# Analyzing Valuation Measures: *A Performance Horse Race over the Past 40 Years*

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It's a basic research question: Which valuation metric has historically performed the best?

Practitioners have relied on a variety of valuation measures, including price-to-earnings ratio (P/E) and the relationship between total enterprise value and earnings before interest, taxes, depreciation, and amortization (TEV/EBITDA). Meanwhile, academic research (e.g., Fama and French [1992]) has traditionally relied on the book-to-market ratio (B/M) and the more recent gross-profits measure (GP), introduced by Novy-Marx [2010].

Eugene Fama and Ken French consider B/M a superior metric. They reason:

> We always emphasize that different price ratios are just different ways to scale a stock's price with a fundamental, to extract the information in the cross-section of stock prices about expected returns. One fundamental (book value, earnings, or cash flow) is pretty much as good as another for this job, and the average return spreads produced by different ratios are similar to and, in statistical terms, indistinguishable from one another. We like BtM because the book value in the numerator is more stable over time than earnings or cashflow, which is important for keeping turnover down in a value portfolio.[1]

Fama and French suggest that different price ratios are "pretty much as good as another for this job" of explaining returns. We beg to differ. We find economically and statistically significant differences in the performance of various valuation metrics. We examine a large swath of pricing metrics, all expressed in yield format:

- Earnings to market capitalization (E/M)
- Earnings before interest and taxes and depreciation and amortization to total enterprise value (EBITDA/TEV)
- Free cash flow to total enterprise value (FCF/TEV)
- Gross profits to total enterprise value (GP/TEV)
- Book to market (B/M)
- Forward earnings estimates to market capitalization (FE/M)

During the analyzed period of 1971 through 2010, we find that EBITDA/TEV is the best valuation metric to use as an investment strategy, relative to other valuation metrics. (Loughran and Wellman [2009] find similar results.) An annually rebalanced, equal-weight portfolio of high EBITDA/TEV stocks earns 17.66% a year, with a 2.91% annual three-factor alpha (eliminating stocks below the 10% NYSE market-equity breakpoint). This compares favorably to E/M,

a practitioner favorite that inverts price to earnings, or P/E. Cheap E/M stocks earn 15.23% a year, but show no evidence of alpha after controlling for market, size, and value exposures.

The academic favorite, book to market (B/M), tells a story similar to that of E/M. It earns 15.03% for the cheapest stocks, but with no alpha. Forward earnings estimates to market (FE/M) is the worst-performing metric by a wide margin, suggesting that investors should shy away from using analyst earnings estimates to make investment decisions.

We make other interesting empirical observations about valuation metrics. When we analyze returns' spread between the cheapest and most expensive stocks, given a specific valuation measure, we again find that EBITDA/TEV is the most effective measure. The lowest-quintile returns based on EBITDA/TEV return 7.97% a year, versus 17.66% for the cheapest stocks—a spread of 9.69%. This compares very favorably to the E/M spread, which is only 5.82% (9.41% for the expensive quintile and 15.23% for the cheap quintile).

Valuation metrics that incorporate last year's earnings or forward earnings are interesting, but what about long-term valuation metrics? Going back to the 1930s, practitioners have promoted the concept of using *normalized earnings* in place of simple one-year earnings estimates. For example, Graham and Dodd [1934, p. 452] speak to the use of current earnings in the context of valuation metrics. Earnings in P/E, they said, "should cover a period of not less than five years, and preferably seven to ten years."

More recently, academics such as Campbell and Shiller [1998], suggested that annual earnings are noisy as a measure of fundamental value. Anderson and Brooks [2006] conducted a robust study of long-term P/E ratios and found evidence that using a long-term earnings average (eight years) in place of one-year earnings increases the spread in returns between value and growth stocks by 6%. (Their evidence is on the U.K. stock market from 1975 through 2003). We are unable to replicate this result in the U.S. stock market and find mixed results with long-term valuation measures.

## DATA

Our data sample includes all firms on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ firms with the required data on CRSP and Compustat. We only examine firms with ordinary common equity on CRSP and eliminate all REITS, ADRS, closed-end funds, utilities, and financial firms. We incorporate CRSP delisting return data using the technique of Beaver, McNichols, and Price [2007]. To be included in the sample, all firms must have a non-zero market value of equity as of June 30 of year *t*. We construct our valuation measures according to the following formulas:

- *Total enterprise value (TEV)*
  Similar to the Loughran and Wellman [2011], we compute TEV as TEV = Market Capitalization (M) + Short-term Debt (DLC) + Long-term Debt (DLTT) + Preferred Stock Value (PSTKRV) – Cash and Short-term Investments (CHE). This variable is used in multiple valuation measures.
- *Earnings to market capitalization (E/M)*
  Following Fama and French [2001], we compute earnings as Earnings = Earnings Before Extraordinary Items (IB) – Preferred Dividends (DVP) + Income Statement Deferred Taxes (TXDI), if available.
- *Earnings before interest and taxes and depreciation and amortization to total enterprise value (EBITDA/TEV)*
  We compute EBITDA as EBITDA = Operating Income Before Depreciation (OIBDP) + Non-operating Income (NOPI).
- *Free cash flow to total enterprise value (FCF/TEV)*
  Similar to Novy-Marx [2010], we compute FCF as FCF = Net Income (NI) + Depreciation and Amortization (DP) – Working Capital Change (WCAPCH) – Capital Expenditures (CAPX).
- *Gross profits to total enterprise value (GP/TEV)*
  Following Novy-Marx [2010], we compute GP as GP = Total Revenue (REVT) – Cost of Goods Sold (COGS).
- *Book to market (B/M)*
  Similar to Fama and French [2001], we compute Book Equity as Book Equity = Stockholder's Equity (SEQ) [or Common Equity (CEQ) + Preferred Stock Par Value (PSTK) or Assets (AT) – Liabilities (LT )] – Preferred Stock (defined below) + Balance Sheet Deferred Taxes and Investment Tax Credit (TXDITC) if available.

