The Cross-Section Predictability of Cyclically-Adjusted Valuation Measures[1]

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ABSTRACT

Cyclically-adjusted valuation metrics predict cross-sectional variation in average stock returns. For example, the annually-rebalanced top decile portfolio ranked on Shiller P/E, or cyclically-adjusted price-to-earnings (CAPE) ratio, earns an annual four-factor alpha of 2 percent a year. More frequent rebalancing and momentum can generate alphas estimates of 8.1% a year. The inflation-adjustment component of cyclically-adjusted measures has little effect on cross-sectional predictability.

JEL Classification: G10, G12, G14

Key words: CAPE, long-term valuation metrics, value investing, market efficiency, Shiller P/E

Graham and Dodd (1934) suggest that the measure for earnings in a price to earnings ratio "should cover a period of not less than five years, and preferably seven to ten years." Robert Shiller has taken the long-term P/E ratio concept from Graham and Dodd one step further and suggests inflation-adjusting the past 10 years of earnings and comparing this long-term cyclically-adjusted earnings metric to the current inflation-adjusted price. [1] The popularity of the Shiller's P/E ratio, or cyclically-adjusted P/E (CAPE),[2] stems from its intuitive appeal and the empirical evidence on the ratio's ability to predict future market returns. For example, Campbell and Shiller (1998c) show a strong negative correlation between CAPE and future long-term stock market returns, on average.

Despite the intuitive appeal of the CAPE concept, there is no research we know of that uses cyclically-adjusted valuation ratios to predict cross-sectional variation in returns. Researchers have performed a battery of tests on other valuation measures to identify their cross-sectional predictability. Examples include Loughran and Wellman (2012), Gray and Vogel (2012), and Anderson and Brooks (2006) in international markets.

Some evidence suggests that longer-term (i.e., less than 8 years) metrics are not reliably better at predicting returns than one year metrics (Gray and Vogel 2012). However, previous authors have not tested the performance of ratios

[1] See the calculations presented at http://www.econ.yale.edu/~shiller/data/ie_data.xls. Accessed September 11, 2013.
[2] E.g., "Have you looked at the Shiller P/E Ratio Lately," Steven Russolillo, *The Wall Street Journal*, Accessed July 23, 2013.

calculated using an inflation-adjustment, nor have previous researchers explored the effectiveness of using a 10-year look-back period. The goal of this paper is to fill this void in the academic literature.

We examine the following pricing metrics (all expressed in "yield" format and all variables are inflation-adjusted by the Consumer Price Index (CPI):

- 10-year average real earnings to market capitalization (CA-EM)
- 10-year average real book values to market capitalization (CA-BM)
- 10-year average real earnings before interest and taxes and depreciation and amortization to total enterprise value (CA-EBITDA/TEV)
- 10-year average real free cash flow to total enterprise value (CA-FCF/TEV)
- 10-year average real free gross profits to total enterprise value (CA-GP/TEV)

From July 1, 1973 through December 31, 2013, we find evidence that cyclically-adjusted valuation metrics can predict cross-sectional stock returns. For example, an annually-rebalanced equal weight portfolio of high CA-EM stocks (top decile) earns 16.3% a year, while a portfolio of low CA-EM stocks (bottom decile) earns 9.9% a year.[3] This outperformance of the cheap cyclically-adjusted

[3] Value weight portfolios yield similar results.

portfolios is consistent across the other measures, and is confirmed when comparing Sharpe and Sortino ratios across the high and low portfolios.

We look at the performance of more frequently rebalanced stock portfolios sorted on cyclically-adjusted valuations. Asness and Frazzini (2013) find that by simply updating the price each month when computing the book-to-market ratio yields 305 annual basis points of 4-factor alpha. Similar to Asness and Frazzini, we updated the price (market capitalization) in our measures each month. Employing a monthly rebalance enhances the performance of all valuation measures. For example, the CA-EM strategy goes from a 16.3 percent compound annual growth rate (CAGR) to a 19.3 percent CAGR.

We investigate the performance associated with combining momentum[4] with cyclically-adjusted valuation measures. Using the monthly-rebalanced portfolios, we split each valuation decile into high and low momentum. Employing this momentum sort enhances portfolio returns by approximately 100bps a year.

Last, we examine how the cyclical adjustment component affects returns compared to a non-inflation-adjusted long-term valuation measure. The evidence suggests that the cyclical adjusted component of 10-year valuation measures have little effect on cross-sectional predictability. In fact, unadjusted 10-year valuation measures are arguably stronger at predicting returns.

[4] Jagadeesh and Titman (1993) have shown that momentum can predict variation in the cross section of stock returns.

Our collective evidence confirms the effectiveness of using cyclically-adjusted valuation metrics to identify high and low performing stocks. Additionally, we find that more frequent rebalancing and momentum can enhance performance. Last, we document that the inflation component of cyclically-adjusted valuation ratios has little effect on cross-sectional predictability.

1. Data

1.1. Data Description

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, 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 30th of year *t*. All valuation metrics include 10 years of inflation-adjusted values for the numerator and the inflation-adjusted price value for the denominator. In the case of CA-EBITDA/TEV, this is represented by the following equation:

$$EBITDA/TEV_{10} = \frac{\frac{\sum_{j=1}^{10} Inflation\ Adjusted\ EBITDA_j}{10}}{Inflation\ Adjusted\ TEV_{10}} \quad (1)$$

The details on the construction of our valuation measures are as follows:

- 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)
    - EBITDA = Operating Income Before Depreciation (OIBDP) + Non-operating Income (NOPI).
- Free cash flow to total enterprise value (FCF/TEV)
    - Similar to the Novy-Marx (2013) paper, we compute FCF and as:

        - FCF = Net Income (NI) + Depreciation and Amortization (DP) - Working Capital Change (WCAP (t) - WCAP (t-1)) - Capital Expenditures (CAPX).
- Gross profits to total enterprise value (GP/TEV)
    - Following Novy-Marx (2013), we compute GP as:
        - GP = Total Revenue (REVT) – Cost of Goods Sold (COGS).
- Book to market (B/M)
    - Similar to Fama 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 = Preferred Stock Redemption Value (PSTKRV) (or Preferred Stock Liquidating Value (PSTKL), or Preferred Stock Par Value (PSTK)).

