOs), as post-CLO capital allocation could be well below that required when keeping entire portfolios of private-firm loans on banks' books. By tying the output to a default rate, this model can also assist in the building of internal capital models within banks, in line with the new Basel capital directives.

Like all new technologies, *RiskCalc*® is a supplement to, not a substitute for, good judgment. Many factors not reflected in balance sheets and income statements are relevant to gauging loan risk. The score produced by *RiskCalc*® alone cannot answer the deeper question of whether the credit adds value from a portfolio and relationship perspective. However, what *RiskCalc*® can do is efficiently summarize one portion of the problem (financial statements) so that analysts can focus their expertise more productively.

Where Moody's KMV *RiskCalc*® Fits In

RiskCalc® targets the middle-market class of borrowers. Other models aimed at this segment, including Altman's Z-score model, use financial statement data to predict default. The lower bound for applicability is around $100,000 in asset size and extends up to publicly traded companies. Importantly, size does not

define the upper limit. The existence of market equity information—a new and important source of information that should not be excluded—does establish the upper boundary. The lower bound comes from general experience in the credit field, obtained by examining the performance of scoring models on firms of various sizes. As market value information is valuable and not reflected in financial statements, these private-firm default models are sub-optimal for those companies with traded equity.

RiskCalc® is at the heart of the commercial credit evaluation process. It is for firms too large to be considered a simple extension of an individual, yet without publicly traded equity information. It generates essential input for portfolio variability calculations and, when combined with facility information, can be used to estimate an expected loss.

Modeling Details

Many ratios—in fact, too many—are correlated with credit quality. Given how these variables correlate with each other, we have to choose a select subset in order to generate a stable statistical model. Statistically, we are forced to choose among many potentially useful inputs. The final variables and ratios used in *RiskCalc*® for private companies are as follows:

RiskCalc® *for Private Company Inputs and Ratios*

Inputs (19)	***Ratios (11)***
Total Assets (two years)	ROA
Accounts Receivable (two years)	Change in ROA
Accounts Payable (two years)	Long-Term Debt/(Long-Term Debt + Net Worth)
Current Liabilities	Retained Earnings/Current Liabilities
Inventory (two years)	Cash Flow/Interest Expense (U.S.) or Cash Flow/Current Liabilities (Canada)
Total Liabilities	Cash/Assets
Net Income (two years)	Inventory/Sales
Retained Earnings	Change in AR Turnover
Sales (two years)	Current Liabilities/Sales
Cash & Securities	Sales Growth
EBITDA	Total Assets
Interest Expense	
Total Long-Term Debt	

These ratios were selected for their univariate power and tested within a multivariate framework on private-firm data.

Definitions of Default

Ideally, we would like to predict loss rates—that is, the severity of losses associated with those loans that not only default through missed payments but do not eventually pay back in full principal and accrued interest. Unfortunately, such information is rare. In practice, once a credit is identified as defaulted, it moves to a different area within the lending unit (workout or collections), making it impractical for analysts to tie the original application data to the eventual recovery amount. Thus, we ignore the recovery issue and choose a definition of default that is relatively unambiguous, easy to measure, and highly correlated with our target: loss of present value compared to the original loan terms.

Prediction Horizon

Having determined what we will count as bad, we then need to determine whether we wish to measure bad over one, five, or 10 years. In analyzing collateral pools for securitizations, Moody's Structured Finance Group targets a 10-year default rate, as many loans and bonds in these structures are outstanding for that duration, and we need to develop comparable loss forecasts with the contractual maturity of the corresponding senior notes. Moody's Global Credit Analysis describes "credit opinions" as pertaining to periods from three to seven years in the future. However, most default research refers to one-year default rates. For example, the B default rate of around 6% refers to a one-year horizon implicitly, just as an interest rate of 6% refers to the annual interest rate, not the quadrennial or monthly total return.

In the past we've only included mappings from default probabilities to Moody's bond default rates at the five-year time horizon. For version 3.1 models we've included the flexibility of a term structure, which yields EDF measures for any time horizon between one and five years. We've also provided ratings for both the one- and five-year EDF.

In summary, given the evolution of credit risk management, RMA, in alliance with Moody's KMV, is pleased to have undertaken this major step to provide our constituency with industry-level probability of default measures. We hope that this benchmark will be helpful to lenders, analysts, portfolio managers, and risk professionals in assessing concentration risk, setting limits, allocating capital, and developing risk-mitigating strategies for both obligors and portfolios.

For Further Analysis, Please Refer to Financial Ratio Benchmarks

If you think *Industry Default Probabilities and Cash Flow Measures* is a valuable resource, wait until you see its companion study. The original *Annual Statement Studies: Financial Ratio Benchmarks* is the only source of financial ratio benchmarks derived directly from more than 173,000 statements of financial institution borrowers and prospects. These financial statements come directly to RMA from our member institutions that get their data straight from the businesses they service.

The latest edition includes many new industries, stronger statements, five years of historical data sorted by assets and sales... In short, it is more like our traditional *Annual Statement Studies*.

Financial Ratio Benchmarks includes:

- Nineteen classic financial statement ratios, clearly defined.
  - Current Ratio
  - Quick Ratio
  - Sales Receivables
  - Days Receivables
  - Cost of Sales/Inventory
  - Days Inventory
  - Cost of Sales/Payables
  - Days Payables
  - Sales/Working Capital
  - EBIT/Interest
  - Net Profit + Depreciation, Depletion, Amortization/Current Maturities Long-Term Debt
  - Fixed/Worth
  - Debt/Worth
  - % Profits Before Taxes/Tangible Net Worth
  - % Profits Before Taxes/Total Assets
  - Sales/Net Fixed Assets
  - Sales/Total Assets
  - % Depreciation, Depletion, Amortization/Sales
  - % Officers', Directors', Owners' Compensation/Sales
- Common-size balance sheet and income statement
- Data arrayed by asset and sales size
- Unique information
- Trend data available for five years

For more information regarding the *Financial Ratio Benchmarks,* please call 1-800-677-7621.