On the Performance of Cyclically Adjusted Valuation Measures[1]

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ABSTRACT

We confirm the effectiveness of using cyclically-adjusted valuation metrics to identify high performing stocks. The Shiller P/E, or cyclically-adjusted price-to-earnings (CAPE) ratio, is not the optimal way to implement a cyclically-adjusted value measure. At the margin, the cyclically-adjusted book-to-market (CA-BM) is a better measure to predict returns. We find that more frequent rebalancing and momentum can enhance strategies based on cyclically-adjusted valuation metrics.

JEL Classification: G10, G12, G14

Key words: CAPE, long-term valuation metrics, value investing, market efficiency

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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 price.[2] Shiller's P/E ratio, or cyclically-adjusted P/E (CAPE), has been popularized in the financial press[3] and Barclays has even launched the Shiller Barclays CAPE Index Family.

Despite the intuitive appeal of the CAPE concept, which inflation-adjusts and averages earnings across a 10-year business cycle, there is little empirical evidence to support the use of such longer-term ratios, in the context of predicting stock returns among firms traded on the NYSE/AMEX/NASDAQ[4]. For example, Gray and Vogel (2012) and Gray and Carlisle (2012) perform a battery of tests on valuation measures—to include an analysis of long-term valuation metrics that include up to 8 years of financial data—and find that one-year earnings before interest, taxes, depreciation and amortization to total enterprise value (EBITDA/TEV) predicts stock returns better than all other valuation metrics.[5] Loughran and Wellman (2012) independently find similar results in their detailed analysis of EBITDA/TEV.

While the evidence suggests that longer-term metrics are not reliably better at predicting returns than one year metrics, previous authors have not directly tested the performance of the Shiller P/E (i.e., CAPE), which represents the inflation-adjusted average earnings over a 10-year

[2] See the calculations presented at http://www.econ.yale.edu/~shiller/data/ie_data.xls. Accessed September 11, 2013.
[3] E.g., "Have you looked at the Shiller P/E Ratio Lately," Steven Russolillo, *The Wall Street Journal*, Accessed July 23, 2013.
[4] Anderson and Brooks (2006) do find some evidence that long-term valuation ratios outperform shorter-term ratios in the UK stock market from 1975 to 2003.
[5] In unpublished results, Gray and Vogel find similar evidence among international stock markets.

business cycle. The goal of this paper is to precisely replicate the Shiller P/E ratio and empirically investigate the measure's ability to predict stock returns.

We take our analysis of the Shiller P/E one step further and explore the inflation-adjusted 10-year earnings concept in the context of other valuation metrics. There is no inherent reason why the price-to-earnings measure is better than other metrics. In fact, academic research has discarded price-to-earnings and (e.g., Fama and French (1992)) has traditionally relied on the book to market (B/M) ratio. Eugene Fama and Ken French consider B/M a superior metric for the following 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 cashflow) 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.* [6]

To settle the debate on the best cyclically-adjusted measure to use, 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)

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

- 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, 2012, we find that CA-BM is the best cyclically-adjusted valuation metric to use as an investment strategy relative to other valuation metrics. An annually rebalanced equal-weight portfolio of high CA-BM stocks earns 16.6 percent a year and generates the highest Sharpe (.64) and Sortino (.85) ratio among all cyclically-adjusted metrics tested.[7] While CA-BM is the marginal top performer over the past 40 years, all cyclically-adjusted value measures have outperformed market benchmarks by large margins.

We also look at the performance of monthly rebalanced cyclically-adjusted valuation measures. 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-BM strategy goes from a 16.6 percent compound annual growth rate (CAGR) to a 19.3 percent CAGR.

Last, we see if integrating momentum into cyclically-adjusted measures can enhance the returns to the monthly rebalanced portfolios. The momentum effect was first discovered by Jagadeesh and Titman (1993) and has been shown to be prevalent in the cross section of stock returns. Using the monthly rebalanced portfolios, we split each decile into high and low momentum. Employing this additional momentum screen adds at least 100 basis points across

[7] Value-weight portfolios yield similar results.

the different valuation metrics. For example, the high-momentum CA-BM portfolio has a compound annual growth rate of 21.6 percent, which is 230 basis points higher than the monthly rebalanced CA-BM portfolio.

