VOLUME 27 | NUMBER 3 | SUMMER 2015

Journal of APPLIED CORPORATE FINANCE

In This Issue: **Activist Investors and the Future of the Public Corporation**

Multiples, Forecasting, and Asset Allocation

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Multiples such as the dividend yield (D/P), the price-earnings ratio (P/E), and the cyclically-adjusted P/E ratio (CAPE) are typically viewed as useful tools to forecast long-term stock returns. In fact, the evidence does suggest that the more investors pay per dollar of a fundamental variable—whether it be dividends, earnings, or cyclically-adjusted earnings—the lower their long-term return is. The ultimate question considered here is whether multiples, which are useful tools to forecast long-term returns, can also be useful tools for asset allocation.

Assume for the sake of the argument that multiples are "strongly" related to ten-year forward returns; that is, a high (low) P/D, P/E, or CAPE today unequivocally implies a low (high) return over the following ten years. If this were the case, an investor could increase his exposure to equity when a given multiple is low, hold the high exposure for ten years, and capture a high return. Similarly, he could decrease his exposure to equity when the multiple is high, hold the low exposure for ten years, and avoid a low return.

The problem is that most individual and (particularly) institutional investors do not set an asset allocation and hold it for ten or more years; rather, they frequently adjust their portfolios in response to short-term conditions, among them changes in multiples, although these give no reliable signals about short-term returns. For this reason, it is conceivable that multiples could be at the same time useful tools to forecast long-term returns and poor tools to determine short-term asset allocations. That is precisely what the evidence in this article suggests. In fact, when multiples that provide reliable long-term strategic signals are (improperly) used as short-term tactical tools, the resulting valuation-based portfolios fail to outperform a simple 60-40 stock-bond portfolio.

The rest of the article is organized as follows. Section 2 discusses in more detail the issue at stake; section 3 discusses the evidence for the U.S. market and its relationship to previous findings; and section 4 provides an assessment.

The Issue

Multiples such as D/P and P/E have a long history as valuation tools. Even CAPE, which has become increasingly popular only recently, can be traced back to Graham and Dodd's (1934) *Security Analysis*. The usefulness of multiples to forecast long-term stock returns is on display in Figure 1, which shows the relationship of the inverse of D/P (panel A) and P/E (panel B) to ten-year forward annualized returns over the 115-year period from 1900-2014.[1] Clearly, history shows that the more investors paid per dollar of dividends per share or earnings per share, the lower the returns they received in the next ten years were.

Based on the 106 observations underlying the two graphs of Figure 1, the correlations between ten-year forward annualized returns and P/D, and between those returns and P/E, were –0.43 and –0.52, respectively. Both correlations are significantly different from 0, although as is well known, significance based on overlapping observations can be misleading. In any case, the relationship between these two multiples and ten-year forward returns is clear from the graphs.

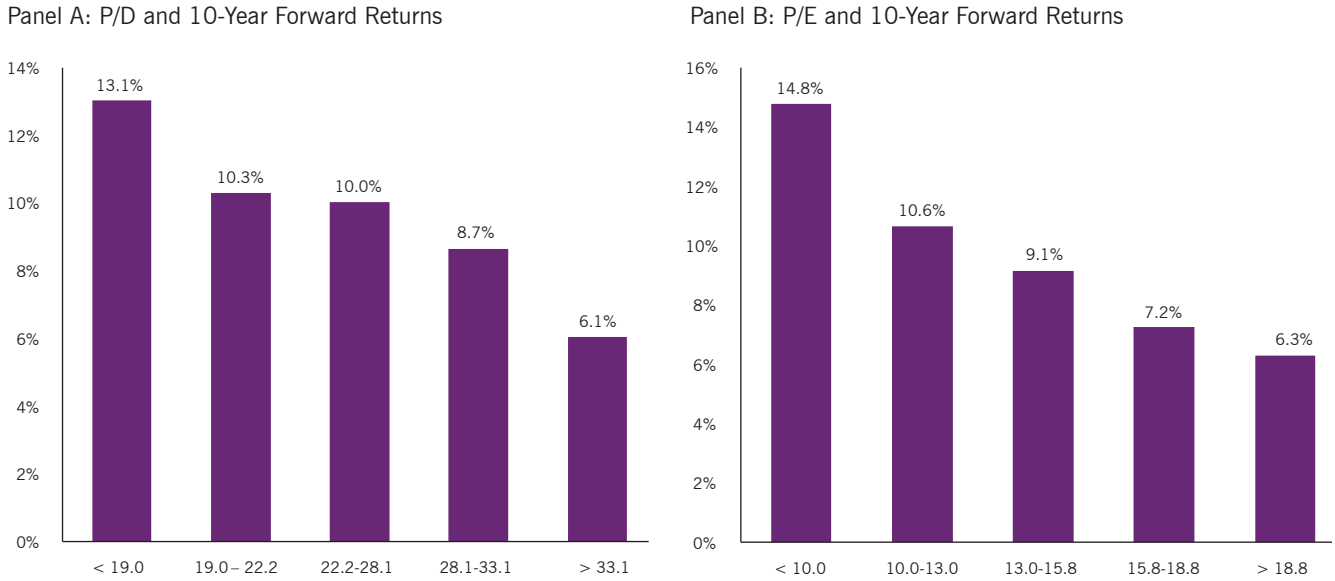
Figure 2, on the other hand, relates P/D (panel A) and P/E (panel B) to one-year forward returns. As is clear from both graphs, the ability of multiples to forecast long-term returns displayed in Figure 1 largely vanishes in the short term. Based on the 115 observations underlying the two graphs of Figure 2, the correlations between one-year forward returns and P/D, and between those returns and P/E, were –0.18 and –0.10, respectively, substantially lower in absolute value than those in Figure 1 (–0.43 and –0.52).