- *Preferred Stock*
  We consider Preferred Stock as = Preferred Stock Redemption Value (PSTKRV) [or Preferred Stock Liquidating Value (PSTKL), or Preferred Stock Par Value (PSTK)].
- *Forward Earnings Estimates/Market Capitalization*
  Forward Earnings = Consensus I/B/E/S earnings forecast of EPS for the fiscal year (available 1982 through 2010). We used a mean of all analysts' annual forecasts issued between March 31 and June 30 of year *t* for each firm, to capture the most recent analyst forecasts.

We restrict our data to include only those firms that have eight years of data for all the necessary metrics described above (except FE/M). We impose this restriction to ensure we can conduct all the necessary analysis on a similar universe when we perform long-term valuation tests. To ensure a baseline amount of liquidity in the securities on which we perform our tests, we restrict our analysis to firms that are above the tenth percentile NYSE market equity breakpoint on June 30 of each year.

Stock returns are measured from July 1971 through December 2010. Firm size (e.g., market capitalization) is determined by the June 30 value of year *t*. Firm fundamentals are based on December 31 of year $t-1$. For firms with fiscal years ending between January 1 and March 31 we use year *t* fundamentals; for firms with fiscal years ending after March 31 we use year $t-1$ fundamentals. We sort firms into quintiles on each measure on June 30 of year *t,* and use this value to compute the monthly returns from July of year *t* to June of year $t+1$. Equal-weight and value-weight portfolio returns are buy and hold.

## DATA SUMMARY STATISTICS

Exhibit 1 outlines the summary statistics. This exhibit highlights the fact that our universe, which includes only firms with eight full years of data for all the variables, is similar to a universe that only requires firms to have one year of data. Though the eight-year universe firms are larger than the one-year universe firms, we see that B/M, leverage, momentum, volatility, and turnover are similar for the one- and eight-year universes. We replicate our analysis using universes that are less constrained than our requirement that all firms have eight years of data. All our results are similar.

## RESULTS: A COMPARISON OF VALUATION METRICS

### Valuation Metric Performance

We analyze the compound-annual growth rates (CAGR) of each valuation metric during the 1971 to 2010 period for equal-weight and value-weight portfolios. Exhibit 2 shows the portfolio quintiles' returns sorted by cheap (quintile 5) and expensive (quintile 1). Each valuation metric captures the well-known return spread between cheap stocks (value) and expensive stocks (growth).

But not all valuation metrics are created equal. For example, FCF/TEV does a decent job capturing the

**EXHIBIT 1**
**Summary Statistics: CRSP Universe Compared to Sample**

This exhibit reports summary statistics for CRSP stocks with information on all the variables in the exhibit compared to all stocks with eight years of data for all variables in the exhibit. The returns are from July 1, 1971 until December 31, 2010. This sample excludes financials, utilities, and all firms below the NYSE 10% market capitalization cutoff. These sample statistics do not require firms to have a forward earnings estimate. The portfolio is formed each year on June 30 and held for one year. The market value of equity (ME) is measured on June 30 each year. B/M is defined as (stockholder's equity + deferred taxes and investment tax credit + preferred stock redemption value) divided by ME. Leverage is defined as long term debt divided by the book value of assets (described above for B/M). Ret (–2, –12) is the buy-and-hold return from the previous July (t – 1) through May (t). Volatility is the standard deviation of daily returns computed over the past year (250 trading days). Turnover is the average daily share turnover during the past year (250 trading days).

| | ME (millions) | B/M | Leverage | Ret (–2,–12) | Volatility | Turnover |
|---|---|---|---|---|---|---|
| **Panel A: All CRSP Stocks Common Stocks** | | | | | | |
| Mean | 2198 | 0.608 | 0.481 | 0.227 | 0.042 | 0.007 |
| 25th Percentile | 115 | 0.254 | 0.027 | –0.112 | 0.018 | 0.001 |
| Median | 322 | 0.478 | 0.269 | 0.116 | 0.024 | 0.003 |
| 75th Percentile | 1001 | 0.819 | 0.623 | 0.400 | 0.034 | 0.007 |
| **Panel B: All Stocks with 8 years of data** | | | | | | |
| Mean | 3164 | 0.665 | 0.474 | 0.200 | 0.041 | 0.006 |
| 25th Percentile | 159 | 0.315 | 0.075 | –0.102 | 0.017 | 0.001 |
| Median | 471 | 0.544 | 0.317 | 0.110 | 0.023 | 0.003 |
| 75th Percentile | 1546 | 0.882 | 0.640 | 0.369 | 0.031 | 0.006 |