Our collective evidence confirms the effectiveness of using cyclically-adjusted valuation metrics to identify high-performing stocks. From a historical perspective, as long as investors purchased low-priced stocks--regardless of the specific metric chosen--they performed admirably relative to passive benchmarks. However, our analysis indicates that the Shiller P/E, or CAPE, is not the optimal way to implement a cyclically-adjusted value measure. The data suggests that CA-BM is a better performing measure, at the margin. Additionally, we find that monthly rebalanced strategies with momentum have historically generated the highest risk-adjusted performance.

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 (2010) 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)).

We restrict our data to include only those firms that have 10 years of data for all the necessary metrics described above. We impose this restriction to ensure we can conduct all the necessary analysis on a similar universe when we perform the long-term valuation tests. 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 at June 30th of each year.

Stock returns are measured from July 1973 through December 2012. 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, we recalculate the market capitalization of the firm each month, while keeping the same firm fundamentals. So 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 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 for illustration purposes. 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 are able to predict returns across the 10 decile portfolios. There is a clear monotonic relationship between cheapness and portfolio performance. The one exception to this rule is CA-FCF/TEV, which has

relatively weak performance compared to the other measures. The cyclically-adjusted free-cash-flow based valuation measure is unable to clearly identify the winners and losers among the universe of stocks we analyze.

[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), max drawdowns, Sharpe ratios, 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 CA-BM measure. The performance is marginally stronger for stocks sorted on cyclically-adjusted B/M (CA-BM). The equal-weight CAGR is 16.6 percent and the Sharpe ratio of 0.64 and Sortino ratio of 0.85 are the best among all measures. [8]

[Insert Figure 2]

2.2. Monthly Rebalance

Table 2 reports performance statistics for monthly rebalanced cyclically-adjusted valuation metrics. The monthly results do not account for taxes or transaction costs, which are assumed to be much higher relative to the annually-rebalanced results discussed in section 2.1. Similar to Table 1, we see a clear monotonic relationship between cheapness and portfolio performance. We find that compound annual growth rates (CAGR), max drawdowns, Sharpe ratios, and Sortino ratios, are uniformly worse for expensive stocks relative to cheap stocks. The

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

monthly rebalance (MR) strategy has a higher CAGR, Sharpe ratio, and Sortino ratio for the monthly rebalance strategy (Table 2), compared to the annual rebalance 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 strongest measure for the monthly rebalanced portfolios is the cheapest cyclically-adjusted B/M portfolio, which corroborates with the results in Table 1. We see that the monthly CAGR, Sharpe and Sortino ratio are 19.3 percent (16.6 percent), 0.69 (0.64), and 1.06 (0.85) for the monthly (annual) rebalanced portfolio, which are the highest compared to the other cyclically-adjusted valuation measures. [9]

2.3. Monthly Rebalance – Splitting on Momentum

We then split each cyclically-adjusted valuation decile by momentum. We rebalance portfolios monthly. The results in Table 3 focus on the cheapest decile of cyclically-adjusted valuation measures. We split the 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).

Table 3 shows common performance metrics for cheap stock portfolios split on high and low momentum. Similar to prior research on momentum, we find that high momentum firms beat low momentum firms. Across all five measures, the low momentum portfolio has a lower CAGR, Sharpe and Sortino ratio compared to the high momentum portfolio. Panel A (B) shows that the high (low) momentum top-decile CA-EM (inverse of CAPE) firms earns a 20.5 percent (16.3 percent) CAGR, has a 0.83 (0.51) Sharpe ratio, and a 1.13 (0.87) Sortino ratio.

The data suggests that splitting portfolios on momentum can systematically improve returns to the cyclically-adjusted valuation measures. When comparing the cheapest monthly-

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

rebalanced portfolios (Table 2, Column 10 (Value)) to the high momentum monthly-rebalanced cheap portfolios (Table 3, Panel A), we see cheap momentum portfolios have higher performance statistics.

The strongest performing measure for monthly rebalanced portfolios split by momentum is the cyclically-adjusted B/M (CA-BM). The CAGR, Sharpe, and Sortino ratios are the highest for the CA-BM measure compared to other cyclically-adjusted valuations measures. Panel A (B) shows that the high (low) momentum top-decile CA-BM firms earns a 21.6 percent (16.3 percent) CAGR, has a 0.86 (0.50) Sharpe ratio, and a 1.20 (0.85) Sortino ratio.

