

Book Excerpt: *Quantitative Value*

[It] is extraordinary to me that the idea of buying dollar bills for 40 cents takes immediately to people or it doesn't take at all. It's like an inoculation. If it doesn't grab a person right away, I find that you can talk to him for years and show him records, and it doesn't make any difference. They just don't seem able to grasp the concept, simple as it is.

—Warren Buffett, *The Superinvestors of Graham-and-Doddsville*¹

Corporate gold dollars are now available in quantity at 50 cents and less—but they do have strings attached.

—Benjamin Graham, *Should Rich but Losing Corporations Be Liquidated?*²

It is difficult to overstate Benjamin Graham's impact on Wall Street. He arrived there in 1914 fresh from Columbia College, where he just had turned down offers to undertake doctorates in the philosophy, mathematics, and English departments. He was employed on Wall Street as a "statistician" (as analysts were known then) and observed in this role that the "mass of information" available from the data services like Moody's and Standard Statistics was "largely going to waste in the area of common-stock analysis." Graham found Wall Street "virgin territory for examination by a genuine, penetrating analysis of security values."³

Graham wasn't exaggerating about the lack of real analysis on Wall Street. At the time, stock market statisticians had a deservedly poor reputation. A 1932 paper by Alfred Cowles III had asked, "Can stock market forecasters forecast?" and concluded that they could not. With the aid of an IBM punch card machine, Cowles examined the investment performance of 16 statistical services, 25 insurance companies, 24 forecasting letters, and the Dow Theory editorials of William Peter Hamilton over the period from December 1903 to December 1929. Only a handful beat the market. Worse, Cowles concluded of the performances of those few who had beaten the market that their results were "little, if any, better than what might be expected to result from pure chance."⁴

Graham took it upon himself to form a rigorous analytical framework for the scrutiny of securities. In 1927, he started teaching his philosophy at Columbia in a night class called "Security Analysis." By 1934, Graham, with the assistance of David Dodd, a student who had taken his first night class in 1927 and was by 1934 a Columbia Business School professor, converted his lectures into *Security Analysis*, his magnum opus. Graham and Dodd's 1934 publication of *Security Analysis* laid out the first well-reasoned and comprehensive approach to analyzing securities. As each new edition was published, and with the subsequent publication of

¹ Warren Buffett, "The Superinvestors of Graham-and-Doddsville," *Hermes Magazine*, Columbia Business School alumni magazine, 1984. Available at www7.gsb.columbia.edu/alumni/news/hermes/print-archive/superinvestors.

² Benjamin Graham, "Should Rich But Losing Corporations Be Liquidated." Reprinted on *Forbes.com*, December 27, 1999. Available at <http://www.forbes.com/forbes/1999/1227/6415410a.html>.

³ Justin Fox, *The Myth of the Rational Market: A History of Risk, Reward, and Delusion on Wall Street* (New York: HarperBusiness, 2009).

⁴ *Ibid.*

The Intelligent Investor in 1949⁵, Graham refined his approach, but the philosophy remained the same: equity securities should be regarded as a part share in a business. An investor should thoroughly analyze a security's financial statements to determine a conservative valuation for the security. If the price of the security was available in the market at a sufficient discount to the rough valuation to provide a margin of safety, the security could be purchased. This was "value" investing. With *Security Analysis* Graham introduced a philosophy that, if applied with discipline, promised to identify stocks set to perform better than the market averages.

While academics continue to debate the reasons why, they almost universally agree that value stocks have outperformed the market. The chart below compares the cumulative returns to the portfolios constructed from the value decile according to several different price ratios⁶: price-to-book value⁷ (**P/B**), price-to-earnings⁸ (**P/E**), total enterprise value⁹-to-earnings before interest, taxes, depreciation, and amortization¹⁰ (**TEV/EBITDA**).

⁵ Benjamin Graham, *The Intelligent Investor: A Book of Practical Counsel: 4th Edition*. (Harper & Row Publishers, 1986).

⁶ A "price ratio" is a measure of a stock's cost relative to a "fundamental," an item found through analysis of the stock's financial statements (for example, book value or earnings). Price ratios make stocks comparable on a like-for-like basis.