The sample only includes those firms that have 10 years of data for all the necessary metrics described above. To ensure there is a baseline amount of

liquidity in the securities in which we perform our tests, we restrict our analysis to firms that are greater than the 40th percentile NYSE market equity breakpoint on June 30th of each year, which leaves 750 firms in the universe on average.

Stock returns are measured from July 1973 through December 2013. Firm size (market capitalization) is determined on June 30th of year *t.* Firm fundamentals are based on December 31st of year *t-1* (for firms with fiscal year ends between January 1st and March 31st we use year *t* fundamentals; for firms with fiscal year ends after March 31st we use year *t-1* fundamentals). Firms are sorted into deciles on each measure on June 30th of year *t*, and this value is used to compute the monthly returns from July 1st of year *t* to June 30th of year *t+1*. Equal-weight portfolio returns are buy and hold.

For the monthly-rebalanced portfolios, firm market capitalization is calculated each month, while keeping the same firm fundamentals. For example, the book value of equity would remain the same from July 1st of year *t* to June 30th of year *t+1*, while the market capitalization would be recalculated each month. Total enterprise value, or TEV, would be computed similarly, with the market capitalization changing each month, while the other variables would remain the same from July 1st of year *t* to June 30th of year *t+1*. This portfolio is rebalanced each month.

Figure 1 highlights the value-weight cyclically-adjusted valuation metrics over time for stocks in our universe. The measures have been scaled to 100 as of July 1, 1973 to facilitate a visual comparison. All ratios are highly correlated and exhibit similar trends over time. One notable exception is CA-FCF/TEV, which signals a much more expensive market during the '80s relative to the other valuation measures. We also plot the rolling 12-month growth in the consumer price index (CPI). The rolling inflation figure appears correlated with market valuation measures.

[Insert Figure 1]

2. Results: A Comparison of Cyclically-Adjusted Valuation Metrics

2.1. Annual Rebalance

We present common performance metrics in Table 1. All valuation metrics predict cross-sectional returns across the 10 decile portfolios. Each decile contains 75 firms, on average. There is a monotonic relationship between cyclically-adjusted long-term valuation ratios and portfolio performance. The one exception to this rule is CA-FCF/TEV, which has weak performance compared to the other measures. The cyclically-adjusted free-cash-flow based valuation measure is unable to identify the winners and losers within the cross-section.[5]

[5] The FCF results are consistent with Novy-Marx (2013), which examines one-year FCF valuation metrics and finds

[Insert Table 1]

With respect to the most expensive stocks (i.e., "growth"), the results suggest that buying expensive securities is a poor risk-adjusted bet. Compound annual growth rates (CAGR), maximum drawdowns, Sharpe and Sortino ratios are uniformly worse for expensive stocks relative to cheap stocks, regardless of the cyclically-adjusted valuation metric employed. Moreover, on every metric, the expensive stocks underperform the buy-and-hold benchmarks.

Buying the cheapest stocks on a cyclically-adjusted ratio basis performs well, regardless of the chosen methodology. Figure 2 shows the growth of $100 invested into each of the top decile (cheap) portfolios as of 7/1/1973. Similar to Table 1, this figure highlights the relative outperformance of the cyclically-adjusted measures compared to an equal-weight benchmark portfolio. The cross-sectional predictability is marginally stronger for stocks sorted on cyclically-adjusted B/M and GP/TEV, which exhibit the largest CAGR spreads between the top and bottom deciles. [6]

[Insert Figure 2]

2.2. Monthly Rebalance

Table 2 reports performance statistics for monthly-rebalanced portfolios using cyclically-adjusted valuation metrics. The monthly results do not account for

low cross-sectional predictability.

[6] In non-tabulated results we look at robustness across time periods. Results are quantitatively similar.

taxes or transaction costs, which are assumed to be higher relative to the annually-rebalanced results discussed in section 2.1. Similar to Table 1, we see a monotonic relationship between cheapness and portfolio performance. Compound annual growth rates (CAGR), maximum drawdowns, Sharpe and Sortino ratios are uniformly worse for expensive stocks relative to cheap stocks. The monthly-rebalance (MR) strategy has a higher CAGR, Sharpe ratio, and Sortino ratio for the monthly-rebalanced strategy (Table 2), compared to the annual-rebalanced strategy (Table 1). This finding corroborates the result found in Asness and Frazzini (2013), which highlights that rebalancing portfolios each month improves portfolio performance.

The performance for the monthly-rebalanced portfolios is again marginally better for the cheapest cyclically-adjusted B/M and GP/TEV portfolios, which corroborates the results in Table 1. Examining the CA-B/M measure, the monthly CAGR, Sharpe and Sortino ratio are 19.7 percent (16.9 percent), 0.72 (0.67), and 1.09 (0.87) for the monthly (annual) rebalanced portfolio.[7] The improvement from annual to monthly rebalance is consistent across the other four measures as well.

2.3. Monthly Rebalance – Splitting on Momentum

Next, we split each cyclically-adjusted valuation decile by momentum. We rebalance the portfolios monthly. The results in Table 3 focus on the most

[7] In non-tabulated results we look at robustness across time periods. Results are quantitatively similar.

expensive and cheapest decile of monthly-rebalanced cyclically-adjusted valuation measures. We split the bottom and top decile on each cyclically-adjusted valuation measure into high and low momentum using the cumulative returns from month -12 to month -2, similar to Fama and French (2008). This creates portfolios with an average of 37 firms.

