

The Base Rate Book – Gross Profitability

Integrating the Past to Better Anticipate the Future

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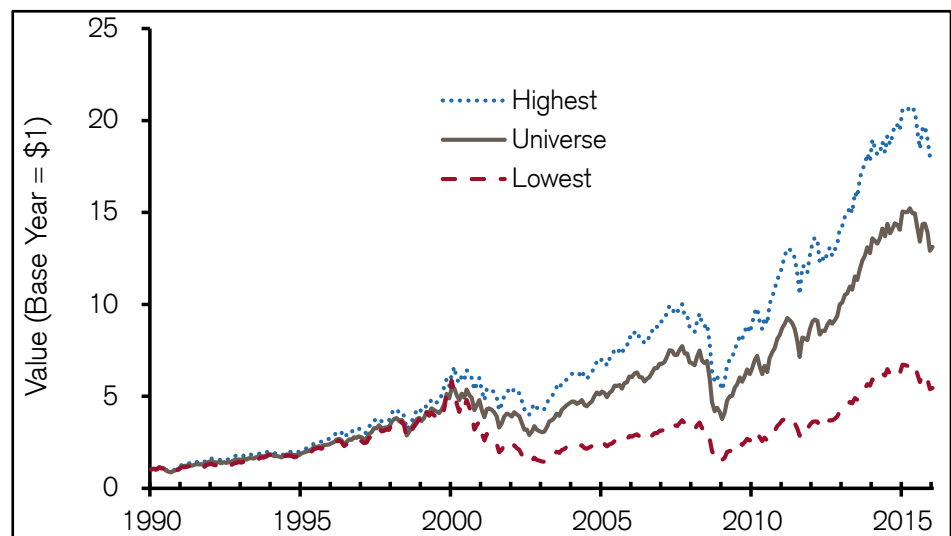
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Source: Credit Suisse HOLT®.

“... people who have information about an individual case rarely feel the need to know the statistics of the class to which the case belongs.”

Daniel Kahneman¹

- Gross profitability, gross profits divided by assets, may be a useful additional input into valuation analysis.
- This measure of profitability can provide a different valuation signal than the price-earnings multiple, which is the most common metric analysts use to value stocks.
- Gross profitability is highly persistent over time, and research shows that firms with high profitability deliver higher total shareholder returns than those with low profitability.
- This report shows the base rate for gross profitability for nearly 1,000 global companies from 1950-2014 and includes analysis by sector.
- We provide a method to integrate company-specific views with the base rate to sharpen the quality of forecasts.

Introduction

Benjamin Graham, the father of security analysis, spent some time with an aeronautical engineer named James Rea in the 1970s. Together, they developed a screen to find attractive stocks that had ten criteria. Because it was toward the end of Graham's life, some refer to the list as Graham's "last will."² About one-half of the measures were based on valuation, consistent with Graham's value orientation. But the other half of the criteria addressed quality. So a company that passed the screen would be both statistically cheap and of high quality.

This installment in our base rate series examines gross profitability, a measure of a company's ability to make money that has attracted the attention of academics and practitioners in recent years. Prior reports include two dedicated to the income statement, sales growth and net income growth, and one to Cash Flow Return on Investment (CFROI[®]), a measure of economic profitability.³

Robert Novy-Marx, a professor of finance at the Simon Business School at the University of Rochester, defines gross profitability as revenues minus cost of goods sold, scaled by the book value of total assets. In other words, gross profitability is gross profit divided by assets. Investors can use gross profitability as a proxy for quality and it is not positively correlated with classic measures of value.⁴

Research shows that gross profitability is highly persistent in the short and long run. This means that you can make a reasonable estimate of future profitability based on the past. Academic research also shows that firms with high gross profitability deliver better total shareholder returns than those with low profitability. This is despite the fact that they start with loftier price-to-book ratios.⁵

Many academics and practitioners now incorporate gross profitability into their asset pricing models. For instance, Eugene Fama, a professor at the University of Chicago and a winner of the Nobel Prize, and Kenneth French, a professor of finance at the Tuck School of Business, Dartmouth College, include profitability as one of the factors that helps explain changes in asset prices. The others include beta (a measure of the sensitivity of an asset's returns to market returns), size, valuation, and investment.⁶ The definition of profitability that Fama and French use differs somewhat from that of Novy-Marx but captures the same essence.