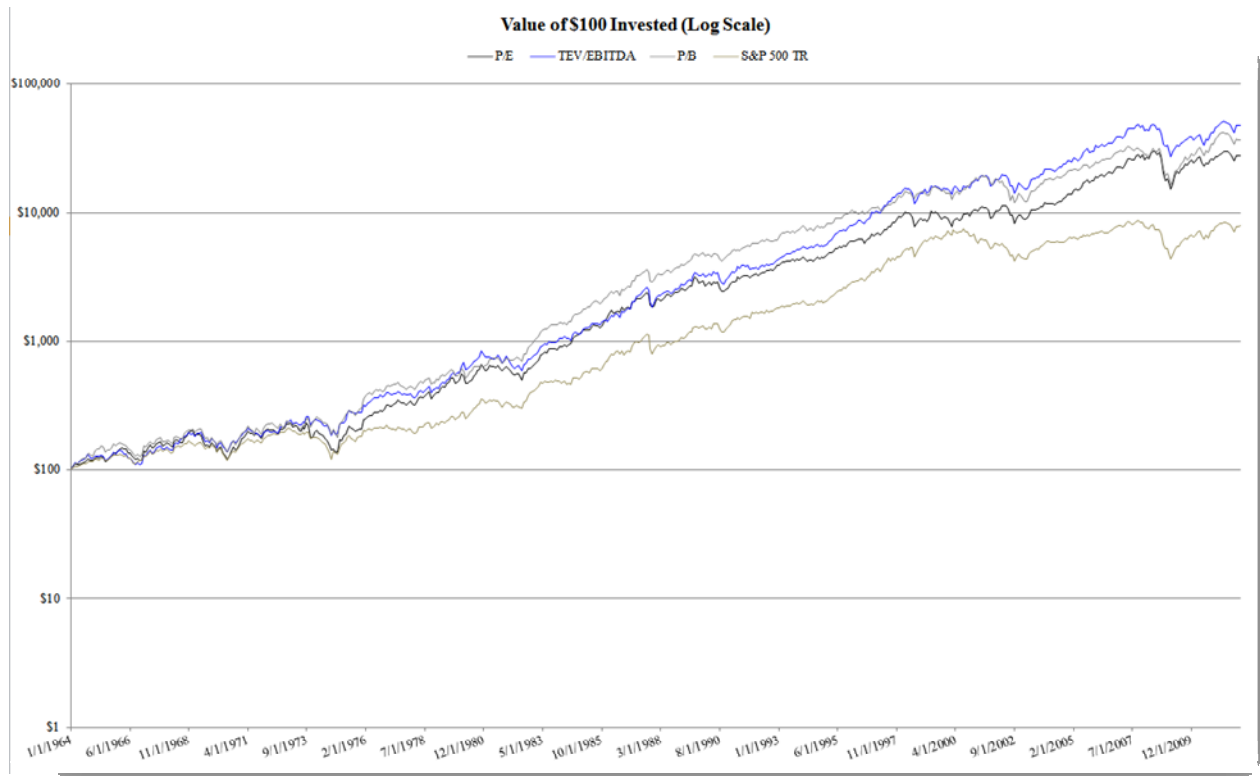
⁷ "Book value" is the residue of assets after deducting liabilities recorded on the Balance Sheet.

⁸ "Earnings" is a stock's profit after tax recorded on the Profit and Loss Statement. It is the "bottom line."

⁹ "Enterprise value" is market capitalization plus preferred stock plus minority interests (if any) plus debt plus unfunded pension liabilities less cash. It is the total cost paid to acquire a company in its entirety.

¹⁰ "Earnings before interest, taxes, depreciation, and amortization" is calculated as it is described. It is a measure of earnings that seeks to adjust for the impact of tax and different mixes of debt and equity in a stock's capital structure.

Figure 1: Chart comparing price ratio performance to S&P500TR (1964 to 2011)



Source: Gray and Carlisle, *Quantitative Value* (December 2012) Wiley Finance.

The chart in Figure 1 demonstrates that, whichever price ratio we choose to examine, over the 47-year period under consideration, value portfolios cumulatively outperformed the market. Figure 2 sets out a table containing the performance statistics for each of the price ratios in the chart.