Last, we examine the robustness of the results across time periods. We analyze performance metrics over the July 1, 1973 to December 31, 1993 period and the January 1, 1994 to December 31, 2012 period. We find that cheap high momentum portfolios (Panels C and E) clearly dominate cheap low momentum portfolios across all time periods (Panels D and F).

3. Conclusion

Our results have three implications: The best cyclically-adjusted valuation measure is the CA-BM (Tables 1-3); monthly rebalancing improves portfolio performance (Table 2); and applying momentum in the context of cyclically-adjusted valuation metrics improves performance (Table 3). The broader take away from our study is that any portfolio strategy focused on purchasing cheap stocks based on cyclically-adjusted valuation measures has historically outperformed a strategy that purchases expensive stocks and a strategy the simply buys and holds the market portfolio.

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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. 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. All cyclically-adjusted metrics are scaled to 100 on 7/1/1973.

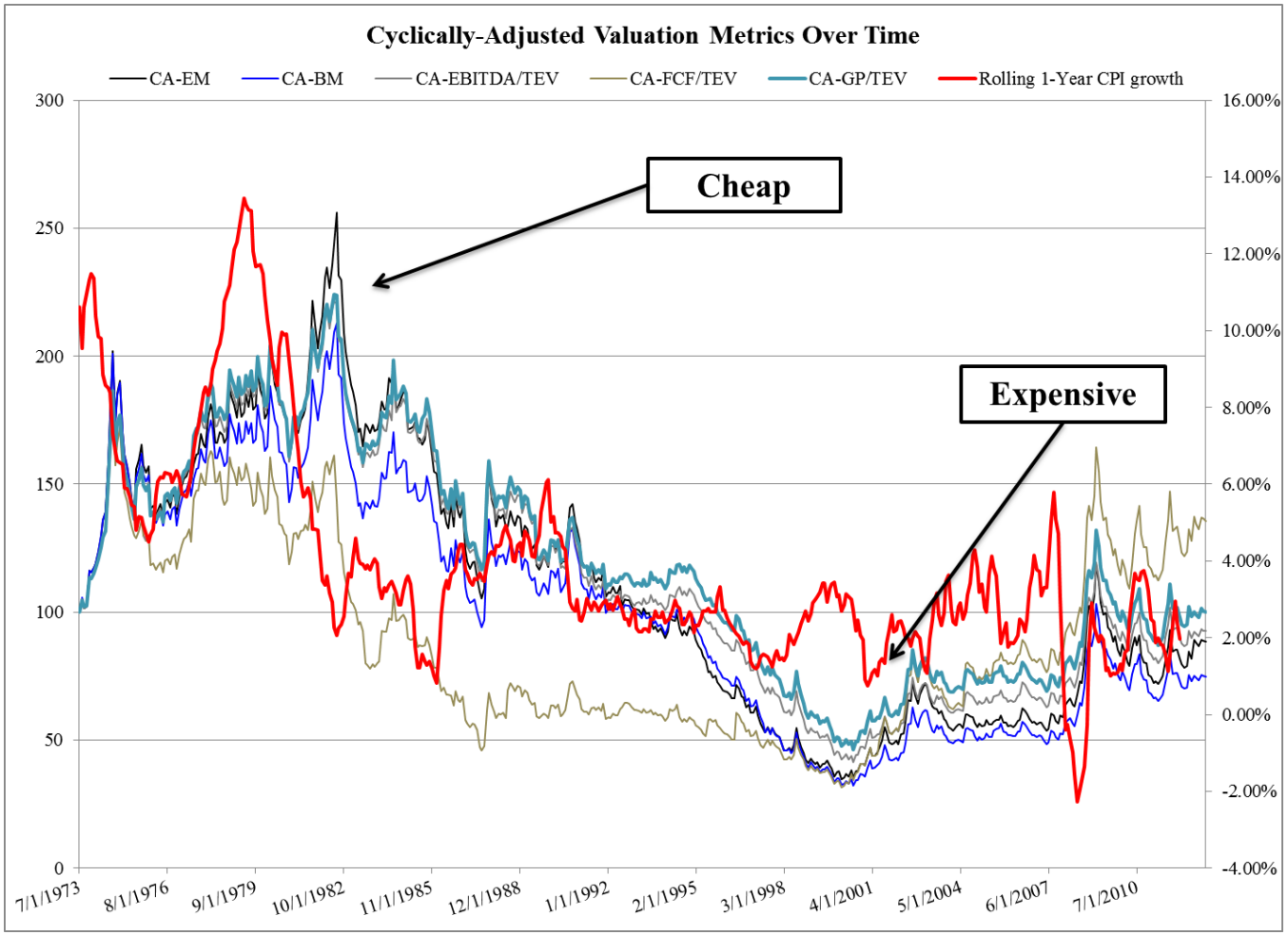

Figure 2: Invested Growth (Log Scale)

This figure reports portfolio growth from July 1, 1973, to December 31, 2012. 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.

