Business Ratios and Formulas

A COMPREHENSIVE GUIDE

SECOND EDITION

Steven M. Bragg

John Wiley & Sons, Inc.

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To Andrea and Victoria: The value of watching you grow
has been beyond measurement.

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About the Author

Steven Bragg, CPA, CMA, CIA, CPIM, has been the chief financial officer or controller of four companies, as well as a consulting manager at Ernst & Young and auditor at Deloitte & Touche. He received a master's degree in finance from Bentley College, an MBA from Babson College, and a bachelor's degree in economics from the University of Maine. He has been the two-time president of the Colorado Mountain Club, is an avid alpine skier and mountain biker, and is a certified master diver. Mr. Bragg resides in Centennial, Colorado with his wife and two daughters. He has published the following books through John Wiley & Sons:

Accounting and Finance for Your Small Business
Accounting Best Practices
Accounting Controls Best Practices
Billing and Collections Best Practices
Controller's Guide to Costing
Controller's Guide to Planning and Controlling Operations
Controller's Guide: Roles and Responsibilities for the New Controller
Controllership
Cost Accounting
Design and Maintenance of Accounting Manuals
Essentials of Payroll
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Inventory Accounting
Inventory Best Practices
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Payroll Best Practices
Sales and Operations for Your Small Business
The Controller's Function
The New CFO Financial Leadership Manual
The Ultimate Accountants' Reference

Also:

Advanced Accounting System (Institute of Internal Auditors)
Run the Rockies (CMC Press)

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Preface

This book is designed for all corporate managers who need to understand the performance levels of their departments. It contains performance measurements for the accounting, engineering, logistics, production, and sales departments. These measurements cover not only financial matters, but also those related to efficiency, effectiveness, capacity, and market share. In addition, the book includes measurements related to asset utilization, operating performance, cash flows, liquidity, capital structure, return on investment, and market performance. These latter categories are of great interest not only to the accounting and finance departments, but also to a company's creditors and investors.

There are nearly 200 measurements itemized in this book. Each one is accompanied by a complete description, an explanation of the calculation, an example, and cautions regarding its use. The cautions are of particular use, as they describe the elements of a measurement that can be modified to deliver misleading results, different measurements that may work better in certain situations, use on a trend-line basis, and other measurements that should be used to reinforce indicated results.

The book also describes how to use an electronic spreadsheet to compile a standard set of measurements, using Microsoft Excel as the template. This is especially useful for investors and financial personnel, who need to compile information about a company's long-term performance.

Anyone who wishes to create a complete set of performance-tracking measurements for an entire company or for a specific function can use this book as a reference source. Managers can choose the correct blend of measurements to achieve an information set that can be used for feedback on strategy initiatives and specific efficiency projects, as well as for performance evaluations. This is the ideal tool for measuring corporate performance.

Centennial, Colorado
October 2006

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1

Introduction

Every department in every business produces some kind of information that can be used by its manager to measure performance. This information may be related to operational considerations within the department, the financial condition of the entire company, or the performance of a company's suppliers and customers. Unfortunately, managers may not be aware of the multitude of measurements that can be used to track these different levels of performance or of the ways that these measurements can yield incorrect or misleading information.

This book is designed to help managers select the best possible set of measurements for a given situation. Chapters 2 through 14 itemize a series of performance measurements for different aspects of a company. Chapter 2 contains asset utilization measurements that can be used to determine a company's ability to sustain its sales, the level of asset and expense usage required to do so, and the sustainability of its current sales and expense levels. There are also specialized ratios that deal with such issues as sales returns, repairs and maintenance, fringe benefits, interest expense, and overhead rates.

Chapter 3 contains operating performance measurements, which describe an organization's operating performance in such areas as sales, gross margins, investment income, operating profit, and net profit.

Chapter 4 contains cash flow measurements, which are useful in determining the ability of a company's cash flows to keep it in business. These measurements should be used in conjunction with the liquidity measurements in Chapter 5, which focus on additional measurements related to cash flows, such as a company's ability to collect accounts receivable in an efficient manner, use its inventory within a short time frame, pay its accounts payable when due, and generally maintain a sufficient amount of liquid funds to pay off short-term liabilities. Chapter 6 contains capital structure and solvency measurements, which determine the relationship between a company's debt and equity, as well as the comparative proportions of different types of stock. It also addresses a company's ability to remain solvent and so can be used in conjunction with Chapters 4 and 5.

Chapter 7 contains return on investment measurements, which encompass net worth, several types of return on assets and equity, earnings per share, economic value added, and return on dividends. Chapter 8 addresses a company's financial

market performance by describing such measurements as the price/earnings ratio, several variations on the stock options to common shares ratio, market value added, and the cost of capital.