Figure 2: Table comparing price ratio performance to S&P500TR (1964 to 2011)

	P/E	Enterprise Multiple	P/B	S&P500 TR
Compound Annual Growth Rate (CAGR)	12.44%	13.72%	13.11%	9.52%
Standard Deviation	17.62%	17.25%	17.39%	15.19%
Downside Deviation	12.17%	11.49%	11.12%	10.66%
Sharpe Ratio	0.46	0.53	0.50	0.33
Sortino Ratio	0.68	0.82	0.80	0.50
Worst Drawdown	-49.01%	-43.45%	-49.20%	-50.21%
Worst Month Return	-22.02%	-18.66%	-22.37%	-21.58%
Best Month Return	25.75%	16.95%	28.59%	16.81%
Profitable Months	60.42%	62.85%	61.63%	60.94%

Source: Gray and Carlisle, *Quantitative Value* (December 2012) Wiley Finance.

The persistence of the value stocks' outperformance seems to defy common sense. Why haven't other market participants eaten the seemingly free lunch on offer? Behavioral finance researchers Joseph Lakonishok, Andrei Shleifer and Robert Vishny in their 1994 paper, "Contrarian Investment, Extrapolation, and Risk"¹¹ argue that value stocks generate better returns because they are contrarian to the behaviorally suboptimal strategies followed by "naïve" investors. "Naïve" investors form expectations about the future performance of stocks without a full appreciation of the phenomenon of mean reversion. They tend to form these expectations on prospects for each individual stock without properly weighting the "base rate," or historical average for that class of stocks. This manifests in investors extrapolating past earnings performance too far into the future; assuming a trend in stock prices will persist; simply overreacting to good or bad news; or conflating a well-run company with a good investment, irrespective of price. Whatever the reason, investors tend to get overly excited about stocks that have done well in the past and bid them up so that these glamour stocks become overpriced. They also overreact to stocks that have done badly, oversell them, and these out-of-favor value stocks become undervalued. Value investors exploit these behavioral errors, investing in undervalued stocks on the expectation that they will revert to the mean and, consequently, beat the market. That's the theory, but as the truism often attributed to Yogi Berra has it, "In theory there is no difference between theory and practice. In practice there is."

¹¹ Lakonishok, J., A. Shleifer and R.W. Vishny, "Contrarian investments, extrapolation, and risk," *Journal of Finance*, Vol. XLIX, No. 5, pp. 1541-1578, 1994.

Graham recognized early on that successful investing required more than an intellectual appreciation for the performance of undervalued stocks: it required emotional discipline. He wrote in the introduction to *The Intelligent Investor*¹²:

Our main objective will be to guide the reader against the areas of possible substantial error and to develop policies with which he will be comfortable. We shall say quite a bit about the psychology of investors. For indeed, the investor's chief problem—and even his worst enemy—is likely to be himself. (“The fault, dear investor, is not in our stars—and not in our stocks—but in ourselves. ...”) This has proved the more true over recent decades as it has become more necessary for conservative investors to acquire common stocks and thus to expose themselves, willy-nilly, to the excitement and the temptations of the stock market. By arguments, examples, and exhortation, we hope to aid our readers to establish the proper mental and emotional attitudes toward their investment decisions. We have seen much more money made and kept by “ordinary people” who were temperamentally well suited for the investment process than by those who lacked this quality, even though they had an extensive knowledge of finance, accounting, and stockmarket lore.

The problem is that simply exhorting investors to “establish the proper mental and emotional attitudes toward their investment decisions” is not enough. Graham seems to nod to this when he says “‘ordinary people’... temperamentally well suited for the investment process” will make more money than those who have “extensive knowledge of finance, accounting, and stockmarket lore.” The problem is behavioral rather than rational. We can understand the issue on an intellectual level, and still fall victim to it because our emotions let us down. Seth Klarman acknowledged as much when he wrote in his book *Margin of Safety*¹³:

So if the entire country became securities analysts, memorized Benjamin Graham's *Intelligent Investor* and regularly attended Warren Buffett's annual shareholder meetings, most people would, nevertheless, find themselves irresistibly drawn to hot initial public offerings, momentum strategies and investment fads. People would still find it tempting to day-trade and perform technical analysis of stock charts. A country of security analysts would still overreact. In short, even the best-trained investors would make the same mistakes that investors have been making forever, and for the same immutable reason—that they cannot help it.