Figures 1 and 2, consistent with evidence discussed by Campbell and Shiller (1998), suggest that entering the market at a high or low multiple does provide fairly reliable information about the long-term expected return, but very little information about the short-term expected return. In fact, investors who entered the market at the end of 1998 at a P/E of 32.6, given a long-term mean up until then of 14.0, should have expected a very low long-term return; and as things turned out, in the ten years through the end of 2008 the market indeed delivered a 23.9% loss. However, the same investors should have not necessar-

* I would like to thank Bill Bernstein, Mike Edleson, Mark Kritzman, Rosy Macedo, and Dick Sweeney for their comments to an early draft of this article. Javier Zazurca provided valuable research assistance. The views expressed below and any errors that may remain are entirely my own.

1. Returns are for the S&P 500; they are expressed in nominal terms and account for capital gains/losses and dividends. Both dividends and earnings are lagged three months to allow for information availability in real time. All five quintiles have the same number of observations.

Figure 1 **Multiples and 10-Year Forward Returns**



ily expected a low short-term return; in fact, in the year through the end of 1999 the market rallied and delivered a 21.0% gain.

The fact that multiples provide useful valuation signals in the long term, but very noisy and rather useless signals in the short term, suggests some interesting questions: Given that investors tend to adjust their asset allocation in response to short-term conditions, among them changes in multiples, are these multiples a useful tool to determine a portfolio's asset allocation? Do multiples enable investors to devise valuation-based strategies with superior performance? Or do multiples instead lead investors to needlessly and frequently tweak their asset allocations, thereby increasing their taxes and transactions costs? These are empirical questions explored in the remainder of this article.

The Evidence

The first part of this section describes the data, strategies considered, and methodology; the second part reviews the performance of the four strategies evaluated; and the third part discusses some additional considerations.

Data, Strategies, and Methodology

The sample consists of monthly total return indices of stocks and bonds between September 1899 and December 2014. Stocks are represented by the S&P 500 and bonds by 90-day U.S. Treasury Bills. All returns considered are nominal and account for capital gains/losses and dividends. Earnings per share and dividends per share for the calculation of P/E and P/D are lagged three months to allow for information availability in real time.[2] Cyclically-adjusted earnings per share for CAPE are calculated as the average earnings per share over the preceding 120 months, again with a three-month lag.[3] All adjustments to asset allocations take place once a year, at the end of the year. Transaction costs and tax costs are not considered.