# EXHIBIT 2
## One-Year Valuation-Measure Performance

This exhibit reports return statistics for CRSP stocks with eight years of data for all variables in the exhibit. The returns are from July 1, 1971 until December 31, 2010. This sample excludes financials and utilities, and all firms below the NYSE 10% market capitalization cutoff. The sample is sorted into quintiles on June 30 of each year, and each portfolio is held for one year. Panel A reports the annual returns (equal and value-weighted) for each quintile portfolio based on one of the following valuation measures: E/M, EBITDA/TEV, FCF/TEV, GP/TEV, and B/M. Panel A also reports the returns of the equal- and value-weight market. Quintile 1 holds growth stocks, whereas quintile 5 contains value stocks. Last, Panel A compares the returns of the value and growth stocks for each valuation measure in the 5-1 row. Panel B reports the Fama-French three-factor alpha for each valuation measure sorted again by quintiles. Alphas are monthly estimates times 12. t-statistics are shown in brackets below each alpha value in Panel B.

| | Equal-Weight Portfolio | | | | | | Value-Weight Portfolio | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | E/M | EBITDA/ TEV | FCF/ TEV | GP/ TEV | B/M | EW Mkt | E/M | EBITDA/ TEV | FCF/ TEV | GP/ TEV | B/M | VW Mkt |
| **Panel A: Annual Returns** | | | | | | | | | | | | |
| 1 | 10.44% | 7.97% | 11.03% | 8.31% | 9.20% | 13.04% | 9.26% | 8.16% | 9.76% | 7.83% | 9.15% | 10.09% |
| 2 | 12.40% | 11.36% | 11.19% | 11.20% | 11.93% | 13.04% | 10.81% | 8.97% | 10.10% | 9.77% | 10.61% | 10.09% |
| 3 | 13.74% | 12.55% | 12.80% | 13.41% | 13.49% | 13.04% | 10.42% | 9.91% | 10.60% | 11.29% | 10.82% | 10.09% |
| 4 | 14.60% | 15.51% | 14.38% | 15.64% | 15.64% | 13.04% | 11.98% | 12.56% | 10.74% | 13.84% | 12.41% | 10.09% |
| 5 | 15.99% | 17.66% | 16.57% | 16.53% | 15.03% | 13.04% | 13.62% | 14.39% | 13.70% | 14.97% | 13.62% | 10.09% |
| 5-1 | 5.54% | 9.69% | 5.54% | 8.22% | 5.83% | N/A | 4.37% | 6.23% | 3.94% | 7.14% | 4.47% | N/A |
| **Panel B: 3-Factor Alpha** | | | | | | | | | | | | |
| 1 | –0.95% | –1.11% | –1.96% | –1.22% | 0.41% | N/A | –0.09% | 1.66% | –1.95% | 0.23% | 2.17% | N/A |
| (Low) | [–0.77] | [–0.99] | [–1.85] | [–1.08] | [0.54] | N/A | [–0.07] | [1.61] | [–1.56] | [0.26] | [2.8] | N/A |
| 2 | 1.67% | 0.02% | –0.50% | –0.53% | 0.98% | N/A | 2.34% | –0.22% | 1.01% | 0.36% | 0.94% | N/A |
| | [2.35] | [0.02] | [–0.71] | [–0.65] | [1.46] | N/A | [2.91] | [–0.29] | [1.27] | [0.49] | [1.13] | N/A |
| 3 | 1.68% | –0.27% | 1.27% | 0.63% | 0.93% | N/A | 0.60% | –0.62% | 2.05% | 0.63% | 0.02% | N/A |
| | [2.21] | [–0.33] | [1.82] | [0.8] | [1.26] | N/A | [0.66] | [–0.64] | [2.7] | [0.74] | [0.03] | N/A |
| 4 | 1.44% | 1.58% | 1.97% | 2.10% | 1.70% | N/A | 0.94% | 0.93% | 0.73% | 2.34% | 0.29% | N/A |
| | [1.77] | [1.97] | [2.58] | [2.69] | [2.33] | N/A | [0.94] | [1.01] | [0.84] | [2.3] | [0.3] | N/A |
| 5 | 1.30% | 2.91% | 2.90% | 2.06% | –0.67% | N/A | 1.08% | 2.48% | 2.22% | 1.83% | –0.90% | N/A |
| (High) | [1.37] | [3.3] | [3.93] | [2.25] | [–0.7] | N/A | [0.98] | [1.95] | [2.09] | [1.46] | [–0.78] | N/A |

returns for cheap stocks (16.57%), but has little ability to identify low-returning growth stocks (11.03%). However, high-EBITDA/TEV stocks earn 17.66% relative to low-EBITDA/TEV stocks, which earn a meager 7.97%. On an absolute return basis, evidence suggests that EBITDA/TEV is superior to alternative valuation measures.[2]

To assess risk-adjusted performance, we control for exposures to market, size, and value, and calculate three-factor Fama and French alpha estimates for each of the quintile portfolios (see Exhibit 2, Panel B). E/M and B/M strategies show no alpha after controlling for the three-factor model. This is not particularly surprising, as B/M is one of the factors in the three-factor model, and B/M and E/M are highly correlated.

Nonetheless, alternative valuation metrics such as EBITDA/TEV, GP/TEV, and FCF/TEV actually provide economically and statistically significant alphas. There is also weak evidence that FCF/TEV can identify overvalued stocks, as evident by the –1.96% alpha on the most expensive FCF/TEV quintile. We conduct the same analysis over the more recent 1991 to 2010 period and find similar results (results not shown, but available upon request).