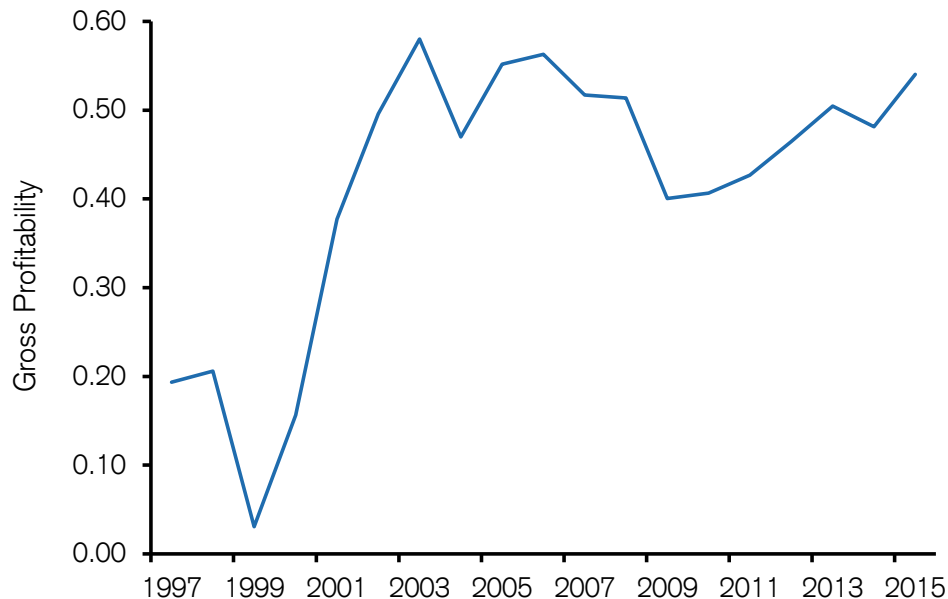
The power of profitability to explain total shareholder returns appears to be a global phenomenon.⁷ Using Compustat data (July 1963 to December 2010) and Compustat Global data (July 1990 to October 2009), Novy-Marx found that the stocks of more profitable firms outperformed the stocks of less profitable firms in the United States as well as in developed markets outside the U.S. Both samples exclude stocks of companies in the financial services sector. These results are consistent with a study that examined the effect of gross profitability on total shareholder returns in 41 countries from 1980 to 2010.⁸

Gross profitability may also be a useful factor to screen for in a search for attractive stocks. Profitability can provide a very different signal than a price-earnings (P/E) multiple, which is the most common metric analysts use to value stocks. A stock that appears unattractive using a P/E multiple may look attractive using gross profitability, and a stock that appears unattractive using gross profitability may look attractive using a P/E multiple.

Take Amazon.com as a case. The stock had a trailing P/E multiple of roughly 540 at year-end 2015 based on a price of \$676 on December 31 and full-year reported earnings per share of \$1.25. For context, the P/E multiple was 20 for the S&P 500 at the same time. Based purely on its P/E multiple, the valuation of Amazon.com appeared high.

The company's gross profitability told a different story. For 2015, Amazon.com's gross profitability was 0.54 (gross profit of \$35 billion and total assets of \$65 billion). According to Novy-Marx, gross profitability of 0.33 or higher is generally attractive.⁹ Not only did Amazon.com's recent gross profitability surpass that level easily, it has been well above that threshold for most of the company's history (see Exhibit 1).

Exhibit 1: Amazon.com's Gross Profitability, 1997-2015



Source: FactSet.