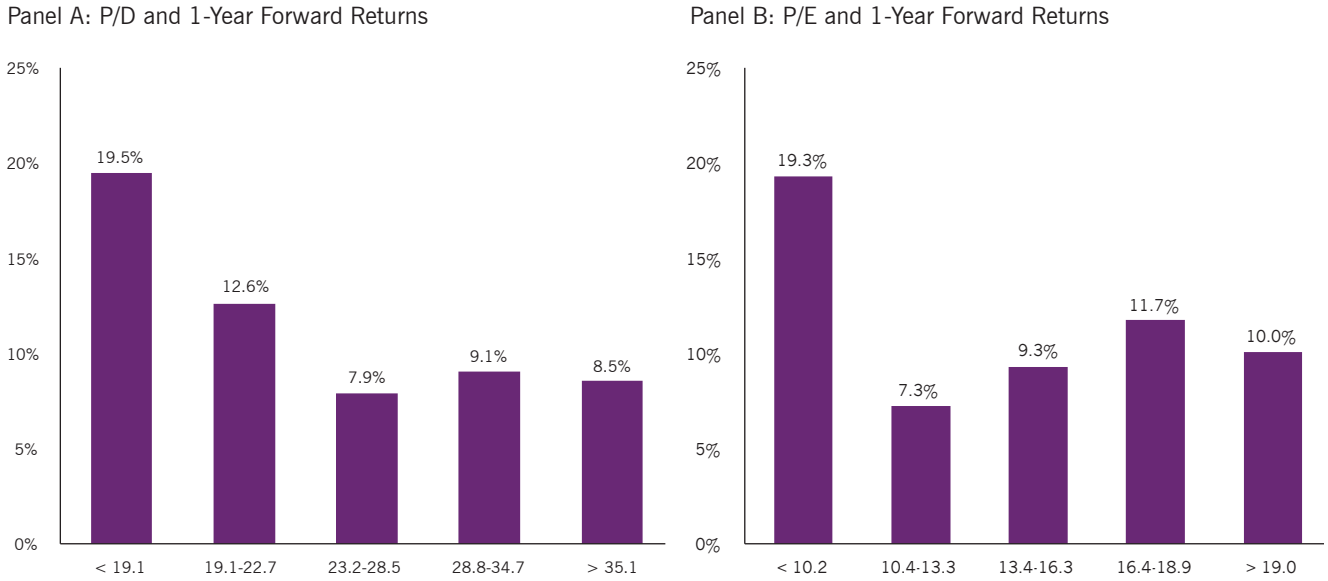
Three valuation-based strategies—one based on the use of P/D, one on the use of P/E, and one on the use of CAPE—are evaluated against a strategy often referred to as the industry standard; that is, a simple 60-40 stock-bond static allocation. This 60-40 portfolio is rebalanced at the end of each year considering 5% tolerance bands. In other words, if at the end of a year the allocation to stocks is between 55% and 65%, no rebalancing takes place; if, on the contrary, the allocation to stocks is below 55% or above 65%, the portfolio is rebalanced back to the 60-40 allocation.

The three valuation-based strategies seek to implement an aggressive portfolio when stocks are cheap and a conservative one when stocks are expensive. Beginning from the benchmark 60-40 allocation, an aggressive portfolio increases the allocation to stocks by 20 percentage points to 80%, and a conservative portfolio reduces the allocation to stocks by 20 percentage points to 40%.

2. To illustrate, the first P/D and P/E in the sample, at the end of Dec 1899, are calculated as the value of the S&P 500 at that point in time divided by the dividends per share and earnings per share at the end of Sep 1899. All P/Ds and P/Es in the sample are calculated in a similar fashion.

3. Unlike the CAPE popularized by Robert Shiller, the CAPE used here does not adjust either prices or earnings for inflation. Note, however, that the correlation between both CAPE measures is 0.95. Note, also, that the results discussed for the nominal CAPE are very similar to those for the inflation-adjusted CAPE (not reported).

Figure 2 **Multiples and 1-Year Forward Returns**



Cheap and expensive stocks are determined as follows. At the end of each month, the long-term mean and standard deviation of P/D, P/E, and CAPE are calculated with all the data available up to that point. The first mean and standard deviation are calculated at the end of Dec 1919 for the 20-year period between Dec 1899 and Dec 1919; from that point on, one month is periodically added to the calculation of both statistics. At the end of each year, stocks are cheap (expensive) if a multiple is more than one standard deviation below (above) its long-term mean, and fairly valued if the multiple is within one standard deviation of its long-term mean.

When stocks are fairly valued (as just defined) at the end of each year, the same tolerance bands applied to the benchmark 60-40 portfolio are applied to the valuation-based portfolios. In other words, if the allocation to (fairly-valued) stocks is between 55% and 65%, nothing is done; if, on the contrary, the allocation to (fairly-valued) stocks is below 55% or above 65%, then the portfolio is rebalanced back to the 60-40 allocation.