Chapters 9 through 14 cover measurements for individual departments. These chapters are devoted to performance measurements for the accounting, engineering, human resources, logistics, production, and sales departments. In contrast to Chapters 2 through 8, which are devoted to measurements that are primarily used by the accounting and finance functions, Chapters 9 through 12 are more concerned with such issues as work capacity levels, efficiency, and effectiveness, which in many cases require no financial information at all. For example, measurements in Chapter 12, which deals with logistics, cover such topics as production schedule accuracy, the on-time parts delivery percentage, and picking accuracy for assembled products.

Chapter 15 covers a variety of topics related to measurements using the Microsoft Excel electronic spreadsheet, including how to set up comprehensive sets of measurements that can be used for proportional, leverage, ratio, and trend analyses. It also covers a variety of spreadsheet formulas and report formats for forecasting, cash flow analysis, capital asset purchase analysis, interest compounding, investment analysis, and risk analysis.

The book concludes with an appendix and glossary. The Appendix lists the names and formulations of every measure in the book, sorted by chapter. This list should only be used with the precautions given for them in their respective chapters to ensure their proper use. The Glossary covers the definitions of the terms found in many of the measurements listed in this book, to clarify the exact types of information needed.

The chapters containing measurements (Chapters 2 through 14) have an identical structure. Each begins with a table that lists the measurements described in it, which one can use to quickly access a needed calculation. Thereafter, each chapter is broken down into the discussion of individual measurements. Within each measurement section there are a description, formula, example, and discussion of cautionary items. The description typically notes how the measurement is used and who uses it. The formula shows any variations on the calculation and what types of data to include or exclude from it. The example is generally a complete scenario that describes how the measurement is used in a simulated business situation. Finally, any cautionary items are noted; these can include the ways in which the measurement can be altered to yield incorrect results, or what other measurement should be used with it in order to yield a more comprehensive set of information.

The reader may use this book to search for a single calculation, which can be used for highly targeted needs. However, a better approach is to peruse the entire book, with the objective of developing a complete set of measurements that will yield a more comprehensive view of a company's entire operating and financial situation. For example, a CFO might be interested in a company's stock market performance and therefore watches only the price/earnings ratio. However, this single measurement focuses only on the perception of investors with regard to a

company's future earnings potential. A more rounded set of measurements might include the days of sales backlog (since it indicates future changes in sales volume), production capacity utilization (since it shows the ability of the company to produce its incoming sales), and the days of accounts receivable (since it shows the company's ability to convert sales into cash). The exact set of measurements will change in accordance with a company's industry, size, operational configuration, and degree of financial leverage, but one issue will remain the same: A single measurement is not enough to yield a clear view of a company's financial and operating condition.

Many of the ratios in this book are of the non-financial variety, such as mean time between failures, the science linkage index, and the quote to close ratio. Managers have a difficult time creating a linkage between these non-financial measures and improvement. A common result is for managers to impose a broad range of non-financial measurements upon a company, hoping that some behavior changes will result in improved financial performance. A better approach is to conduct a detailed review of the financial performance drivers of a business, and to only measure the results of non-financial measurements that are likely to have a direct impact on those financial measures. For example, a consulting business is experiencing significant delays in the completion of customer projects, which delays revenue generation; the delays are caused by a high level of employee turnover, requiring long lead times to bring in qualified replacement staff. Thus, a reasonable non-financial measurement in this case is the annual employee turnover percentage, since there is a direct linkage between it and revenue generation.

Once non-financial measurements are selected, be sure to verify that improvements in the activities being measured are actually resulting in altered financial performance. There is often merely an assumption that enhancements to a non-financial activity will improve financial performance, but no one has actually tested the assumption. This verification step will ensure that measures that do not assist in improving financial results are thrown out.

A major problem with measurement systems is inconsistency of application. If a company has multiple locations, then it must have a system in place for ensuring that the same measure is calculated in exactly the same way in every location. Local managers can be quite skilled at tweaking measurement systems to reveal the best possible results, frequently by excluding some data from measurements, altering the date ranges over which data is collected, or by altering the measurements themselves. This issue can be monitored through the use of occasional internal audits, or with centralized measurements systems that keep local managers from being involved in the measurement process.

Even if a company has developed a reasonable set of measurements, this does not mean that they should never be changed. On the contrary, measured items will generally gather a great deal of management attention and then improve to the point where they no longer change—thereby resulting in a stale set of measurements. For example, inventory accuracy can improve only to 100%. At this point, the measurement is needed on a monitoring basis to ensure that it does not degrade, while a new measurement can be created to be the focus of corporate attention.