Base Rate of Gross Profitability

Two common ways of making a forecast include bottom-up research (known as the "inside view"), which is the most natural approach, and application of a base rate ("outside view") to see what the results have been for an appropriate reference class. The research in decision making shows that the bottom-up approach is subject to biases and that incorporating the base rate generally improves the accuracy of the forecast.¹⁰ You want to combine the two approaches intelligently.

There is a technique to blend the approaches that we apply to gross profitability.¹¹ The basic idea is if an outcome in the present is consistent with the past, you can place more weight on the inside view. On the other hand, if the present outcome is very different than the past, you should place greater emphasis on the outside view.

The key to the method is correlation, which measures the degree of the linear relationship between variables in a pair of distributions. The value of a correlation coefficient can fall between -1.0 (the rise in one variable perfectly correlates with the fall of the other) to 1.0 (both variables move in tandem). A zero correlation indicates randomness. Correlations for gross profitability are high and positive.

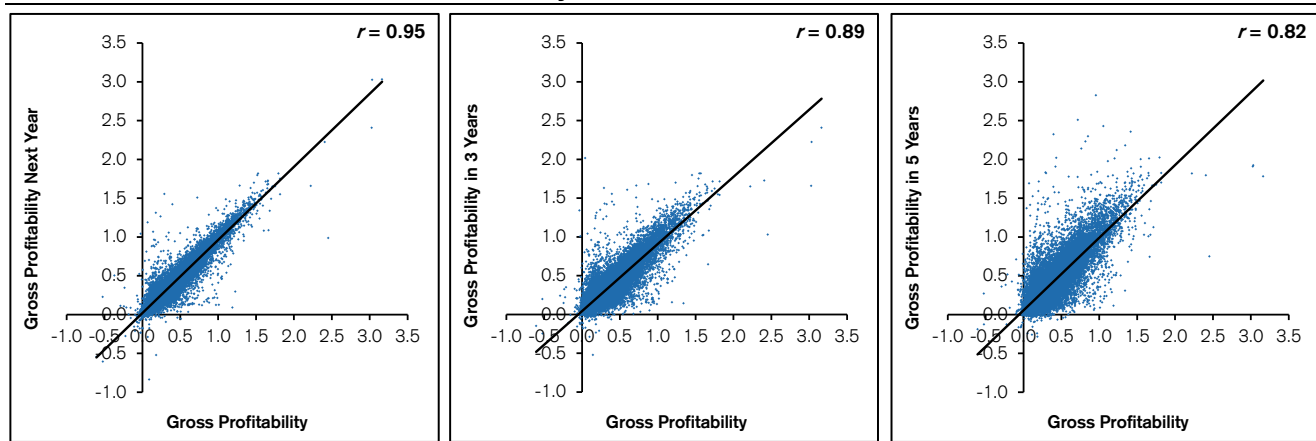
If the correlation between two distributions is high, then what happened before gives you a really good sense of what will follow. For example, the correlation between the expense ratio for U.S. equity mutual funds today and three years ago is about 0.98. Provided that correlation persists, you can forecast a mutual fund's future expense ratio with a great deal of accuracy if you know the ratio today.¹² The bottom-up work is highly relevant.

If the correlation is low, what happened before provides little sense of what will happen next. Alpha, a measure of a fund's risk-adjusted excess return, is a good example. For U.S. mutual funds that invest in stocks of large capitalization companies, the correlation between the three-year periods of alpha is 0.05. That means knowing a mutual fund's alpha from 2010-2012 would tell you little about the fund's alpha from 2013-2015. As a consequence, your best forecast for future alpha is close to the average of the reference class.

Exhibit 2 shows that the Novy-Marx definition of gross profitability is very persistent over one-, three-, and five-year periods. For example, the correlation between profitability in the current year and three years in the future has a coefficient, r , of 0.89 (middle panel of Exhibit 2). But even the five-year correlation is high at 0.82 (right panel).