Table 3 Panels A and B show common performance metrics for growth (expensive) stock portfolios split into low and high momentum. Similar to prior research on momentum, we find that high momentum firms beat low momentum firms. The low momentum portfolio has a lower CAGR, Sharpe ratio and Sortino ratio compared to the high momentum portfolio for four of the five measures (the exception is CA-FCF/TEV). Panel A (B) shows that the low (high) momentum growth CA-EM (inverse of CAPE) firms earns a 7.0 percent (11.9 percent) CAGR, has a 0.19 (0.37) Sharpe ratio, and a 0.28 (0.55) Sortino ratio.

Table 3 Panels C and D show common performance metrics for value (cheap) stock portfolios split into low and high momentum respectively. Across all five measures, the low momentum portfolio has a lower CAGR, Sharpe ratio and Sortino ratio compared to the high momentum portfolio. Panel C (D) shows that the low (high) momentum value CA-EM (inverse of CAPE) firms earns a 17.6 percent (20.7 percent) CAGR, has a 0.58 (0.82) Sharpe ratio, and a 0.92 (1.17) Sortino ratio.

The data suggests that splitting portfolios on momentum can systematically improve returns to the cyclically-adjusted valuation measures. When comparing the monthly-rebalanced value portfolios (Table 2, Column 10 (Value)) to the high momentum monthly-rebalanced value portfolios (Table 3, Panel D), we find that value momentum portfolios have higher performance statistics, as the returns improve from 19.3% to 20.7%.

2.4. Alpha Analysis

We implement a calendar-time portfolio regression approach advocated by Mitchell and Stafford (2000). We calculate the monthly returns to the portfolios in excess of the risk-free rate and regress this variable on a linear asset pricing model, which include the following variables: MKT (excess value-weighted market index return), SMB (small minus big), HML (high book-to-market minus low book-to-market), and MOM (high momentum minus low momentum).[8]

[Insert Table 4]

The estimated alphas from our calendar-time portfolio regressions are presented in Table 4. Panels A and B examine the alpha for the annually-rebalanced bottom and top deciles respectively. Panel A reports an insignificant negative alpha for the bottom decile, while Panel B reports a significant alpha for the top decile (0.168% per month for the CA-EM measure). Panels C and D

[8] See Fama and French (1993) and Carhart (1997). Factors obtained from Ken French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_librar y.html,

examine the alpha for the monthly-rebalanced bottom and top deciles respectively. Panel C again finds an insignificant negative alpha for the bottom decile, while Panel D reports a positive and significant alpha for the top decile. For the CA-EM measure, the alpha for the top decile increases from 0.168% (Panel B) to 0.540% (Panel D) per month when switching from annual to monthly rebalancing. Last, Panels E and F examine the alpha for the monthly-rebalanced portfolios which include momentum. Panel E finds a larger, yet still insignificant, negative alpha for the low momentum growth portfolio. Conversely, Panel F finds the largest positive and significant alpha for the high momentum value portfolio. The CA-EM alpha increases from 0.540% (Panel D) to 0.577% (Panel F) per month when adding the momentum screen to the monthly rebalance. Overall, the alpha analysis confirms that cyclically adjusted valuation help explain the cross-section of average stock returns above and beyond the 4-factor Carhart asset pricing model.

2.5. Does the Inflation Adjustment Matter?

In this section we examine how cyclically-adjusted measures compare to a non-cyclically adjusted valuation measure. All valuation metrics include 10 years of values for the numerator and the price value for the denominator. In the case of EBITDA/TEV, this is represented by the following equation:

$$EBITDA/TEV_{10} = \frac{\frac{\sum_{j=1}^{10} EBITDA_j}{10}}{TEV_{10}} \quad (1)$$

Unlike the prior analysis, there is no inflation adjustment for the numerator and denominator. Table 5 examines the equal-weight annually-rebalanced portfolios for both the cyclically adjusted (Columns 2 and 4) and non-cyclically adjusted (Columns 3 and 5) valuation measures. Panel A reports the CAGR, Panel B reports the Sharpe ratio, and Panel C reports the 4-factor alphas for the portfolios. Overall, one can see that the CAGR, Sharpe ratio, and monthly alpha are similar for both the cyclically and non-cyclically adjusted valuation measures. Specifically, examining the gross profits to total enterprise measure (GP/TEV), the top decile returns 17.37% (17.08%), has a Sharpe ratio of 0.674 (0.661), and a monthly alpha of 0.310% (0.284%) for the non-cyclically adjusted (cyclically adjusted) measure. Overall, there does not appear to be a significant outperformance of the cyclically adjusted measures compared to a non-cyclically adjusted measure.

3. Conclusion

We confirm the effectiveness of using cyclically-adjusted valuation metrics to predict the cross-sectional stock returns. We also document that more frequent rebalancing and the addition of a momentum sort can enhance strategies based on cyclically-adjusted valuation metrics. Last, we document that the inflation

adjustment component of long-term cyclically-adjusted measure has little effect on cross-sectional predictability.

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Figure 1: Cyclically-adjusted valuation metrics over time

This figure plots the value-weighted monthly cyclically-adjusted valuation metric for all NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t (left-axis). Cyclically-adjusted values are an average of inflation-adjusted values over ten years relative to an inflation-adjusted current market price or total enterprise value. Rolling 1-Year CPI growth represents the rolling annual compound growth in the consumer price index (right-axis). All cyclically-adjusted metrics are scaled to 100 on 7/1/1973. Results are from 7/1/1973 to 12/31/2013.