The value-weight portfolios show less pronounced results compared to the equal-weight portfolios, suggesting valuation metrics are more effective in smaller stocks. For example, the value-weight portfolio returns for EBITDA/TEV, which put more weight on larger stocks, earn a 14.39% return for cheap stocks and an

8.16% for expensive stocks. And though there is no clear best strategy for value-weight results, evidence suggests that EBITDA/TEV and GP/TEV have the best performance, and that all strategies have approximately the same return and the same spreads between cheap and expensive.

The alpha for value-weight portfolios tells a story similar to that of the equal-weight portfolios. There is evidence that EBITDA/TEV and FCF/TEV add value. EBITDA/TEV has a 2.48% annual alpha and FCF/TEV has a 2.22% annual alpha. The other valuation metrics have no statistically reliable alpha in the context of the Fama and French three-factor model.

## VALUATION METRIC RISK

Exhibit 3 presents common risk metrics for the valuation measures. Panel A highlights the results for cheap stocks (value). The valuation metrics are similar in character, although EBITDA/TEV and FCF/TEV stand out with favorable Sharpe and Sortino ratios (see Exhibit 3, Panel A). For example, EBITDA/TEV has a monthly Sortino of 0.26, which compares favorably to all other metrics.

Maximum draw-downs are similar across all portfolios. However, the value-weight EBITDA/TEV and FCF/TEV portfolios have maximum draw-downs that are considerably smaller than that of the other portfolios. Overall, the cheapest-ranked stock portfolios have risk characteristics that are similar, if not superior, to the buy-and-hold, equal-weight, and value-weight benchmarks.

With respect to the most expensive stocks (growth), the results suggest that buying expensive securities is a poor risk-adjusted bet (see Exhibit 3, Panel B). Maxinum draw-downs, Sharpe ratios, and Sortino ratios are uniformly worse for expensive stocks relative to cheap stocks, regardless of the valuation metric employed. Moreover, on every metric, the expensive stocks underperform the buy-and-hold benchmarks.

Exhibit 4 shows the draw-downs for EBITDA/TEV. Both Panels A and B (value- and equal-weighted portfolios) show that "cheap" stocks (value) have better drawdown measures than "expensive" stocks (growth), or CRSP and SP 500 stocks. Looking at the worst performance over 60 months, we see that "cheap" EBITDA/TEV stocks vastly outperform the market.

## FORWARD-LOOKING ESTIMATES

We repeat our analysis on all one-year valuation metrics, to include consensus forward earnings estimates to market capitalization (FE/M). The period we analyze is from July 1, 1982 through December 31, 2010, due to data limitations from I/B/E/S.

The top-ranked FE/M quintile's performance is considerably worse than all other measures.[3] For example, over the 1982 to 2010 time period the CAGR for the top-performing FE/M quintile is 8.63%. This compares poorly with the value-weight market return of 11.73% and the worst-performing valuation measure B/M, which earned 13.63% over the same period. Moreover, these returns strongly underperformed the best performing metric, EBITDA/TEV, which earned 16.37% from 1982 to 2010. The evidence suggests that investors should be wary of using forward earnings estimates in their valuation toolkit.

## RESULTS: EXAMINING LONG-TERM VALUATION MEASURES

### Long-Term Valuation Metric Performance

The central hypothesis proposed by proponents of long-term valuation metrics is that *normalizing* earnings decreases the noise of the valuation signal and therefore increases the metric's predictive power. We test this conjecture and highlight the results in Exhibit 5. In each column of Exhibit 5 we represent a different perturbation of the long-term valuation metric.

For example, the two-year column uses the two-year average of the numerator for the valuation metric. In the case of EBITDA/TEV, this is represented by the following equation:

$$\frac{EBITDA}{TEV_n} = \frac{\frac{\sum_{j=1}^{n} EBITDA_j}{n}}{TEV} \qquad (1)$$

Turning to Exhibit 5, we find little evidence that the practice of normalizing the numerator for a valuation metric has any ability to predict higher portfolio returns. If anything, the evidence suggests that the one-year valuation measure is superior to normalized metrics.

## Exhibit 3

### One-Year Price Measure Risk Metrics

This exhibit reports return statistics for CRSP stocks with eight years of data for all variables in the exhibit. The returns are from July 1, 1971 until December 31, 2010. This sample excludes financials and utilities, and all firms below the NYSE 10% market capitalization cutoff. The sample is sorted into quintiles on June 30 of each year, and each portfolio is held for one year. Panels A and B report return statistics (equal- and value-weighted) based on one of the following valuation measures: E/M, EBITDA/TEV, FCF/TEV, GP/TEV, and B/M. Panel A reports the return statistics for the value stocks (quintile 5 in Exhibit 2) for each valuation measure. Panel B reports the return statistics for the growth stocks (quintile 1 in Exhibit 2) for each valuation measure.