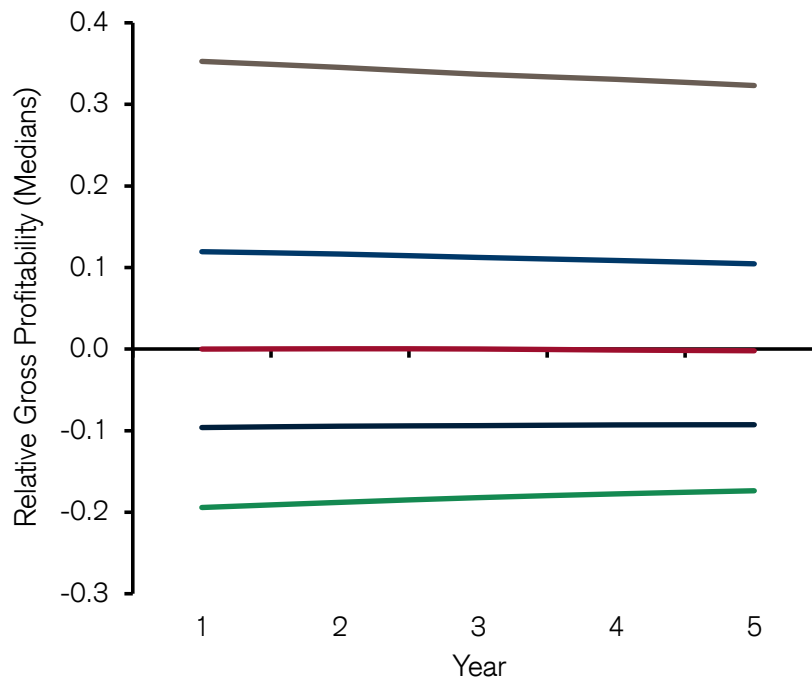
This universe includes the top 1,000 firms in the world from 1950 to 2014 as measured by market capitalization. The sample includes dead companies but excludes firms in the financial services and utilities sectors. The data include nearly 40,000 company years, and there is no need to take into account inflation because profitability is expressed as a ratio.

Exhibit 2: Persistence of Gross Profitability



Source: Credit Suisse HOLT®.

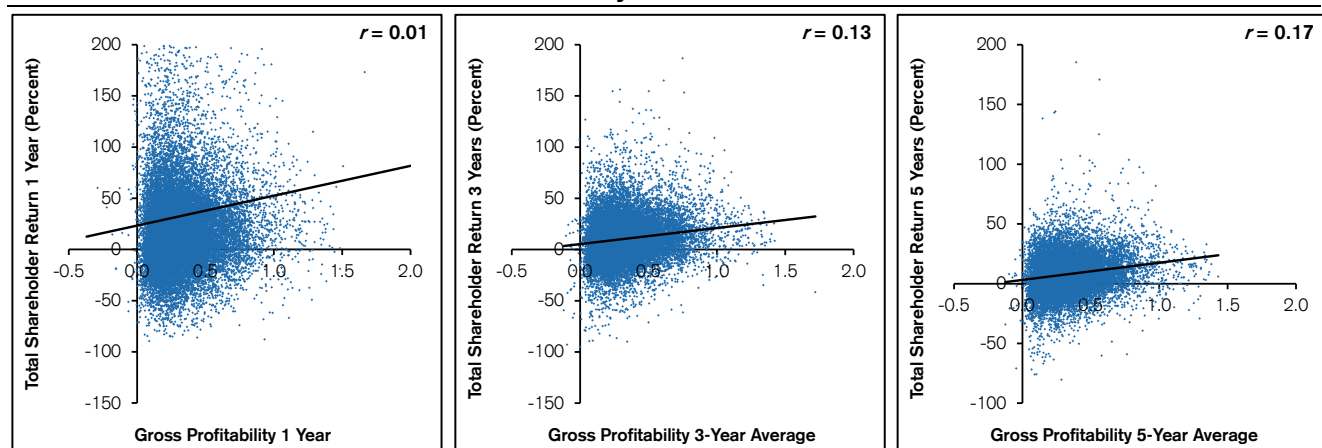
Exhibit 3 shows the stability of gross profitability. We start by sorting companies into quintiles based on gross profitability at the beginning of a year. We then follow the gross profitability for each of the five cohorts. There is very little regression toward the mean. The spread from the highest to the lowest quintile shrinks only slightly, from 0.55 to 0.50. Given this stability, a sensible forecast is to start with last year's profitability and seek reasons to move away from it.