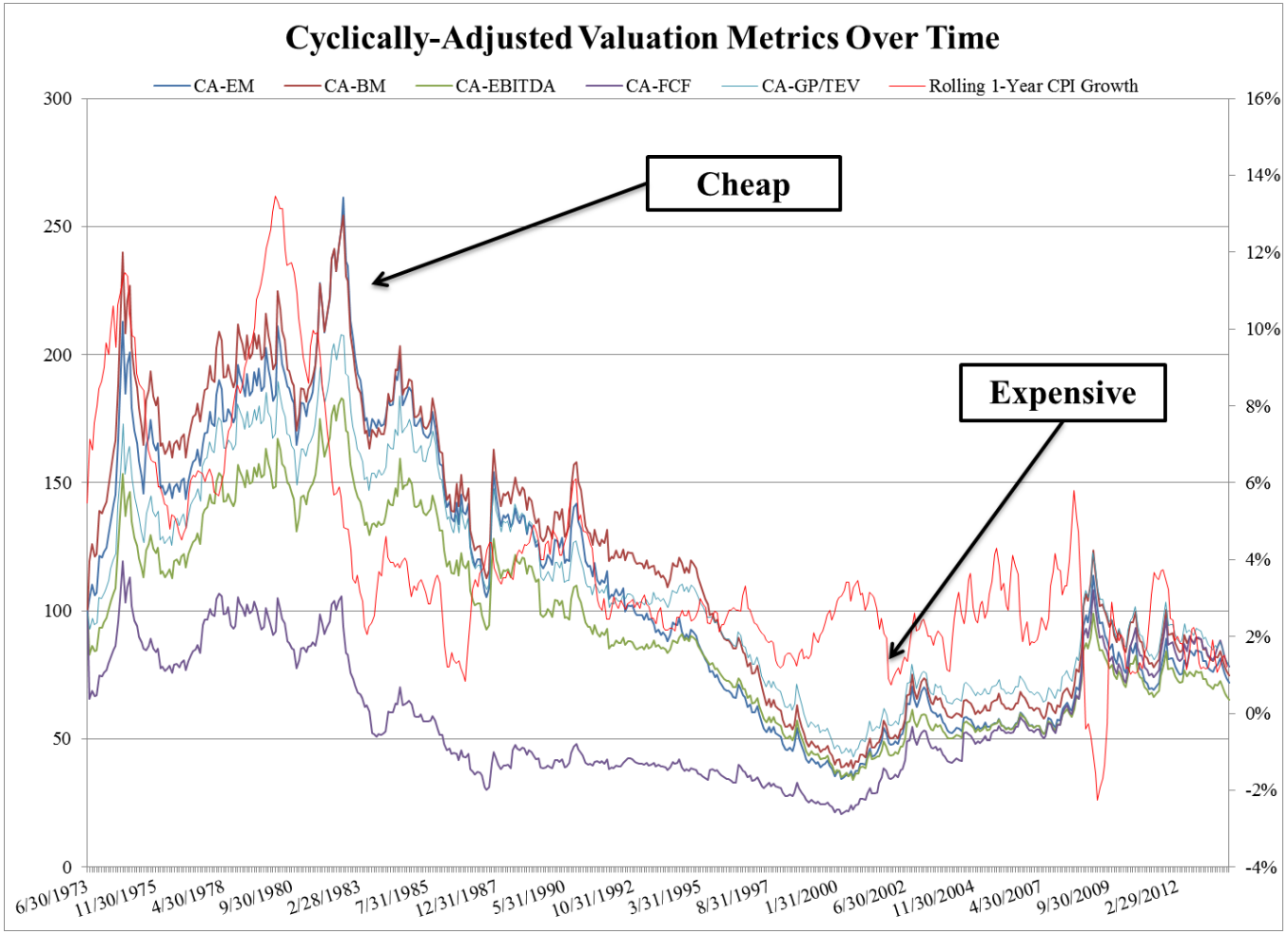

Figure 2: Invested Growth (Log Scale)

This figure reports portfolio growth from July 1, 1973, to December 31, 2013. The sample is sorted into deciles on June 30th of each year, and each portfolio is held for one year. All returns are calculated as equal-weight buy-and-hold. The figure reports the growth of $100 for the top decile portfolio based on one of the following cyclically-adjusted valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. We only include NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t.