| | Equal-Weight Portfolio | | | | | | Value-Weight Portfolio | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | E/M | EBITDA/TEV | FCF/TEV | GP/TEV | B/M | EW Mkt | E/M | EBITDA/TEV | FCF/TEV | GP/TEV | B/M | VW Mkt |
| **Panel A: Value** | | | | | | | | | | | | |
| Monthly Sharpe Ratio | 0.17 | 0.19 | 0.18 | 0.17 | 0.15 | 0.13 | 0.15 | 0.16 | 0.16 | 0.16 | 0.14 | 0.10 |
| Monthly Sortino | 0.23 | 0.26 | 0.25 | 0.24 | 0.20 | 0.19 | 0.22 | 0.23 | 0.24 | 0.23 | 0.20 | 0.15 |
| Worst Drawdown | –50.81% | –55.11% | –52.39% | –62.53% | –60.89% | –56.31% | –45.89% | –42.50% | –41.94% | –54.61% | –53.02% | –51.57% |
| Worst 12 Month | –42.09% | –43.46% | –41.76% | –47.03% | –49.77% | –47.48% | –40.73% | –36.52% | –34.38% | –41.40% | –47.04% | –44.21% |
| Worst Monthly | –27.99% | –26.94% | –27.96% | –28.79% | –28.98% | –27.22% | –21.59% | –21.50% | –22.18% | –22.73% | –27.95% | –22.54% |
| **Panel B: Growth** | | | | | | | | | | | | |
| Monthly Sharpe Ratio | 0.09 | 0.06 | 0.10 | 0.07 | 0.08 | 0.13 | 0.08 | 0.06 | 0.09 | 0.06 | 0.08 | 0.10 |
| Monthly Sortino | 0.13 | 0.10 | 0.14 | 0.10 | 0.12 | 0.19 | 0.12 | 0.10 | 0.12 | 0.09 | 0.13 | 0.15 |
| Worst Drawdown | –61.64% | –68.96% | –61.19% | –65.19% | –57.84% | –56.31% | –57.48% | –72.85% | –61.81% | –69.83% | –54.23% | –51.57% |
| Worst 12 Month | –52.26% | –50.60% | –54.12% | –49.47% | –47.12% | –47.48% | –50.56% | –60.73% | –54.45% | –50.92% | –45.57% | –44.21% |
| Worst Monthly | –32.36% | –31.30% | –31.80% | –29.87% | –28.55% | –27.22% | –27.01% | –26.72% | –28.36% | –25.15% | –22.22% | –22.54% |

We are also unable to replicate the findings from Anderson and Brooks [2006]. These authors find evidence that the use of long-term valuation metrics increases the spread between value stocks and growth stocks by 6% a year in the U.K. stock market. In contrast to their results, we find that the spread between value and growth stocks is very similar across different normalizing periods.

## RESULTS: ROBUSTNESS OF VALUATION METRICS ACROSS THE BUSINESS

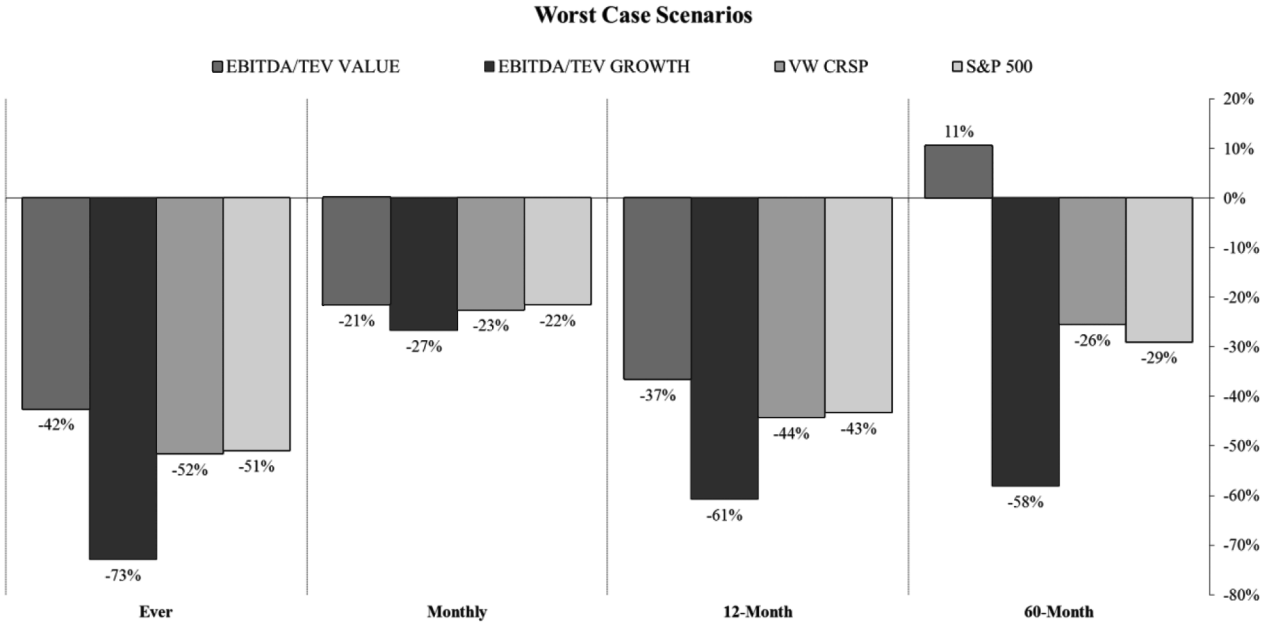
Given the analysis thus far, EBITDA/TEV is arguably the best-performing value investment strategy, on a risk-adjusted basis. However, one can imagine a world in which a particular valuation metric might outperform another measure in a particular economic environment. For example, cash-focused measures, such as free cash flow, might perform better during economic downturns than would accounting-focused measures, such as earnings. Or perhaps a more asset-based measure, such as book value, will outperform when the economy is more manufacturing based, as it was in the 1970s and 1980s, but struggle when the economy is oriented toward human capital and services, therefore making asset-based measures less relevant.