Exhibit 3: Regression Toward the Mean for Gross Profitability

Source: Credit Suisse HOLT®.

Gross Profitability and Total Shareholder Returns

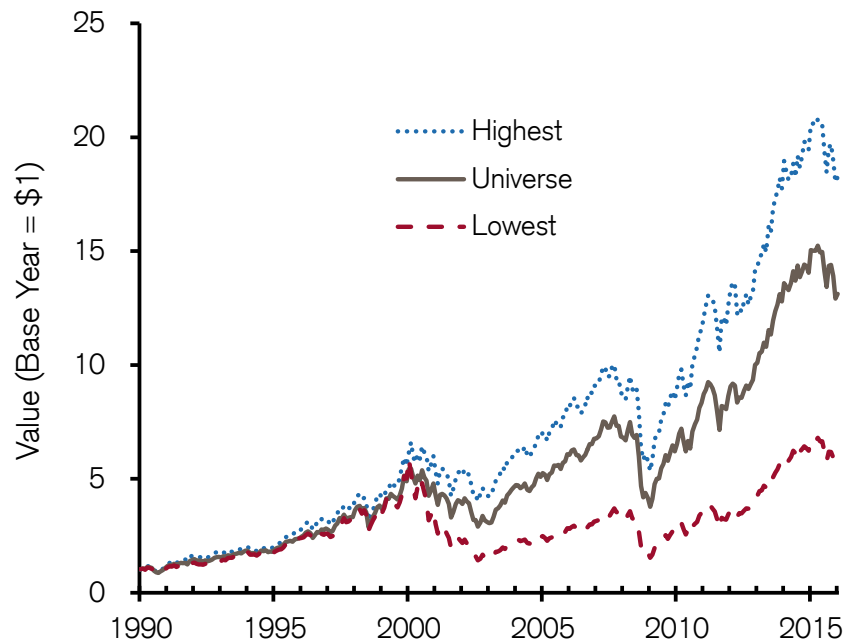
Exhibit 4 shows that the correlation between gross profitability and total shareholder return (TSR) is 0.01 for one year, 0.13 for three years, and 0.17 for five years. However, neither Novy-Marx nor Fama and French recommend a simple correlation between gross profitability and TSR.

Exhibit 4: Predictive Value of Gross Profitability

Source: Credit Suisse HOLT®.

A more effective way to use gross profitability is to rank stocks in quintiles by gross profitability and to build portfolios for each. Exhibit 5 shows the cumulative growth in value of \$1 for the quintiles with the highest and lowest ratios of gross profitability, as well as that for the whole universe. The sample includes the largest 1,000 U.S. industrial and service companies from 1990 through January 2016. The portfolios are rebalanced monthly.

Exhibit 5: Total Return for the Highest and Lowest Quintiles of Profitability (1990-January 2016)



Source: Credit Suisse HOLT®.