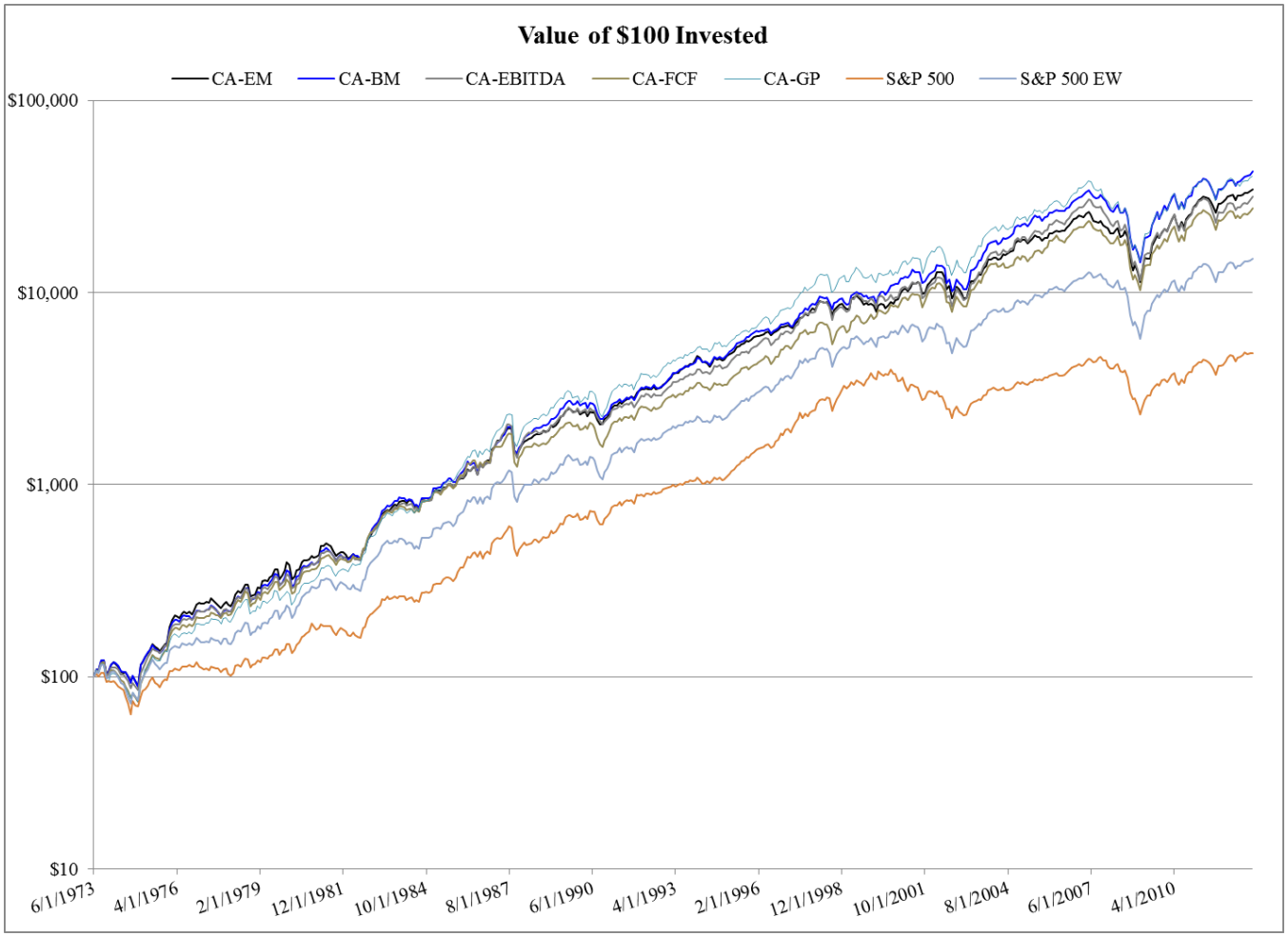

Table 1: Cyclically-Adjusted Valuation Metric Performance

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, 2012. 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	9.1%	9.7%	11.7%	12.1%	13.2%	12.1%	13.5%	15.4%	14.6%	15.9%	9.5%	13.5%	13.0%
Sharpe Ratio	0.27	0.30	0.41	0.44	0.52	0.47	0.55	0.67	0.63	0.63	0.33	0.51	0.51
Sortino Ratio	0.40	0.43	0.57	0.62	0.70	0.65	0.76	0.91	0.92	0.84	0.56	0.73	0.71
Max Drawdown	-55.8%	-61.3%	-56.9%	-51.1%	-45.0%	-46.8%	-42.2%	-41.0%	-42.7%	-56.6%	-47.6%	-55.1%	-48.0%
Worst Monthly	-31.2%	-27.7%	-25.2%	-26.5%	-27.6%	-24.4%	-23.5%	-22.8%	-17.5%	-23.6%	-17.9%	-25.6%	-24.6%
	Panel B: Cyclically-Adjusted 10-year Book to Market												
CAGR	7.7%	10.8%	12.5%	11.8%	13.3%	12.9%	13.2%	14.1%	15.0%	16.6%	12.0%		
Sharpe Ratio	0.21	0.36	0.45	0.43	0.51	0.49	0.53	0.58	0.64	0.64	0.47		
Sortino Ratio	0.31	0.54	0.66	0.60	0.69	0.66	0.70	0.81	0.88	0.85	0.75		
Max Drawdown	-68.8%	-51.7%	-51.2%	-43.8%	-43.2%	-47.3%	-50.1%	-44.8%	-49.3%	-57.6%	-50.4%		
Worst Monthly	-26.7%	-26.1%	-26.2%	-27.1%	-26.4%	-26.8%	-23.9%	-20.2%	-18.5%	-24.5%	-19.6%		
	Panel C: Cyclically-Adjusted 10-year EBITDA to Total Enterprise Value												
CAGR	7.3%	9.5%	11.9%	12.8%	12.0%	14.3%	13.6%	15.2%	15.3%	15.7%	11.2%		