If mere awareness that our judgments are biased does little to correct the errors we make, how then can we protect against these errors? Nassim Taleb, author of the book *Fooled by Randomness*¹⁴ argues that we should not even attempt to correct our behavioral flaws, but should instead seek to “go around” our emotions:

We are faulty and there is no need to bother trying to correct our flaws. We are so defective and so mismatched to our environment that we can just work around these

¹² Graham.

¹³ Seth A. Klarman, Seth, A. *Margin of Safety: Risk-Averse Value Investing Strategies for the Thoughtful Investor*, (New York: HarperCollins, 1991).

¹⁴ Nassim Nicholas Taleb, *Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets*. (Random House, 2008).

flaws. I am convinced of that after spending almost all my adult and professional years in a fierce fight between my brain (not *Foiled by Randomness*) and my emotions (completely *Foiled by Randomness*) in which the only success I've had is in going around my emotions rather than rationalizing them. Perhaps ridding ourselves of our humanity is not in the works; we need wily tricks, not some grandiose moralizing help. As an empiricist (actually a skeptical empiricist) I despise the moralizers beyond anything on this planet: I wonder why they blindly believe in ineffectual methods. Delivering advice assumes that our cognitive apparatus rather than our emotional machinery exerts some meaningful control over our actions. We will see how modern behavioral science shows this to be completely untrue.

Research supports Taleb's method—tricking ourselves into doing the right thing—works better than simply trying to do the right thing (or flagellating ourselves if we don't).¹⁵ James Montier, an expert in behavioral investing, discusses this phenomenon in his book, *Behavioral Investing: A Practitioners Guide to Applying Behavioral Finance*¹⁶ writing, “Even once we are aware of our biases, we must recognize that knowledge does not equal behavior. The solution lies in designing and adopting an investment process that is at least partially robust to behavioral decision-making errors.”¹⁷ The advantage of a quantitative approach to investment is that it starts with the idea that most of us are temperamentally unsuited to investing, and then seeks to protect against those potential errors. If we acknowledge this flaw from the outset, we can build a process to force or trick us into exhibiting the correct behaviors. Our cognitive biases are most pronounced when we reason intuitively, so the more we rely on statistical evidence and limit our discretion, the fewer errors we should make. This is a powerful argument for a quantitative approach to value investment.

In *Quantitative Value: A Practitioner's Guide to Automating Intelligent Investment and Eliminating Behavioral Errors* (hardcover, 288 pages, Wiley Finance) we make the case for quantitative value investment in stock selection and portfolio construction as a means for avoiding behavioral errors. Our contention is that a quantitative approach to value investing assists us to defend against our own behavioral errors, and exploit the errors made by others. In the book, we examine in detail industry and academic research into a variety of fundamental value investing tools, independently backtest each, and combine the best into a new quantitative value investment model.

We then created a checklist based on our research. We divide our quantitative investment checklist into three broad categories:

¹⁵ See, for example, Charles G. Lord, Elizabeth Preston, and Mark Lepper, “Considering the Opposite: A Corrective Strategy for Social Judgment.” *Journal of Personality and Social Psychology* 47(6) (1984): 1231–1243; or Asher Koriat, Sarah Lichtenstein, and Baruch Fischhoff, “Reasons for Confidence.” *Journal of Experimental Psychology: Human Learning and Memory* 6(2) (1980): 107–118.

¹⁶ James Montier, *Behavioural Investing: A Practitioners Guide to Applying Behavioural Finance* (Hoboken, NJ: John Wiley & Sons, 2007).

¹⁷ James Montier. *The Little Book of Behavioral Investing: How Not To Be Your Own Worst Enemy* (Little Books, Big Profits (UK)), (Hoboken, NJ: John Wiley & Sons, 2010).