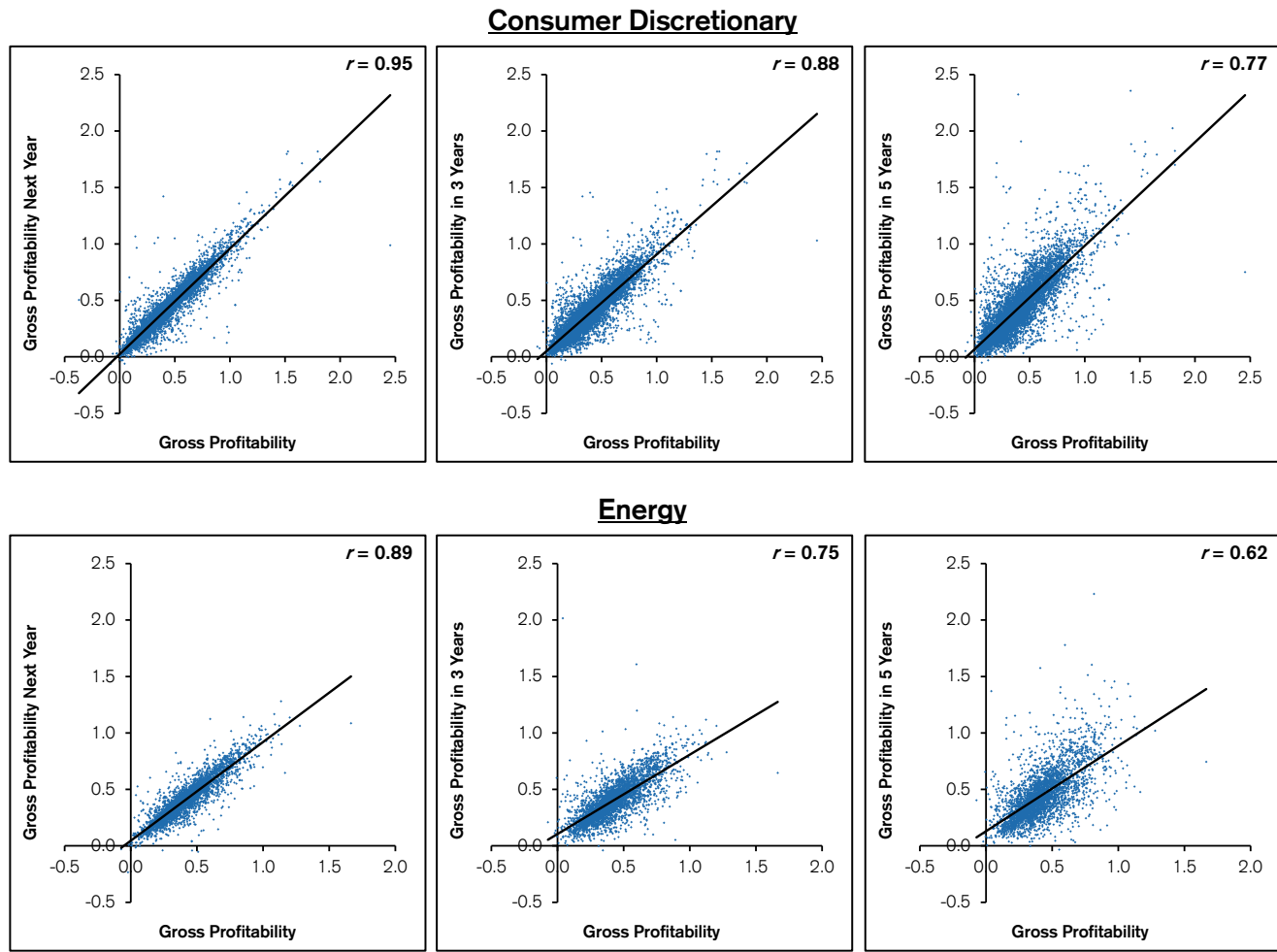
Note: Gross profitability is calculated using the average of the assets at the beginning and the end of the fiscal year.

Base Rate of Gross Profitability for Sectors

We can refine this analysis by examining gross profitability at the sector level. This reduces the sample size but improves its relevance. We present a guide for calculating the rate of regression toward the mean, as well as the proper mean to use, for eight sectors. We exclude the financial services and utilities sectors.

Exhibit 6 examines gross profitability for two sectors, consumer discretionary and energy. The panels at the top show the persistence of gross profitability for the consumer discretionary sector. On the right, we see that the correlation between gross profitability in the base year and five years in the future is 0.77.