Sharpe Ratio	0.20	0.30	0.43	0.49	0.46	0.58	0.55	0.64	0.61	0.60	0.42		
Sortino Ratio	0.29	0.44	0.59	0.67	0.61	0.80	0.77	0.89	0.84	0.80	0.60		
Max Drawdown	-64.9%	-54.2%	-48.8%	-50.4%	-46.9%	-43.5%	-44.1%	-40.1%	-51.1%	-62.1%	-51.3%		
Worst Monthly	-27.7%	-28.0%	-25.0%	-26.5%	-24.6%	-22.9%	-19.7%	-21.4%	-25.2%	-25.9%	-21.8%		
	Panel D: Cyclically-Adjusted 10-year Free-Cash-Flow to Total Enterprise Value												
CAGR	12.9%	12.3%	10.0%	11.3%	12.1%	13.6%	13.0%	14.1%	14.3%	15.3%	6.9%		
Sharpe Ratio	0.46	0.47	0.34	0.41	0.45	0.53	0.49	0.55	0.55	0.59	0.22		
Sortino Ratio	0.63	0.64	0.48	0.60	0.66	0.74	0.70	0.77	0.78	0.79	0.38		
Max Drawdown	-57.6%	-53.6%	-51.2%	-48.4%	-45.7%	-40.6%	-46.3%	-44.9%	-47.8%	-56.2%	-35.1%		
Worst Monthly	-23.9%	-21.5%	-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	7.6%	10.5%	11.8%	12.4%	12.6%	12.5%	14.0%	14.1%	15.8%	16.4%	12.6%		
Sharpe Ratio	0.21	0.37	0.46	0.48	0.48	0.46	0.54	0.54	0.61	0.62	0.55		
Sortino Ratio	0.29	0.52	0.67	0.68	0.70	0.65	0.74	0.74	0.84	0.84	0.78		
Max Drawdown	-66.7%	-53.7%	-47.1%	-40.1%	-40.4%	-50.9%	-48.4%	-48.7%	-52.4%	-61.9%	-48.0%		
Worst Monthly	-25.1%	-22.4%	-17.5%	-23.6%	-24.9%	-26.9%	-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, 2012. 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.