However, there will be a few measurements, usually involving sales levels and break-even points, that will always be the centerpiece of any measurement system, since they bring attention to bear on the most crucial revenue and cost elements of the business. Thus, a properly designed measurement system should include a few key items that will be constant for many years, accompanied by other measures that are used for internal improvement purposes and will change in concert with corporate objectives.

A final warning: Do not become so enamored of measurement systems that you burden the company with a wild profusion of measurements that track every conceivable activity, since this causes several problems. first, no one knows which of the measures are most useful for tracking the company's ability to achieve its mission. Therefore, they try to perform well under *all* of the measures, resulting in resources being allocated to the improvement of some measures that have no bearing on financial performance. Second, employees may engage in irrational behavior in order to achieve high scores through the measurement system, even if they must downgrade their performance in areas not being measured.

This book is filled with over 200 financial and operational measurements that have proven to be of considerable use to the author in tracking the performance of many companies in a variety of industries. If you would like to see other measurements in the next edition of this book, please send your request to the author at *bragg.steven@gmail.com.*

2

Asset Utilization Measurements

This chapter focuses on the ratios and formulas that can be derived primarily from the income statement. There are several that require additional information from the balance sheet, as well as internal information, such as employee headcount, that may not be readily discernible from published financial statements. The general intent of the analysis tools presented here is to show a company's ability to sustain its sales, the level of asset and expense usage required to do so, and the sustainability of its current sales and expense levels. There are also specialized ratios that deal with such issues as sales returns, repairs and maintenance, fringe benefits, interest expense, and overhead rates.

Each of the following sections describes the uses of a ratio or formula, explains the proper method of calculation, and gives an example. Each section also discusses how each ratio or formula can be misused, skewed, or incorrectly applied.

The ratios and formulas presented in this chapter are:

- Sales to Working Capital Ratio
- Sales to Fixed Assets Ratio
- Sales to Administrative Expenses Ratio
- Sales to Equity Ratio
- Sales per Person
- Sales Backlog Ratio
- Sales Returns to Gross Sales Ratio
- Repairs and Maintenance Expense to Fixed Assets Ratio
- Accumulated Depreciation to Fixed Assets Ratio
- Fringe Benefits to Wages and Salaries Expense
- Sales Expenses to Sales Ratio
- Discretionary Cost Ratio
- Interest Expense to Debt Ratio
- Foreign Exchange Ratios
- Overhead Rate
- Goodwill to Assets Ratio
- Overhead to Cost of Sales Ratio
- Investment Turnover
- Break-Even Point
- Margin of Safety
- Tax Rate Percentage

SALES TO WORKING CAPITAL RATIO

Description: It is exceedingly important to keep the amount of cash used by an organization at a minimum, so that its financing needs are reduced. One of the best ways to determine changes in the overall use of cash over time is the ratio of sales to working capital. This ratio shows the amount of cash required to maintain a certain level of sales. It is most effective when tracked on a trend line, so that management can see if there is a long-term change in the amount of cash required by the business in order to generate the same amount of sales. For instance, if a company has elected to increase its sales to less creditworthy customers, it is likely that they will pay more slowly than regular customers, thereby increasing the company's investment in accounts receivable. Similarly, if the management team decides to increase the speed of order fulfillment by increasing the amount of inventory for certain items, then the inventory investment will increase. In both cases, the ratio of working capital to sales will worsen because of specific management decisions. This ratio is also used for budgeting purposes, since budgeted working capital levels can be compared to the historical amount of this ratio to see if the budgeted working capital level is sufficient.

Formula: Annualized net sales are compared to working capital, which is accounts receivable, plus inventory, minus accounts payable. One should not use annualized *gross* sales in the calculation, since this would include in the sales figure the amount of any sales that have already been returned and are therefore already included in the inventory figure. The formula is:

$$\frac{\text{Annualized net sales}}{\text{(Accounts receivable + Inventory – Accounts payable)}}$$

Example: The Jolt Power Supply Company has elected to reduce the amount of inventory it carries for some of its least-ordered stock items, with the goal of increasing inventory turnover from twice a year to four times a year. It achieves its inventory goal rapidly by selling back some of its inventory to its suppliers in exchange for credits against future purchases. Portions of its operating results for the first four quarters after this decision was made are shown in Table 2.1.