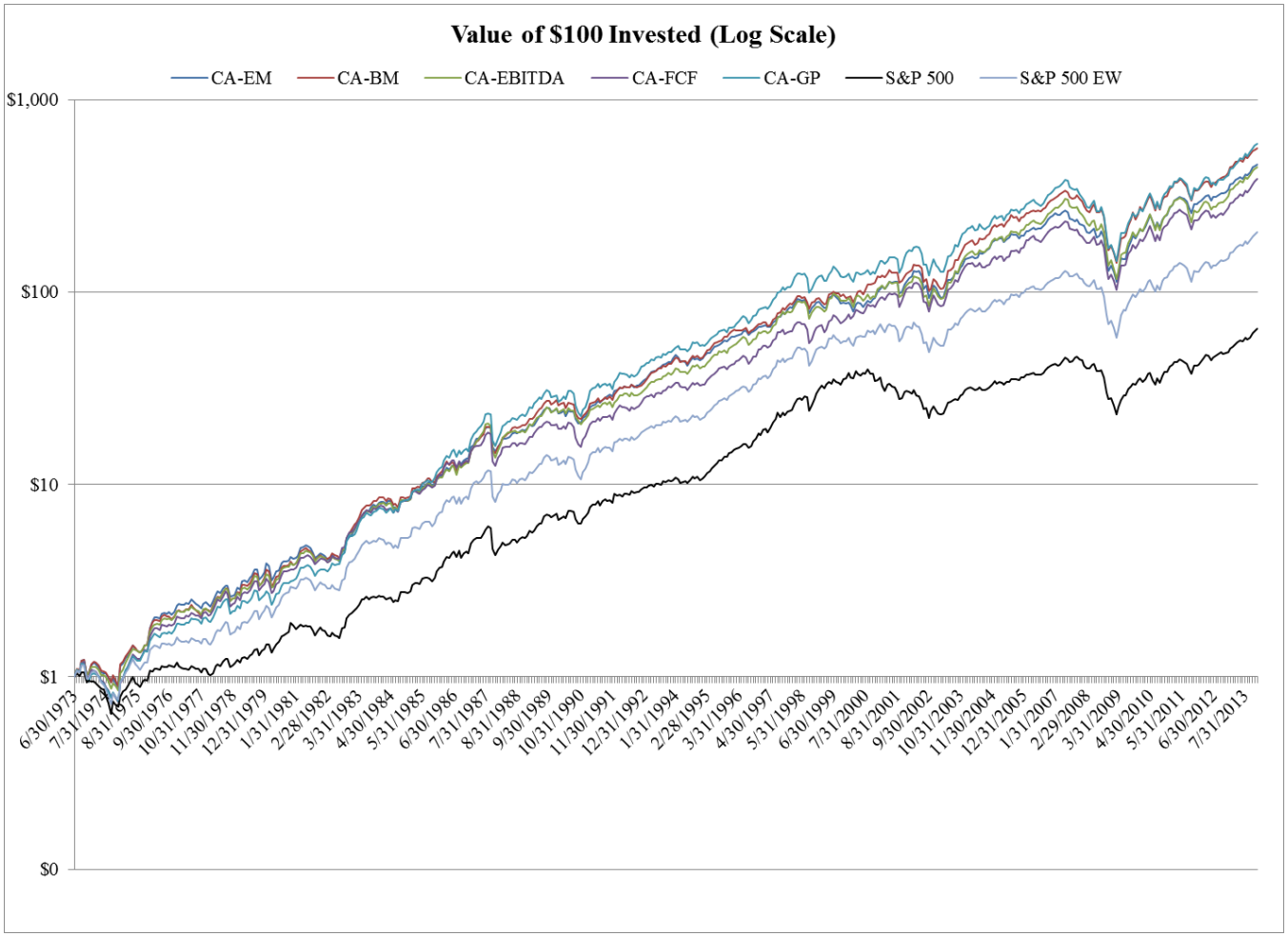

Table 1: Cyclically-Adjusted Valuation Metric Performance

This table reports return statistics for all NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t. We calculate monthly returns to the portfolios. Portfolios for each strategy are rebalanced each year on July 1st and are held from July 1st of year t until June 30th of year t+1. The time period under analysis is from July 1, 1973, to December 31, 2013. The sample is sorted into deciles on June 30th of each year, and each portfolio is held for one year. 10-1 is a funded long/short portfolio that earns the risk-free rate on short proceeds. All returns are calculated as buy-and-hold. Panels A-E report the equal-weight results for each decile portfolio based on one of the following valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. EW SP is the equal-weight S&P 500 index. EW Universe is the equal-weight universe of stocks included in our analysis.

	Panel A: Cyclically-Adjusted 10-year Earnings to Market												
Equal-Weight	1 (Growth)	2	3	4	5	6	7	8	9	10 (Value)	10-1	EW SP	EW Universe
CAGR	9.9%	10.5%	12.1%	12.3%	13.9%	12.9%	13.7%	15.8%	15.1%	16.3%	9.0%	14.0%	14.0%
Sharpe Ratio	0.31	0.34	0.43	0.47	0.56	0.52	0.56	0.71	0.68	0.66	0.31	0.55	0.55
Sortino Ratio	0.44	0.48	0.59	0.64	0.74	0.71	0.75	0.95	0.97	0.88	0.50	0.77	0.77
Max Drawdown	-56.3%	-61.8%	-57.0%	-51.5%	-44.7%	-47.4%	-42.7%	-41.3%	-40.4%	-57.8%	-50.4%	-55.1%	-51.3%
Worst Monthly	-30.7%	-27.1%	-26.3%	-26.8%	-28.0%	-25.3%	-25.1%	-22.1%	-16.9%	-23.6%	-19.4%	-25.6%	-24.4%
	Panel B: Cyclically-Adjusted 10-year Book to Market												
CAGR	8.6%	11.4%	13.0%	12.3%	13.7%	13.6%	13.6%	14.6%	15.5%	16.9%	11.2%		
Sharpe Ratio	0.26	0.40	0.49	0.46	0.54	0.54	0.56	0.62	0.67	0.67	0.43		
Sortino Ratio	0.37	0.57	0.68	0.63	0.71	0.72	0.73	0.85	0.92	0.87	0.69		
Max Drawdown	-68.9%	-51.7%	-51.2%	-43.7%	-43.5%	-47.1%	-49.9%	-44.9%	-49.5%	-57.7%	-50.4%		
Worst Monthly	-26.7%	-26.4%	-26.0%	-26.9%	-26.8%	-26.6%	-23.9%	-20.2%	-18.5%	-24.5%	-19.6%		
	Panel C: Cyclically-Adjusted 10-year EBITDA to Total Enterprise Value												
CAGR	8.1%	10.0%	12.4%	13.4%	12.6%	14.6%	13.9%	15.7%	15.9%	16.2%	10.9%		
Sharpe Ratio	0.24	0.33	0.47	0.53	0.50	0.60	0.57	0.68	0.65	0.64	0.41		
Sortino Ratio	0.33	0.47	0.63	0.72	0.66	0.83	0.80	0.93	0.88	0.83	0.59		
Max Drawdown	-64.9%	-54.4%	-48.8%	-49.8%	-45.8%	-44.8%	-44.8%	-39.4%	-51.5%	-61.8%	-51.3%		
Worst Monthly	-27.8%	-28.2%	-24.8%	-26.4%	-24.5%	-23.1%	-19.7%	-21.4%	-25.2%	-25.9%	-21.8%		
	Panel D: Cyclically-Adjusted 10-year Free-Cash-Flow to Total Enterprise Value												
CAGR	13.5%	12.9%	10.3%	11.7%	12.8%	13.9%	13.5%	14.5%	15.0%	15.9%	6.8%		
Sharpe Ratio	0.50	0.51	0.37	0.45	0.50	0.56	0.53	0.58	0.60	0.63	0.22		
Sortino Ratio	0.67	0.68	0.51	0.63	0.71	0.77	0.74	0.81	0.83	0.83	0.35		
Max Drawdown	-57.6%	-53.7%	-51.4%	-48.5%	-45.0%	-41.2%	-46.1%	-45.2%	-47.6%	-56.2%	-34.9%		
Worst Monthly	-23.9%	-21.9%	-21.4%	-24.0%	-24.0%	-27.0%	-24.9%	-27.8%	-26.8%	-27.8%	-10.6%		
	Panel E: Cyclically-Adjusted 10-year Gross Profits to Total Enterprise Value												
CAGR	8.3%	10.9%	12.4%	12.8%	13.2%	13.0%	14.4%	14.7%	16.5%	17.1%	12.5%		
Sharpe Ratio	0.25	0.40	0.50	0.51	0.52	0.50	0.57	0.57	0.65	0.66	0.55		
Sortino Ratio	0.33	0.54	0.72	0.71	0.74	0.69	0.78	0.78	0.89	0.88	0.77		
Max Drawdown	-66.9%	-54.4%	-46.8%	-40.5%	-40.6%	-50.6%	-48.1%	-49.2%	-52.5%	-61.8%	-48.2%		
Worst Monthly	-24.9%	-23.0%	-17.3%	-23.6%	-25.1%	-26.6%	-25.1%	-29.1%	-27.1%	-27.3%	-16.9%		