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CAGR	8.9%	9.2%	11.0%	11.8%	12.4%	12.4%	14.7%	15.7%	17.3%	18.8%	12.6%	13.5%	13.0%
Sharpe Ratio	0.26	0.28	0.37	0.44	0.47	0.48	0.60	0.67	0.73	0.67	0.49	0.51	0.51
Sortino Ratio	0.39	0.40	0.52	0.63	0.64	0.64	0.82	0.95	1.10	1.04	0.86	0.73	0.71
Max Drawdown	-60.3%	-62.7%	-55.7%	-49.9%	-48.6%	-44.5%	-49.1%	-47.8%	-46.4%	-64.7%	-38.6%	-55.1%	-48.0%
Worst Monthly	-31.2%	-26.5%	-27.1%	-24.3%	-28.2%	-26.3%	-24.4%	-21.8%	-18.6%	-25.8%	-16.6%	-25.6%	-24.6%
	Panel B: Cyclically-Adjusted 10-year Book to Market												
CAGR	6.8%	10.3%	12.1%	12.9%	12.8%	14.0%	13.3%	14.6%	16.4%	19.3%	15.9%		
Sharpe Ratio	0.17	0.34	0.44	0.48	0.47	0.55	0.51	0.59	0.67	0.69	0.64		
Sortino Ratio	0.26	0.51	0.63	0.66	0.66	0.73	0.69	0.81	0.98	1.06	1.04		
Max Drawdown	-70.5%	-51.3%	-48.0%	-46.9%	-51.0%	-48.6%	-55.6%	-50.8%	-54.9%	-64.0%	-43.5%		
Worst Monthly	-27.5%	-26.4%	-25.4%	-26.7%	-26.5%	-25.7%	-25.7%	-23.3%	-21.0%	-24.7%	-23.4%		
	Panel C: Cyclically-Adjusted 10-year EBITDA to Total Enterprise Value												
CAGR	6.7%	8.8%	11.3%	12.2%	12.5%	14.2%	14.5%	16.5%	17.4%	18.5%	15.0%		
Sharpe Ratio	0.17	0.27	0.40	0.46	0.47	0.56	0.58	0.67	0.68	0.67	0.61		
Sortino Ratio	0.25	0.39	0.56	0.65	0.64	0.79	0.84	0.97	0.98	0.94	0.88		
Max Drawdown	-69.3%	-50.7%	-52.1%	-48.5%	-50.4%	-48.9%	-50.1%	-45.3%	-57.1%	-66.4%	-46.2%		
Worst Monthly	-28.9%	-26.7%	-26.1%	-26.9%	-25.3%	-22.3%	-18.3%	-21.6%	-21.6%	-27.0%	-26.5%		
	Panel D: Cyclically-Adjusted 10-year Free-Cash-Flow to Total Enterprise Value												
CAGR	13.3%	12.4%	10.0%	10.9%	12.1%	13.0%	14.0%	13.7%	15.9%	17.5%	8.7%		
Sharpe Ratio	0.46	0.46	0.35	0.39	0.45	0.49	0.53	0.52	0.60	0.64	0.40		
Sortino Ratio	0.65	0.65	0.49	0.55	0.68	0.69	0.77	0.74	0.90	0.92	0.68		
Max Drawdown	-66.2%	-56.7%	-53.5%	-44.6%	-43.4%	-47.4%	-50.2%	-52.9%	-47.2%	-58.6%	-24.9%		
Worst Monthly	-26.1%	-21.9%	-21.8%	-24.3%	-23.6%	-27.1%	-25.4%	-27.2%	-26.7%	-28.4%	-8.4%		
	Panel E: Cyclically-Adjusted 10-year Gross Profits to Total Enterprise Value												
CAGR	7.3%	9.9%	11.8%	11.4%	13.5%	13.1%	14.3%	15.8%	16.7%	18.9%	15.8%		
Sharpe Ratio	0.20	0.34	0.45	0.42	0.51	0.49	0.54	0.59	0.62	0.68	0.73		
Sortino Ratio	0.27	0.47	0.68	0.60	0.76	0.69	0.77	0.84	0.90	0.96	1.14		
Max Drawdown	-67.7%	-54.4%	-46.8%	-49.3%	-44.8%	-57.1%	-47.9%	-50.6%	-54.4%	-66.5%	-41.4%		
Worst Monthly	-25.8%	-21.8%	-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, 2012 for panels A and B; July 1, 1973, to December 31, 1993 for panels C and D; and from January 1, 1994, to December 31, 2012 for panels E and F. Panels A-F report the equal-weight results for the top decile portfolio based on one of the following valuation measures: CA-EM, CA-BM, CA-EBITDA/TEV, CA-FCF/TEV, and CA-GP/TEV. The top decile portfolio is then split by momentum, which is calculated as the cumulative returns from month -12 to month -2. Panels A, C, and E show the returns to the high momentum portfolio, while Panels B, D, and F show the returns to the low momentum portfolio. SP 500 EW is the equal-weight S&P 500 index. SP 500 is the S&P 500 index.