1. Steps to avoid stocks at the highest risk of sustaining a permanent loss of capital, including those exhibiting financial statement manipulation, fraud, or financial distress (e.g. bankruptcy)
2. Steps to find stocks of the highest quality, which we define as those possessing an economic franchise, and superior financial strength
3. Steps to identify the most undervalued stocks that lead to the best risk-adjusted investment performance.

Applying the Model

We ran our model on March 13, 2013, finding Apple Inc. (AAPL) to be one of the highest quality stocks in the bargain bin. AAPL designs, manufactures and markets a variety of mobile devices, including the *iPhone*, *iPad*, and *iPod*, along with *Mac* products, operating systems, cloud products, related software and services, and many other products. Its devices are ubiquitous, and are catnip to consumers, driving one of the most valuable brands in the world. Why has the company shed over a third of its market capitalization since peaking near \$700 per share in September of 2012?

In short, this former hedge fund darling has become the company that everyone loves to hate. *iPod* and *Mac* sales are down from last year. The media has pounced on reports of weakness in the sale of the *iPhone 5* and now questions whether AAPL will be competitive with the newest smartphones. The market did not react well to AAPL's latest earnings announcement, and dozens of analysts have reduced their price targets over the past few months. So what's going on here? Is AAPL again headed for the technology dustbin of history? Or might this be a manifestation of investors' behavioral bias?

Our model leads us to believe that AAPL offers exceptional franchise characteristics and is statistically cheap, with an EBIT/TEV yield of nearly 21 percent, which is among the very cheapest within the cheapest decile of stocks in the market. Below are some additional highlights from the quantitative output of our screens, which will give the reader a high-level view of the company's profile, and then we will dig deeper on some details. Clearly, the fact that Mr. Market is offering us a company of this quality at this price should raise some questions.

Figure 3: Apple Summary Statistics (March 13, 2013)

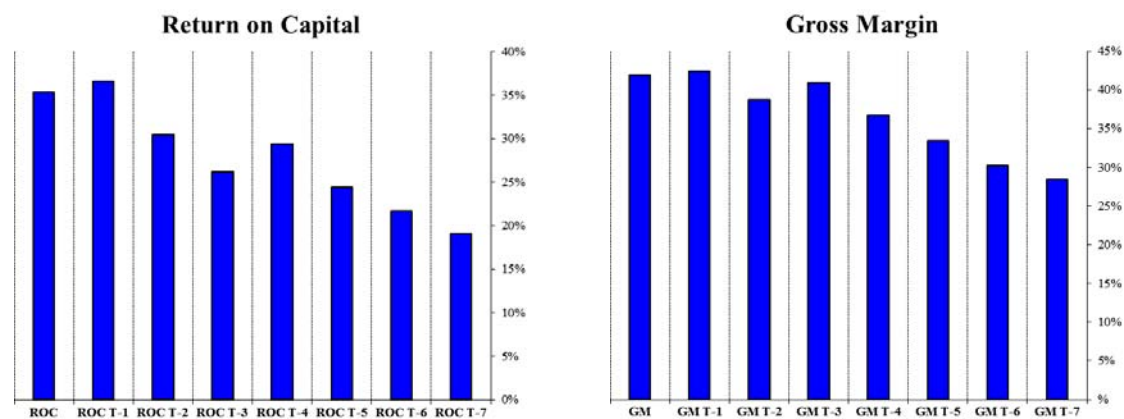
EBIT/TEV	EBIT (\$B)	TEV (\$B)	Avg. Vol (20day, \$B)	Price	Mkt. Cap. (\$B)
20.78%	\$55.11	\$265.21	\$7.41	\$428.35	\$402.25
Eight-Year ROA	Percentile Eight-Year ROA	Eight-Year ROA	Percentile Eight-Year ROA	Safety Score	
17.1 percent	97 percent	27.7 percent	97 percent	3/3	

Source: Empiritrage, LLC, Bloomberg, LP

Does AAPL have an Economic Franchise?

What makes us believe AAPL might be a high quality company? AAPL has developed a reputation for developing exceptionally easy-to-use products, and this has contributed to a widely trusted brand that allows AAPL to charge a premium over competing products. AAPL's return on capital (Figure 4) and gross margin (Figure 5) have been nothing short of extraordinary.

Figures 4 and 5: Return on Capital and Gross Margin for the past 8 years.