Table 2: Monthly Rebalanced Cyclically-Adjusted Valuation Metric Performance

This table reports return statistics for all NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t. We calculate monthly returns to the portfolios. Portfolios for each strategy are rebalanced at the end of each month. The time period under analysis is from July 1, 1973, to December 31, 2013. The sample is sorted into deciles at the end of each month. 10-1 is a funded long/short portfolio that earns the risk-free rate on short proceeds. All returns are calculated as buy-and-hold. Panels A-E report the equal-weight results for each decile portfolio based on one of the following valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. EW SP is the equal-weight S&P 500 index. EW Universe is the equal-weight universe of stocks included in our analysis.

	Panel A: Cyclically-Adjusted 10-year Earnings to Market												
Equal-Weight	1 (Growth)	2	3	4	5	6	7	8	9	10 (Value)	10-1	EW SP	EW Universe
CAGR	9.5%	10.3%	11.4%	12.1%	12.9%	13.2%	15.1%	16.2%	17.6%	19.3%	12.3%	14.0%	14.0%
Sharpe Ratio	0.29	0.33	0.40	0.46	0.51	0.52	0.63	0.70	0.76	0.71	0.49	0.55	0.55
Sortino Ratio	0.42	0.46	0.54	0.65	0.68	0.69	0.85	0.97	1.14	1.08	0.85	0.77	0.77
Max Drawdown	-60.6%	-61.5%	-56.6%	-48.7%	-49.1%	-44.4%	-48.9%	-48.3%	-45.7%	-65.0%	-39.1%	-55.1%	-51.3%
Worst Monthly	-31.1%	-26.3%	-28.1%	-24.9%	-26.9%	-27.7%	-23.9%	-22.7%	-18.5%	-26.0%	-17.2%	-25.6%	-24.4%
	Panel B: Cyclically-Adjusted 10-year Book to Market												
CAGR	7.8%	10.9%	12.6%	13.4%	13.3%	14.5%	13.8%	15.0%	16.7%	19.7%	15.1%		
Sharpe Ratio	0.22	0.38	0.47	0.51	0.51	0.58	0.55	0.62	0.69	0.72	0.61		
Sortino Ratio	0.32	0.54	0.66	0.69	0.69	0.77	0.73	0.84	1.01	1.09	1.00		
Max Drawdown	-70.4%	-51.2%	-48.3%	-47.0%	-50.8%	-48.7%	-55.4%	-50.7%	-55.4%	-64.0%	-43.3%		
Worst Monthly	-27.5%	-26.4%	-25.4%	-26.7%	-26.5%	-25.7%	-25.7%	-23.3%	-21.0%	-24.4%	-23.2%		
	Panel C: Cyclically-Adjusted 10-year EBITDA to Total Enterprise Value												
CAGR	7.4%	9.5%	11.7%	12.8%	13.0%	14.6%	15.0%	16.8%	17.9%	19.1%	14.6%		
Sharpe Ratio	0.21	0.31	0.43	0.50	0.51	0.59	0.62	0.70	0.72	0.70	0.60		
Sortino Ratio	0.29	0.43	0.59	0.69	0.68	0.82	0.88	1.00	1.02	0.97	0.85		
Max Drawdown	-69.3%	-50.9%	-52.3%	-47.4%	-51.1%	-49.3%	-50.0%	-45.5%	-57.0%	-66.4%	-46.2%		
Worst Monthly	-29.0%	-26.7%	-26.1%	-26.9%	-25.3%	-22.3%	-17.9%	-21.6%	-21.6%	-27.0%	-26.5%		
	Panel D: Cyclically-Adjusted 10-year Free-Cash-Flow to Total Enterprise Value												
CAGR	13.9%	12.9%	10.5%	11.5%	12.5%	13.4%	14.6%	14.3%	16.4%	18.2%	8.6%		
Sharpe Ratio	0.49	0.50	0.38	0.43	0.48	0.52	0.57	0.56	0.64	0.68	0.41		
Sortino Ratio	0.68	0.69	0.52	0.60	0.71	0.72	0.81	0.78	0.94	0.96	0.68		
Max Drawdown	-66.5%	-56.6%	-53.7%	-44.7%	-43.6%	-47.3%	-50.2%	-52.4%	-47.5%	-58.6%	-23.7%		
Worst Monthly	-25.8%	-21.9%	-21.9%	-24.2%	-23.7%	-27.2%	-25.4%	-27.2%	-26.7%	-28.4%	-7.7%		
	Panel E: Cyclically-Adjusted 10-year Gross Profits to Total Enterprise Value												
CAGR	8.0%	10.4%	12.1%	11.8%	13.9%	13.7%	14.7%	16.3%	17.3%	19.7%	15.7%		
Sharpe Ratio	0.24	0.37	0.48	0.45	0.54	0.53	0.57	0.63	0.66	0.72	0.73		
Sortino Ratio	0.31	0.51	0.70	0.64	0.79	0.74	0.80	0.88	0.93	1.01	1.13		
Max Drawdown	-67.6%	-54.0%	-46.7%	-49.6%	-45.5%	-57.1%	-48.0%	-50.6%	-54.2%	-66.6%	-41.3%		
Worst Monthly	-25.9%	-22.0%	-18.0%	-22.4%	-22.4%	-25.4%	-26.9%	-27.5%	-28.1%	-27.4%	-17.0%		