The panels at the bottom of exhibit 6 show the same relationships for the energy sector. On the right, we see that the correlation between gross profitability in the base year and five years in the future is 0.62. This suggests you should expect a slower rate of regression toward the mean in the consumer discretionary sector than in the energy sector.

Exhibit 6: Correlation Coefficients for Gross Profitability in Consumer Discretionary and Energy

Source: Credit Suisse HOLT®.

Exhibit 7 shows the correlation coefficient for five-year changes in gross profitability for eight sectors from 1950 to 2014, as well as the standard deviation for the ranges of recorded correlations. Two aspects of the exhibit are worth highlighting. The first is the ordering of r from high to low. This gives you a sense of the rate of regression toward the mean by sector. A high r suggests slow regression, and a low r means more rapid regression. Consumer-oriented sectors generally have higher r 's, and sectors with more exposure to technology or commodities have lower r 's.

The second aspect is how the correlations change from year to year. The standard deviation for the consumer discretionary sector was 0.10. With a correlation coefficient of 0.77, that means 68 percent of the observations fell within a range of 0.67 and 0.87. The standard deviation for the energy sector was 0.18. With a correlation coefficient of 0.62, that means 68 percent of the observations fell within a range of 0.44 and 0.80.

Exhibit 7: Correlation Coefficients for Gross Profitability in Consumer Discretionary and Energy

Sector	5-Year Correlation Coefficient	Standard Deviation
Consumer Staples	0.86	0.07
Industrials	0.78	0.12
Health Care	0.77	0.12
Consumer Discretionary	0.77	0.10
Materials	0.76	0.14
Information Technology	0.64	0.13
Energy	0.62	0.18
Telecommunication Services	0.61	0.44

Source: Credit Suisse HOLT®.

Exhibit 8 presents guidelines on the rate of regression toward the mean, as well as the proper mean to use, for eight sectors based on more than sixty years of data. Keep in mind that regression toward the mean works on a population but not necessarily on every individual company.

The third and fourth columns show the median and mean, or average, gross profitability for each sector. We include medians because the gross profitability in many sectors does not follow a normal distribution. (When the average is higher than the median, the distribution is skewed to the right.) Still, the means are only 5-10 percent higher than the medians.

The two columns at the right show measures of variability. The coefficient of variation, a normalized measure, captures dispersion. The coefficient of variation equals the standard deviation of gross profitability divided by average gross profitability. It is not surprising that gross profitability is higher and less volatile in consumer discretionary than it is in energy.

Exhibit 8: Rate of Reversion and to What Mean Gross Profitability Reverts for Eight Sectors

Sector	How Much Reversion?	To What Level?			
	5-Year Correlation Coefficient	Median	Average	Standard Deviation	Coefficient of Variation
Consumer Staples	0.86	0.50	0.54	0.08	0.14
Industrials	0.78	0.28	0.30	0.07	0.23
Health Care	0.77	0.48	0.50	0.09	0.17
Consumer Discretionary	0.77	0.36	0.40	0.05	0.12
Materials	0.76	0.26	0.28	0.04	0.14
Information Technology	0.64	0.40	0.42	0.06	0.13
Energy	0.62	0.22	0.24	0.04	0.17
Telecommunication Services	0.61	0.24	0.27	0.07	0.26

Source: Credit Suisse HOLT®.

Summary

Benjamin Graham understood years ago that buying a good business at an attractive price would likely yield satisfactory results. This report examines gross profitability, a measure of corporate performance that has received attention from both academics and practitioners. For example, profitability is now one of the factors in Eugene Fama and Kenneth French's five-factor asset pricing model.

Further, gross profitability can send a different valuation signal than does a more traditional valuation approach such as the price-earnings multiple. We show that gross profitability is persistent and confirm the positive relationship between gross profitability and total shareholder returns.