To test these hypotheses, we analyze different valuation metrics' returns during economic expansions and contractions. Our definitions for expanding or contracting economic periods are from the National Bureau of Economic Research.[4] Results are shown in Exhibit 6.

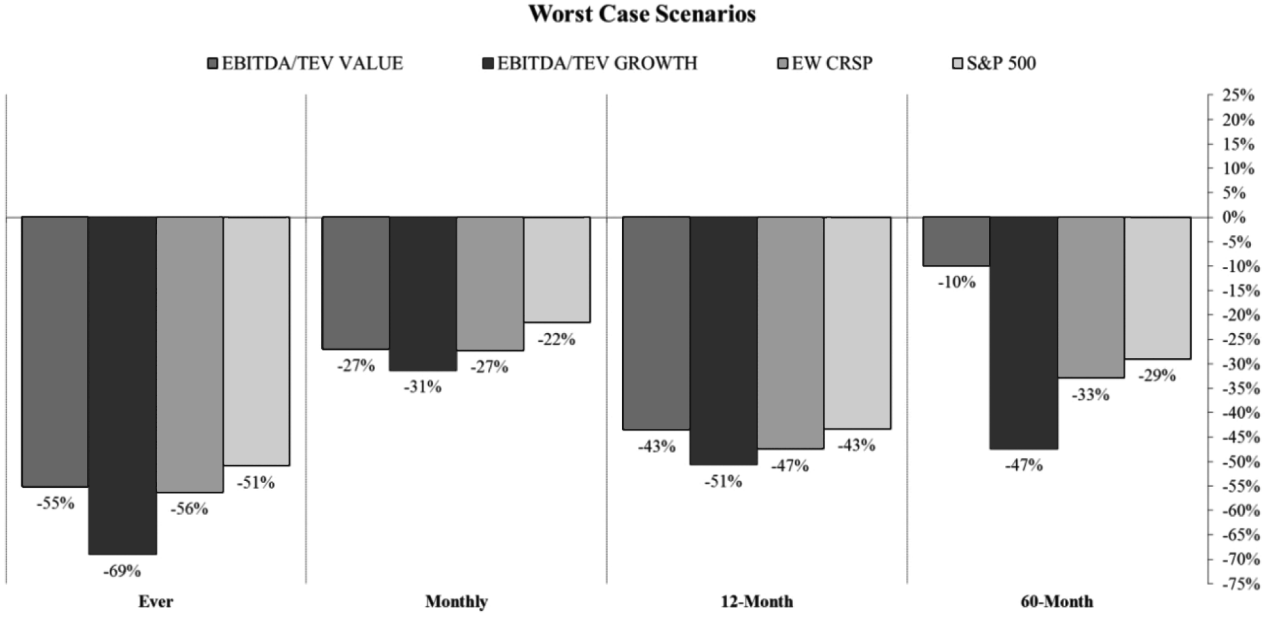
Exhibit 6, Panel A presents the returns for value strategies during economic expansions. B/M enjoys periods of relative outperformance in the early 1970s, early 1980s, and in late 2009. The B/M performance pattern lends weak evidence to the hypothesis that balance sheet-based value measures perform better than income or cash-flow statement value metrics when the economy generates more returns from tangible assets such as property, facilities, and equipment, relative to intangible assets such as human capital, R&D, and brand equity. Overall, there is no strong

# EXHIBIT 4
## Draw-Down Analysis for EBITDA/TEV

**Panel A:** Value-weight draw-down analysis for EBITDA/TEV (July 1, 1971 to December 31, 2010).




**Panel B:** Equal-weight draw-down analysis for EBITDA/TEV (July 1, 1971 to December 31, 2010).



# EXHIBIT 5

## Long-Term vs. Short-Term Valuation Measures

This exhibit reports return statistics for CRSP stocks with eight years of data for all variables in the exhibit. The returns are from July 1, 1971 until December 31, 2010. This sample excludes financials, utilities, and all firms below the NYSE 10% market capitalization cutoff. The sample is sorted into quintiles on June 30 of each year and each portfolio is held for one year. Panels A and B report return statistics based on one of the following valuation measures: E/M, EBITDA/TEV, FCF/TEV, GP/TEV, and B/M. The one-year valuation measure indicates that the measure is constructed using the current numerator and current denominator for each measure. All other year valuation measures (two to eight years) take the average of the numerator over the past N years and divide this average by the current denominator. For example, the eight-year FCF/TEV measure is constructed by averaging the past eight years FCF for each company (including the current observation), and dividing this by the company's current TEV. Panel A reports the equal-weighted return statistics for the value stocks (quintile 5) for each valuation measure. Panel B reports the value-weighted return statistics for the growth stocks (quintile 1) for each valuation measure. Both panels A and B also compare the value and growth portfolios by looking at the spread between value and growth.