Table 3: Momentum and Monthly Rebalanced Cyclically-Adjusted Valuation Metrics

This table reports return statistics for all NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t. We calculate monthly returns to the portfolios. Portfolios for each strategy are rebalanced each month. The time period under analysis is from July 1, 1973, to December 31, 2013. Panels A-D report the equal-weight results based on one of the following valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. Growth (value) firms are the bottom (top) decile for each of the five measures. The top (bottom) decile portfolio is then split by momentum, which is calculated as the cumulative returns from month -12 to month -2. Panels A (C) shows the returns to the low momentum portfolio for growth (value) firms, while Panels B (D) shows the returns to the high momentum portfolio for growth (value) firms. SP 500 EW is the equal-weight S&P 500 index. SP 500 is the S&P 500 index.

	CA-EM	CA-BM	CA-EBIDTA/TEV	CA-FCF/TEV	CA-GP/TEV	SP 500 EW	SP 500
	Panel A: Low Momentum Growth Firms						
CAGR	7.0%	6.1%	5.1%	14.0%	6.6%	14.0%	14.0%
Sharpe Ratio	0.19	0.15	0.11	0.47	0.17	0.55	0.55
Sortino Ratio	0.28	0.21	0.15	0.67	0.23	0.77	0.77
Max Drawdown	-68.6%	-69.0%	-71.6%	-60.6%	-71.0%	-55.1%	-51.3%
Worst Monthly	-29.9%	-25.9%	-28.8%	-24.5%	-24.5%	-25.6%	-24.4%
	Panel B: High Momentum Growth Firms						
CAGR	11.9%	9.1%	9.9%	13.4%	9.1%	14.0%	14.0%
Sharpe Ratio	0.37	0.28	0.30	0.46	0.28	0.55	0.55
Sortino Ratio	0.55	0.39	0.43	0.65	0.37	0.77	0.77
Max Drawdown	-57.9%	-75.7%	-67.8%	-70.3%	-65.0%	-55.1%	-51.3%
Worst Monthly	-32.0%	-29.1%	-28.9%	-28.4%	-26.8%	-25.6%	-24.4%
	Panel C: Low Momentum Value Firms						
CAGR	17.6%	17.8%	17.8%	16.7%	18.2%	14.0%	14.0%
Sharpe Ratio	0.58	0.59	0.60	0.58	0.61	0.55	0.55
Sortino Ratio	0.92	0.92	0.88	0.84	0.86	0.77	0.77
Max Drawdown	-71.3%	-70.7%	-67.8%	-63.6%	-73.4%	-55.1%	-51.3%
Worst Monthly	-31.1%	-30.0%	-27.3%	-27.5%	-28.1%	-25.6%	-24.4%
	Panel D: High Momentum Value Firms						
CAGR	20.7%	21.1%	20.1%	19.5%	20.9%	14.0%	14.0%
Sharpe Ratio	0.82	0.81	0.78	0.76	0.80	0.55	0.55
Sortino Ratio	1.17	1.21	1.03	1.05	1.14	0.77	0.77
Max Drawdown	-58.0%	-56.4%	-64.0%	-53.1%	-58.5%	-55.1%	-51.3%
Worst Monthly	-24.6%	-27.2%	-27.1%	-29.2%	-27.4%	-25.6%	-24.4%

Table 4: Calendar-Time Portfolio Regressions

This table reports return statistics for all NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t. We calculate monthly returns to the portfolios. Portfolios for each strategy are rebalanced either annually or monthly. The time period under analysis is from July 1, 1973, to December 31, 2013 for panels A through E. Panels A through E report the equal-weight results for the bottom and top decile portfolios (growth and value) based on one of the following valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. The portfolios are formed using either annually valuation measures (Panels A and B), monthly valuation measures, (Panels C and D), or monthly valuation measures combined with momentum (Panels E and F). Portfolio formation and rebalancing is the same as in Table 1 (for Panels A and B), Table 2 (for Panels C and D), and Table 3 (for Panels E and F). Panels A through E report the 4-factor alpha. Average alphas are in monthly percent, p-values are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. Regression p-values use robust standard errors as computed in Davidson and MacKinnon (1993, pg. 553).