Decision-making research shows that using base rates can improve the quality of forecasts. This report provides the base rate for gross profitability for nearly 1,000 global companies from 1950-2014, and it shows gross profitability by sector. Investors may find gross profitability to be a useful metric to screen for and an additional input into valuation analysis.

Endnotes

- ¹ Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 249.
- ² James B. Rea, "Remembering Benjamin Graham – Teacher and Friend," *Journal of Portfolio Management*, Vol. 3, No. 4, Summer 1977, 66-72. Also, see P. Blustein, "Ben Graham's Last Will and Testament," *Forbes*, August 1, 1977, 43-45. Also, Charles M. C. Lee and Eric C. So, "Alphanomics: The Informational Underpinnings of Market Efficiency," *Foundations and Trends in Accounting*, Vol. 9, Nos. 2-3, December 2014, 59-258.
- ³ Michael J. Mauboussin, Dan Callahan, and Darius Majd, "The Base Rate Book – Sales Growth: Integrating the Past to Better Anticipate the Future," *Credit Suisse Global Financial Strategies*, February 23, 2016; Michael J. Mauboussin, Dan Callahan, and Darius Majd, "The Base Rate Book – Earnings Growth: Integrating the Past to Better Anticipate the Future," *Credit Suisse Global Financial Strategies*, December 16, 2015; Michael J. Mauboussin, Dan Callahan, Bryant Matthews, and David A. Holland, "How to Model Reversion to the Mean: Determining How Fast, and to What Mean, Results Revert," *Credit Suisse Global Financial Strategies*, September 17, 2013.
- ⁴ Robert Novy-Marx, "The Other Side of Value: The Gross Profitability Premium," *Journal of Financial Economics*, Vol. 108, No. 1, April 2013, 1-28. Credit Suisse's HOLT team also analyzed this topic. See Bryant Matthews, David A. Holland, and Richard Curry, "The Measure of Quality," *Credit Suisse HOLT Wealth Creation Principles*, February 2016.
- ⁵ Some researchers are critical of the claim that gross profit, the numerator of gross profitability, is a better measure of earnings than other popular measures such as net income or operating income. They argue that gross profitability and net income have similar predictive power when they are deflated the same way. See Ray Ball, Joseph Gerakos, Juhani T. Linnainmaa, and Valeri V. Nikolaev, "Deflating Profitability," *Journal of Financial Economics*, Vol. 117, No. 2, August 2015, 225-248. Another study suggests operating leverage explains the excess returns to gross profitability. See Michael Kisser, "What Explains the Gross Profitability Premium?" *Working Paper*, November 2014.
- ⁶ Eugene F. Fama and Kenneth R. French, "A Five-Factor Asset Pricing Model," *Journal of Financial Economics*, Vol. 116, No. 1, April 2015, 1-22.
- ⁷ Phil DeMuth, "The Mysterious Factor 'P': Charlie Munger, Robert Novy-Marx And The Profitability Factor," *Forbes*, June 27, 2013.
- ⁸ Lei Sun, Kuo-Chiang (John) Wei, and Feixue Xie, "On the Explanations for the Gross Profitability Effect: Insights from International Equity Markets," *Asian Finance Association 2014 Conference Paper*, December 23, 2014.
- ⁹ Jason Zweig, "Have Investors Finally Cracked the Stock-Picking Code?" *Wall Street Journal*, March 1, 2013.
- ¹⁰ Dan Lovallo and Daniel Kahneman, "Delusions of Success: How Optimism Undermines Executives' Decisions," *Harvard Business Review*, July 2003, 56-63.
- ¹¹ William M. K. Trochim and James P. Donnelly, *The Research Methods Knowledge Base, Third Edition* (Mason, OH: Atomic Dog, 2008), 166. See <http://www.socialresearchmethods.net/kb/regmean.php>.
- ¹² Michael J. Mauboussin, Dan Callahan, and Darius Majd, "What Makes for a Useful Statistic: Not All Numbers Are Created Equal," *Credit Suisse Global Financial Strategies*, April 5, 2016.