Source: Empiritrage, LLC, Bloomberg, LP

Consider also the company's positioning in the growing market for mobile devices. The company has a well-established mobile platform with strong market share. The growth in sales of notebooks, tablets and other mobile devices, which consumers increasingly prefer to personal computers, has enabled AAPL to establish its *iOS* software as a leading mobile personal computing operating system. The primary competitor for *iOS* is Android, a Linux-based, Google-supported open source operating system. AAPL does not license its *iOS* operating system, and bundles it with its hardware, which requires *iOS* to function. Many of AAPL's big competitors want badly to be accessible on *iOS*. For example, Google is rumored to be paying AAPL up to \$1 billion to be the default search engine on *iOS*, and that number may go up in future years. Additionally, AAPL tightly controls the development of high quality Apps on its *iOS* platform, thus further enhancing its reputation for quality, and thus its brand. It is notable that AAPL's *App Store* revenues are a multiple of those for *Google Play*, the application store for Android.

Activist investor David Einhorn, who raised his AAPL stake by nearly 50 percent in the last quarter of last year, has observed that AAPL can be thought of as a software company (*iOS*, *OS X*, the *App Store*, *iTunes*, and *iCloud*) that drives earnings through recurring update/upgrade cycles for its hardware products that access that software. The company's wide range of products, united by their reliance on the *iOS* operating system, creates an economic moat for the company, since users are reluctant to leave the AAPL product ecosystem due to high switching costs. This arrangement is an additional source of pricing power as it enables AAPL to maintain

or grow margins for its hardware, based on captive demand for the software platform. AAPL has grown its gross margins at a rate of 5.7 percent per year over the past eight years, which places the company in the 93rd percentile of our universe.

Why do consumers pay up for additional AAPL devices? The typical AAPL customer might have an array of applications, and a content library that includes music and photos—it is expensive and challenging to migrate these to another platform. Who needs the hassle when you can buy AAPL products that all communicate with each other? *iCloud* may be a natural extension of this strategy, as the consumer's hard drive contents and libraries can be easily shared across all of AAPL's devices.

Our qualitative review of AAPL seems consistent with the quantitative analysis of long-term returns and margins. At least historically, AAPL shows signs that it possesses an economic moat.

Is AAPL Financially Strong?

The evidence suggests that AAPL enjoys a fairly wide economic moat. Clearly, an 18 percent EBIT/TEV yield signals that the market is pricing AAPL as if the economic moat will deteriorate over time. Our research suggests that economic moats are sticky over time—once you establish a moat, it tends to stay in place for a lot longer than the market expects. How does one trade on this empirical finding? By purchasing firms with economic moats at bargain prices and letting history repeat itself. There is a potential snag with this strategy. In order for a firm to take advantage of favorable economics, this firm needs to survive through short-term stresses. We analyze this ability to survive via a checklist to determine financial strength. Our process is similar to the nine-point *F_Score* proposed by Stanford accounting professor Joe Piotroski. We have adapted and improved upon the *F-Score*, and created a ten-point checklist we call the “Financial Strength” or *FS_Score*. This simple checklist helps us distinguish the winners from the losers among low-priced stocks.

Our *FS_Score* checklist is broken into three key areas: profitability, stability, and recent operating improvements:

1. *Profitability*: AAPL is currently highly profitable, generating 23.7 percent Net Income on Total Assets, which is notably higher than its long run average, and Free Cash Flow/Assets is also strong at 26.9 percent. AAPL's cash flow exceeded its net income, indicating that the company is not currently using accruals, which would be a statistical red flag. Overall, we give the company three out of a possible three points with respect to our profitability metrics.
2. *Stability*: Turning to our next component of financial strength, stability measures, we find that AAPL's leverage is unchanged, remaining at zero. Although this is not a negative development, the company must be showing improving leverage (scaled by assets) to earn a point. Additionally, AAPL's current ratio decreased by 8.7 percent, which signals decreased liquidity, and ability to meet creditor demands. Although few would have a view that AAPL could have problems meeting its short-term obligations, based on our statistical output we cannot award

a point here either. AAPL was also a net issuer of equity. The company should be a net repurchaser of equity to win a point here. AAPL achieves zero out of a possible three points for its stability.