	Panel A: Annual Rebalance - Growth Firms					Panel B: Annual Rebalance - Value Firms				
	CA-EM	CA-BM	CA-EBIDTA/TEV	CA-FCF/TEV	CA-GP/TEV	CA-EM	CA-BM	CA-EBIDTA/TEV	CA-FCF/TEV	CA-GP/TEV
Alpha	-0.104	0.022	-0.039	-0.066	-0.115	**0.168**	0.164	**0.193**	**0.192**	**0.284**
	0.330	0.796	0.693	0.553	0.331	0.069	0.114	0.033	0.021	0.002
Market Return – RF	**1.176**	**1.086**	**1.093**	**1.083**	**0.994**	**1.003**	**1.034**	**1.048**	**1.022**	**1.052**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SMB	**0.428**	**0.157**	**0.291**	**0.301**	**0.255**	**0.253**	**0.295**	**0.274**	**0.379**	**0.372**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HML	**-0.215**	**-0.520**	**-0.547**	**0.486**	**-0.255**	**0.689**	**0.706**	**0.579**	**0.406**	**0.472**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MOM	-0.013	-0.027	-0.016	-0.026	-0.012	**-0.130**	**-0.099**	**-0.146**	**-0.115**	**-0.163**
	0.707	0.271	0.571	0.484	0.734	0.000	0.002	0.000	0.000	0.000
	Panel C: Monthly Rebalance - Growth Firms					Panel D: Monthly Rebalance - Value Firms				
Alpha	-0.026	-0.095	-0.098	0.112	-0.177	**0.540**	**0.563**	**0.553**	**0.525**	**0.612**
	0.827	0.238	0.315	0.351	0.113	0.000	0.000	0.000	0.000	0.000
Market Return – RF	**1.195**	**1.082**	**1.084**	**1.128**	**1.007**	**1.058**	**1.092**	**1.103**	**1.076**	**1.102**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SMB	**0.416**	**0.191**	**0.325**	**0.307**	**0.278**	**0.348**	**0.346**	**0.306**	**0.364**	**0.413**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HML	**-0.261**	**-0.498**	**-0.551**	**0.455**	**-0.209**	**0.696**	**0.675**	**0.521**	**0.377**	**0.430**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MOM	-0.136	0.026	-0.002	**-0.238**	0.004	**-0.404**	**-0.399**	**-0.366**	**-0.344**	**-0.364**
	0.011	0.281	0.934	0.000	0.899	0.000	0.000	0.000	0.000	0.000
	Panel E: Monthly Rebalance - Low Momentum Growth Firms					Panel F: Monthly Rebalance - High Momentum Value Firms				
Alpha	-0.162	-0.179	-0.184	0.267	-0.211	**0.577**	**0.602**	**0.590**	**0.583**	**0.677**
	0.285	0.082	0.099	0.064	0.118	0.000	0.000	0.000	0.000	0.000
Market Return – RF	**1.209**	**1.041**	**1.058**	**1.108**	**0.963**	**1.007**	**1.058**	**1.053**	**1.054**	**1.041**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SMB	**0.319**	**0.118**	**0.292**	**0.341**	**0.228**	**0.250**	**0.245**	**0.220**	**0.300**	**0.351**
	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HML	-0.096	**-0.379**	**-0.513**	**0.459**	-0.023	**0.652**	**0.636**	**0.487**	**0.356**	**0.372**
	0.307	0.000	0.000	0.000	0.727	0.000	0.000	0.000	0.000	0.000
MOM	**-0.281**	**-0.074**	**-0.153**	**-0.430**	**-0.176**	**-0.245**	**-0.244**	**-0.246**	**-0.251**	**-0.258**
	0.000	0.021	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000

Table 5: Cyclically versus non-cyclically adjusted measures

This table reports return statistics for all NYSE/AMEX/NASDAQ firms above the NYSE 40th percentile for market value of equity on June 30th of year t. We calculate monthly returns to the portfolios. Portfolios for each strategy are rebalanced annually. The time period under analysis is from July 1, 1973, to December 31, 2013 for panels A through C. Panels A through C report the equal-weight results for the bottom and top decile portfolios (growth and value) based on one of the following valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. The valuation measures are computed using either cyclically adjusted (columns 2 and 4) or non-cyclically adjusted (columns 3 and 5) valuation measures. Panel A reports the compound annual growth rate (CAGR), Panel B reports the Sharpe ratio, and Panel C reports the 4-factor alpha. Average alphas are in monthly percent, p-values are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. Regression p-values use robust standard errors as computed in Davidson and MacKinnon (1993, pg. 553).

	Growth		Value	
Panel A	CAGR		CAGR	
	Cyclically Adjusted	Non-Cyclically Adjusted	Cyclically Adjusted	Non-Cyclically Adjusted
P/E	9.86%	9.35%	16.35%	16.52%
B/M	8.62%	8.43%	16.91%	16.38%
EBITDA/TEV	8.08%	8.10%	16.25%	16.22%
FCF/TEV	13.48%	12.62%	15.85%	16.01%
GP/TEV	8.28%	8.24%	17.08%	17.37%
Panel B	Sharpe Ratio		Sharpe Ratio	
P/E	0.307	0.287	0.661	0.658
B/M	0.260	0.251	0.671	0.627
EBITDA/TEV	0.236	0.236	0.639	0.636
FCF/TEV	0.496	0.444	0.626	0.630
GP/TEV	0.248	0.245	0.661	0.674
Panel C	4-Factor Alpha		4-Factor Alpha	
P/E	-0.104	-0.144	0.168	0.178
	0.330	0.186	0.069	0.058
B/M	0.022	0.001	0.164	0.126
	0.796	0.989	0.114	0.277
EBITDA/TEV	-0.039	-0.048	**0.193**	**0.189**
	0.693	0.629	0.033	0.040
FCF/TEV	-0.066	-0.107	**0.192**	**0.220**
	0.553	0.358	0.021	0.011
GP/TEV	-0.115	-0.098	**0.284**	**0.310**
	0.331	0.416	0.002	0.001