| | 1yr | 2yr | 3yr | 4yr | 5yr | 6yr | 7yr | 8yr |
|---|---|---|---|---|---|---|---|---|
| **Panel A: Equal-Weight** | | | | **EW Value** | | | | |
| E/M | 15.99% | 15.73% | 16.14% | 16.16% | 15.74% | 15.63% | 15.65% | 15.81% |
| EBITDA/TEV | 17.66% | 17.30% | 17.37% | 16.87% | 16.79% | 16.68% | 16.51% | 16.49% |
| FCF/TEV | 16.57% | 16.03% | 15.92% | 15.87% | 15.77% | 15.53% | 14.93% | 15.12% |
| GP/TEV | 16.53% | 16.70% | 16.67% | 16.66% | 16.59% | 16.44% | 16.68% | 16.62% |
| B/M | 15.03% | 15.47% | 15.53% | 15.42% | 15.36% | 15.33% | 15.59% | 15.59% |
| | | | | **EW Growth** | | | | |
| E/M | 10.44% | 10.56% | 10.21% | 10.28% | 9.91% | 10.02% | 9.88% | 9.67% |
| EBITDA/TEV | 7.97% | 7.73% | 7.35% | 7.28% | 7.31% | 7.26% | 7.33% | 7.10% |
| FCF/TEV | 11.03% | 11.38% | 11.20% | 11.46% | 11.28% | 11.59% | 11.91% | 11.90% |
| GP/TEV | 8.31% | 8.07% | 8.08% | 8.13% | 8.23% | 8.07% | 8.19% | 8.37% |
| B/M | 9.20% | 8.67% | 8.08% | 8.04% | 8.02% | 7.99% | 8.10% | 8.06% |
| | | | | **Spread (Value-Growth)** | | | | |
| E/M | 5.54% | 5.17% | 5.93% | 5.88% | 5.84% | 5.61% | 5.77% | 6.14% |
| EBITDA/TEV | 9.69% | 9.56% | 10.01% | 9.60% | 9.49% | 9.42% | 9.17% | 9.39% |
| FCF/TEV | 5.54% | 4.65% | 4.72% | 4.41% | 4.49% | 3.95% | 3.02% | 3.22% |
| GP/TEV | 8.22% | 8.63% | 8.59% | 8.53% | 8.36% | 8.36% | 8.49% | 8.25% |
| B/M | 5.83% | 6.80% | 7.45% | 7.38% | 7.35% | 7.34% | 7.49% | 7.53% |
| **Panel B: Value-Weight** | | | | **VW Value** | | | | |
| E/M | 13.62% | 13.78% | 13.91% | 14.03% | 14.40% | 14.16% | 13.88% | 14.15% |
| EBITDA/TEV | 14.39% | 14.52% | 15.19% | 15.21% | 14.83% | 15.05% | 14.41% | 14.48% |
| FCF/TEV | 13.70% | 12.62% | 12.61% | 12.59% | 12.42% | 12.49% | 12.41% | 12.33% |
| GP/TEV | 14.97% | 15.16% | 15.38% | 15.61% | 15.33% | 15.10% | 14.64% | 14.41% |
| B/M | 13.62% | 13.96% | 14.16% | 14.05% | 13.97% | 14.20% | 14.34% | 14.87% |
| | | | | **VW Growth** | | | | |
| E/M | 9.26% | 9.25% | 9.61% | 9.12% | 7.68% | 8.21% | 8.20% | 7.03% |
| EBITDA/TEV | 8.16% | 8.29% | 8.19% | 7.92% | 8.00% | 7.80% | 7.82% | 7.72% |
| FCF/TEV | 9.76% | 10.77% | 10.38% | 10.48% | 10.14% | 9.49% | 9.70% | 10.17% |
| GP/TEV | 7.83% | 8.41% | 8.41% | 8.09% | 8.07% | 7.95% | 8.38% | 8.16% |
| B/M | 9.15% | 8.98% | 8.91% | 8.64% | 8.54% | 8.45% | 8.67% | 8.69% |
| | | | | **Spread (Value-Growth)** | | | | |
| E/M | 4.37% | 4.53% | 4.30% | 4.90% | 6.72% | 5.95% | 5.69% | 7.12% |
| EBITDA/TEV | 6.23% | 6.24% | 7.01% | 7.29% | 6.84% | 7.24% | 6.59% | 6.76% |
| FCF/TEV | 3.94% | 1.85% | 2.22% | 2.12% | 2.28% | 3.01% | 2.71% | 2.16% |
| GP/TEV | 7.14% | 6.75% | 6.97% | 7.52% | 7.25% | 7.15% | 6.26% | 6.24% |
| B/M | 4.47% | 4.99% | 5.25% | 5.41% | 5.43% | 5.75% | 5.67% | 6.18% |

## EXHIBIT 6

### Business Cycle Returns, 1971–2010

This exhibit reports compound annual growth rates during expansion and contraction periods in the U.S. economy. Economic period definitions are from the National Bureau of Economic Research. This exhibit reports return statistics for CRSP stocks with eight years of data for all variables in the exhibit. This sample excludes financials, utilities, and all firms below the NYSE 10% market capitalization cutoff. The sample is sorted into quintiles on June 30 of each year and each portfolio is held for one year. Panel A reports the annual returns (equal- and value-weighted) for the top-quintile portfolio based on one of the following valuation measures: E/M, EBITDA/TEV, FCF/TEV, GP/TEV, and B/M. The best-performing portfolio for a given time period is highlighted in bold.