3. *Recent operating improvements:* Next we review the company's recent operating improvements across several key statistical metrics. Return on assets decreased slightly versus a year ago, which is a negative sign and does not earn the company a point. Free Cash Flow/Assets also decreased versus a year ago, and thus we withhold another point here, as less free cash flow per unit of assets is statistically undesirable. AAPL's gross margins decreased year-on-year, which also fails to earn the company a financial strength point. Finally, AAPL's asset turnover ratio increased versus the prior year, indicating a more efficient use of the company's assets. Overall, the company scores one out of a possible four points in connection with its recent operating improvements.

AAPL scores four out of a possible ten points on our FS_Score. While AAPL is not using accruals and is profitable, it is not showing statistical signs of stability, and among our four operating improvements metrics, the company shows an improvement only in its asset turnover ratio. A human analyst could dig deeper on the question of trends in margins, net equity issuance, and overall operating momentum. While there are some questions here, the company is highly profitable, has no debt, and enjoys increasing returns on assets.

Profitability			Stability			Recent Operating Improvements				FS_SCORE (out of 10)
ROA	FCFTA	ACCRUAL	DEBT	CR	NEQISS	ΔROA	ΔFCFTA	ΔMARGIN	ΔTURN	
1	1	1	0	0	0	0	0	0	1	4/10

Source: Empiritrage, LLC, Bloomberg, LP

Summary

Let's review our conclusions. With an EBIT/TEV yield of 21 percent, AAPL is cheap. It is among the cheapest stocks in our investable universe. On this basis alone, the company is worth owning. AAPL's brand is one of the strongest and most recognizable in the world: the *iPhone*, *iPad*, and *iPod* and other popular AAPL products have changed the way people interact with technology. AAPL's success at innovating and maintaining quality and customer trust, and its software platform, keep customers returning to purchase new products. This has enabled the company to continue to command high price points, and thus grow its margins over time and maintain strong returns on assets and capital.

AAPL's mobile device platform, based on its *iOS* operating system, has become a market leader, and is a formidable competitor to Android. It is not unreasonable to think that *iOS* could eventually dominate this market. AAPL's software is bundled with its hardware, which requires *iOS* or other AAPL operating system. This dependence of AAPL hardware on its software creates an interdependent and integrated product suite that makes it more difficult for customers to switch away from AAPL's product ecosystem. This provides AAPL with ongoing pricing

power, and enables the company to grow its margins and generate sustained high returns on assets and capital.

The company is showing statistical signs that it possesses an economic moat consistent with these observations. Normalized eight-year geometric average returns on assets of 17.1 percent and returns on capital of 27.8 percent are both spectacular, earning scores for each metric that fall in the 97th percentile of our screening universe. These are higher returns than the vast majority of companies we examine and demonstrate the strength and durability of AAPL's franchise. Normalized eight-year geometric gross margin growth of 5.7 percent places AAPL in the 93rd percentile of our universe, and also suggests the existence of a strong franchise.

The company is highly profitable, with strong returns, and free cash flow, its margins have grown over a long time frame, and it is not currently using accruals, which would be a red flag. While our overall Financial Strength score of 4/10 is not spectacular, neither is it weak, and AAPL's cash balance is a backstop we should not ignore. AAPL scores in the 99th percentile for our overall Franchise Power score, and scores 40 percent (4/10) for Financial Strength; thus its overall quality score (average of these two metrics) is 69 percent, which is a solid quality score within our universe. Statistically speaking, we could reasonably argue that AAPL's stratospheric Franchise Power score comfortably offsets its weaker Financial Strength score. Additionally, the company passed our screens for manipulation and financial distress, scoring a 3/3 for safety. The numbers suggest that the company shows no signs of fraud, manipulation, or financial distress.

We believe a quantitative or fundamental analyst could make a reasonable case that the market for AAPL stock has gotten overly bearish, heavily discounting earnings growth, even as the company continues to benefit from its economic moat and additional statistical trends. In summary, AAPL appears to be an inexpensive, safe, high quality, mega-capitalization stock with significant franchise power, and can provide investors a good way to get exposure to the technology sector.

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