1973-2012	CA-EM	CA-BM	CA-EBIDTA/TEV	CA-FCF/TEV	CA-GP/TEV	SP 500 EW	SP 500
	Panel A: High Momentum						
CAGR	20.5%	21.6%	20.0%	18.6%	20.1%	13.5%	10.3%
Sharpe Ratio	0.83	0.86	0.80	0.74	0.79	0.51	0.38
Sortino Ratio	1.13	1.20	1.04	0.98	1.08	0.73	0.54
Max Drawdown	-56.5%	-57.2%	-61.5%	-52.4%	-56.8%	-55.1%	-50.2%
Worst Monthly	-25.5%	-27.2%	-28.3%	-30.0%	-28.0%	-25.6%	-21.6%
	Panel B: Low Momentum						
CAGR	16.3%	16.3%	16.3%	16.0%	17.1%	13.5%	10.3%
Sharpe Ratio	0.51	0.50	0.52	0.52	0.54	0.51	0.38
Sortino Ratio	0.87	0.85	0.81	0.83	0.83	0.73	0.54
Max Drawdown	-71.5%	-70.4%	-69.8%	-64.0%	-74.3%	-55.1%	-50.2%
Worst Monthly	-27.9%	-29.0%	-28.8%	-27.7%	-29.8%	-25.6%	-21.6%
1973-1993							
	Panel C: High Momentum						
CAGR	25.5%	26.2%	25.2%	22.3%	25.1%	16.2%	12.2%
Sharpe Ratio	0.94	0.94	0.93	0.80	0.89	0.52	0.35
Sortino Ratio	1.45	1.42	1.37	1.13	1.35	0.93	0.71
Max Drawdown	-32.0%	-28.9%	-35.8%	-33.5%	-34.3%	-37.2%	-38.9%
Worst Monthly	-25.5%	-27.2%	-28.3%	-30.0%	-28.0%	-25.6%	-21.6%
	Panel D: Low Momentum						
CAGR	18.8%	18.4%	20.1%	17.7%	21.1%	16.2%	12.2%
Sharpe Ratio	0.56	0.54	0.66	0.55	0.68	0.52	0.35
Sortino Ratio	1.30	1.20	1.17	1.05	1.14	0.93	0.71
Max Drawdown	-39.2%	-40.4%	-32.8%	-42.3%	-40.1%	-37.2%	-38.9%
Worst Monthly	-16.7%	-16.4%	-25.7%	-26.7%	-26.7%	-25.6%	-21.6%
1994-2012							
	Panel E: High Momentum						
CAGR	15.4%	16.8%	14.7%	14.9%	14.8%	10.7%	8.4%
Sharpe Ratio	0.71	0.78	0.67	0.69	0.68	0.50	0.41
Sortino Ratio	0.79	0.94	0.71	0.79	0.77	0.52	0.37
Max Drawdown	-56.5%	-57.2%	-61.5%	-52.4%	-56.8%	-55.1%	-50.2%
Worst Monthly	-23.2%	-19.8%	-22.0%	-19.8%	-18.9%	-20.8%	-16.7%
	Panel F: Low Momentum						
CAGR	13.6%	14.0%	12.4%	14.2%	12.9%	10.7%	8.4%
Sharpe Ratio	0.47	0.48	0.43	0.51	0.45	0.50	0.41
Sortino Ratio	0.63	0.65	0.59	0.68	0.60	0.52	0.37
Max Drawdown	-71.5%	-70.4%	-69.8%	-64.0%	-74.3%	-55.1%	-50.2%
Worst Monthly	-27.9%	-29.0%	-28.8%	-27.7%	-29.8%	-20.8%	-16.7%