Table 2.1

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Revenue	$320,000	$310,000	$290,000	$280,000
Accounts receivable	$107,000	$103,000	$97,000	$93,000
Inventory	$640,000	$320,000	$320,000	$320,000
Accounts payable	$53,000	$52,000	$48,000	$47,000
Total working capital	$694,000	$371,000	$369,000	$366,000
Sales to working capital ratio	1:0.54	1:0.30	1:0.32	1:0.33

The ratio calculation at the end of each quarter is for annualized sales, so we multiply each quarterly sales figure by 4 to arrive at estimated annual sales. The accounts receivable turn over at a rate of once every 30 days, which does not change through the term of the analysis. Inventory drops in the second quarter to arrive at the new inventory turnover goal, while the amount of accounts payable stays at one-half of the revenue level, reflecting a typical distributor's gross margin of 50% throughout all four periods. The resulting ratio shows that the company has indeed improved its ratio of working capital to sales, but at the price of some lost sales to customers who were apparently coming to the company because of its broad inventory selection.

Cautions: As stated in Table 2.1, using this ratio to manage a business can result in unforeseen results, such as a drop in sales because of reduced inventory levels or tighter customer credit controls. Also, arbitrarily lengthening the terms of accounts payable in order to reduce the working capital investment will likely lead to strained supplier relations, which may eventually result in increased supplier prices or the use of different and less reliable suppliers.

SALES TO FIXED ASSETS RATIO

Description: In some industries, a key barrier to entry is the large amount of assets required to produce revenues. For example, the oil-refining business requires the construction of a complete refining facility before any sales can be generated. By using the sales to fixed assets ratio, one can see if a company is investing a great deal of money in assets in order to generate sales. This is a particularly effective measure when compared to the same ratio for other companies in the same industry; that is, if another company has found a way to generate profitable sales with a smaller asset investment, then it will be rewarded with a higher valuation. This measure is also useful when tracked on a trend line, so that one can see if there are any sudden jumps in asset investments that the company has made to incrementally bring in more sales. For example, a printing facility may have achieved 100% utilization of its printing plant, and so cannot generate more sales without a multimillion dollar investment in new equipment. In such cases, the key question is whether there is a reasonable expectation of generating a sufficient incremental increase in revenues to justify the additional investment.

Formula: Divide net sales for a full year by the total amount of fixed assets. There are several variations on this formula. One is to calculate annualized net sales on a rolling basis, so that the last 12 months of revenue are always used. This can be a better approach than attempting to extrapolate revenues forward for several months, especially if future revenues are uncertain. The denominator in the calculation, which is the amount of total fixed assets, may be used net of depreciation or before depreciation; the most common usage is after depreciation, since this is more indicative of the actual value of the assets. However, if accelerated

depreciation is used, there may be little relationship between the amount of depreciation recognized and the value of the fixed assets, which may lead one to use total fixed assets prior to accumulated depreciation. Both variations on the formula are shown here:

$$\frac{\text{Annualized net sales}}{\text{Total fixed assets}}$$

$$\frac{\text{Annualized net sales}}{\text{Total fixed assets prior to accumulated depreciation}}$$

Example: The Turtle Tank Company creates tracked vehicles for a number of military organizations. It has recently received an order from the country of Montrachet for annual delivery of 20 tanks per year for the next eight years. The trouble with this order is that the company's existing capacity can only handle 10 more tanks per year. An entire additional production line must be created in order to manufacture the extra tanks, which will require an increase in fixed assets of $20 million. The price the company will receive for each tank is $850,000. Currently, it produces 70 tanks per year, and has fixed assets of $40 million. Based on these numbers, its net sales to fixed assets ratio will change as shown in Table 2.2.

The Turtle Tank Company is a publicly held company, so its management is concerned that the much lower ratio that would be caused by the new investment would not compare favorably to the same ratio for its competitors. This might cause investors to think that the company is poorly managed, resulting in a sell-off of its stock. An alternative solution for the situation is for the managers to ignore the short-term impact of the ratio and instead to focus on the key issue, which is whether there will be enough additional business in the future to justify the additional investment.

Cautions: The sales to fixed assets ratio should not be used at a consolidated level for companies that include many types of businesses, since it is quite possible that only a few businesses within the entity are asset-intensive. For this reason, it is better to calculate the measure for individual businesses or product lines. The ratio can also be misleading if a company does not have sufficient funds to purchase new assets, in which case it may appear to have a small asset base due to the large amount of offsetting depreciation expense that has accumulated over time.

Table 2.2

	If No Change	If Invest in New Line
Annual sales	$68,000,000	$76,500,000
Total fixed assets	$40,000,000	$60,000,000
Sales to fixed asset ratio	**1.7:1**	**1.3:1**