| | Equal-Weight Portfolio | | | | | | Value-Weight Portfolio | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | E/M | EBITDA/TEV | FCF/TEV | GP/TEV | B/M | EW Mkt | E/M | EBITDA/TEV | FCF/TEV | GP/TEV | B/M | VW Mkt |
| **Panel A: Expansion** | | | | | | | | | | | | |
| July 1971–Oct. 1973 | 3.16% | 4.52% | 2.54% | –2.51% | **5.35%** | –6.59% | 8.24% | 6.04% | 0.34% | –2.93% | **13.84%** | 4.82% |
| Apr. 1975–Dec. 1979 | 28.57% | 27.82% | 27.69% | 24.60% | 27.80% | **31.44%** | 20.60% | **20.97%** | 20.18% | 20.31% | 20.93% | 13.62% |
| Aug. 1980–June 1981 | 33.91% | 34.97% | 30.12% | 34.94% | 34.95% | **40.88%** | 18.65% | 9.70% | 20.93% | 17.35% | **23.49%** | 17.69% |
| Dec. 1982–Jun. 1990 | 20.61% | **22.60%** | 20.67% | 22.53% | 16.90% | 10.07% | 20.82% | 21.96% | 19.26% | **23.84%** | 19.12% | 15.86% |
| Apr. 1991–Feb. 2001 | 15.33% | 17.44% | 18.27% | **18.31%** | 14.84% | 15.63% | 17.71% | 18.86% | 18.88% | **19.77%** | 15.97% | 14.41% |
| Dec. 2001–Nov. 2007 | 16.69% | **19.52%** | 15.50% | 14.42% | 15.81% | 15.95% | 14.46% | **15.89%** | 13.49% | 12.05% | 7.75% | 8.48% |
| Jul. 2009–Dec. 2010 | 41.48% | 44.22% | 40.32% | 47.41% | **50.08%** | 38.62% | 24.58% | 26.18% | 19.91% | 31.77% | **38.52%** | 28.71% |
| **Panel B: Contraction** | | | | | | | | | | | | |
| Nov. 1973–Mar. 1975 | –6.05% | –3.91% | –3.90% | –6.71% | **–0.66%** | –9.78% | –10.48% | –9.83% | –9.74% | –6.15% | **–0.08%** | –14.82% |
| Jan. 1980–July 1980 | 24.22% | 22.82% | 28.93% | 26.48% | 25.84% | **33.02%** | 18.34% | 32.76% | **36.07%** | 29.46% | 25.95% | 29.64% |
| Jul. 1981–Nov. 1982 | 11.02% | 16.94% | 18.47% | **28.91%** | 9.85% | 5.82% | 2.37% | 1.11% | 11.33% | **17.86%** | 9.35% | 8.83% |
| Jul. 1990–Mar. 1991 | 3.80% | 5.27% | 4.91% | **6.02%** | –1.94% | 3.84% | 0.49% | 7.90% | **13.27%** | 10.84% | –2.49% | 9.64% |
| Mar. 2001–Nov. 2001 | 8.27% | 12.31% | 7.92% | **22.58%** | 5.04% | 2.44% | –4.60% | –4.24% | –7.42% | **4.63%** | –3.13% | –9.15% |
| Dec. 2007–June 2009 | **–12.11%** | –16.30% | –16.32% | –21.62% | –20.07% | –17.40% | –18.15% | –18.35% | **–16.32%** | –19.79% | –17.22% | –23.54% |

evidence that a particular valuation metric systematically outperforms all other metrics during expanding economic periods.

Exhibit 6, Panel B presents the returns for value strategies during economic contractions. Similar to Panel A's results, those of Panel B suggest a lack of clear evidence that a particular value strategy systematically outperforms all other strategies in contracting economic periods. For example, during the July 1981 to November 1982 and March 2001 to November 2001 contractions GP/TEV shows strong outperformance, but this same metric has the worst performance during the December 2007 to June 2009 recession.

Overall, there is little evidence that a particular value strategy outperforms all other metrics during economic contractions and expansions. However, there is clear evidence that value strategies as a whole do outperform passive benchmarks in good times and in bad. The one exception to this rule occurred during the April 1975 to June 1981 business cycle, a time when a passive small-cap equity portfolio performed exceptionally well.

## CONCLUSION

Evidence suggests that EBITDA/TEV has historically been the best-performing valuation metric, an assertion based on a variety of analyses. Our analysis of absolute performance, risk metrics, and three-factor alpha estimates confirms that EBITDA/TEV has historically been a superior strategy, but also suggests that FCF/TEV can add value to a portfolio.

Based on analysis of periods of economic contraction and expansion, we find no evidence that a single valuation measure outperforms all others in contractions or expansions. However, we do find evidence that valuation-based strategies outperform the market in both expanding and contracting economic environments. Finally, we explore a popular concept in the investment community that suggests that the use of long-term valuation ratios can enhance portfolio performance. In

contrast to prior empirical work, we find that long-term ratios add little investment value over one-year valuation metrics.

## ENDNOTES

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[1]http://www.dimensional.com/famafrench/2011/06/qa-why-use-book-value-to-sort-stocks.html, accessed 11/15/2011.

[2]We perform all analysis with EBIT/TEV in place of EBITDA/TEV and find nearly identical results.

[3]Full results not tabulated, but available upon request.

[4]http://www.nber.org/cycles.html

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