Two variations of this base case are considered, one altering the definition of aggressive and conservative portfolios, and the other altering the definition of cheap and expensive stocks. The first variation consists of a more extreme asset allocation when stocks are cheap or expensive. More precisely, beginning from the benchmark 60-40 portfolio, an aggressive portfolio increases the allocation to stocks by 30 percentage points to 90%, and a conservative portfolio reduces the allocation to stocks by 30 percentage points to 30%. The second variation consists of a more extreme way of determining when stocks are cheap or expensive. More precisely, stocks are considered cheap (expensive) when a multiple is more than two standard deviations below (above) its long-term mean, and fairly valued when the multiple is within two standard deviations of its long-term mean. The four scenarios considered are summarized in Table 1.

At the end of 1919, $100 is invested in the 60-40 static allocation and in each of the three valuation-based strategies considered; no more capital is added to these four portfolios through the end of the evaluation period. The static portfolio is rebalanced at the end of each year considering the 5% tolerance bands already discussed; the valuation-based portfolios are rebalanced at the end of each year considering the rebalancing rules in Table 1. The performance of all strategies is evaluated over the 95 years between the beginning of 1920 and the end of 2014.

Results

The results of the base case, considering shifts of 20 percentage points in the asset allocation when stocks are cheap or expensive, and one standard deviation bands around the long-term mean of multiples to determine cheap or expensive valuations, are summarized in panel A of Table 2. The annualized return of the 60-40 portfolio is the same as that of the strategies based on P/E and CAPE (8.1%) and slightly higher than that of the strategy based on P/D (7.9%). Thus, adjusting the asset allocation based on the signals provided by multiples does not enable investors to enhance the return of their portfolios relative to the static allocation.

The 60-40 portfolio has essentially the same annualized volatility as the valuation-based portfolios, all of them right around 11%. The combination of very similar returns and very similar risk produces identical risk-adjusted returns (0.22) for the four strategies considered. Note, however, that the valuation-based strategies are rebalanced almost twice as often as the 60-40 portfolio, which is rebalanced only 37 times in 95 years.

Table 1 **Valuation-Based Strategies – Rebalancing Rules**

This exhibit shows the allocation to stocks (S) in the four scenarios considered. At the end of each year, stocks are considered cheap or expensive depending on the value of a multiple (M) relative to its long-term mean (AM) and standard deviation (SD), both estimated with all the data available up to that point in time. A tolerance band of 5% around the benchmark allocation of 60% applies when stocks are fairly valued.

		Portfolio	
		Base Case (+/– 20%)	Alternative (+/– 30%)
Valuation	*Base Case* (1 SD)	$M < \text{AM}-\text{SD} \Rightarrow S=80\%$ $M > \text{AM}+\text{SD} \Rightarrow S=40\%$ Otherwise $\Rightarrow S=60\%$	$M < \text{AM}-\text{SD} \Rightarrow S=90\%$ $M > \text{AM}+\text{SD} \Rightarrow S=30\%$ Otherwise $\Rightarrow S=60\%$
	Alternative (2 SDs)	$M < \text{AM}-2\cdot\text{SD} \Rightarrow S=80\%$ $M > \text{AM}+2\cdot\text{SD} \Rightarrow S=40\%$ Otherwise $\Rightarrow S=60\%$	$M < \text{AM}-2\cdot\text{SD} \Rightarrow S=90\%$ $M > \text{AM}+2\cdot\text{SD} \Rightarrow S=30\%$ Otherwise $\Rightarrow S=60\%$

Hence, if transaction and tax costs were considered, the 60-40 portfolio would outperform the valuation-based strategies by a small margin in terms of both returns and risk-adjusted returns.

Is it the case that valuation-based strategies do not outperform a 60-40 portfolio because the valuation signals are not implemented aggressively enough? As panel B shows, that is not the case. When valuations signals are followed by 30% shifts in asset allocation, the annualized returns remain essentially unchanged relative to those in panel A. And because the same is the case with annualized volatility, once again the four strategies produce virtually-identical risk-adjusted returns. For this reason, as was the case before, if transaction and tax costs were considered, the 60-40 portfolio would come out slightly ahead.

Do the valuation-based strategies fail to outperform a 60-40 portfolio because the one standard deviation band around the long-term mean of a multiple triggers too many rebalancing events? As panel C shows, that is not the case. When two standard deviation bands around the long-term means are considered, once again the annualized returns are nearly identical to those in panels A and B. In this case, however, the volatility of valuation-based strategies is slightly lower, but still risk-adjusted returns are essentially the same across all four strategies. That said, although the wider bands reduce the number of rebalancing events triggered by valuation signals, the 60-40 portfolio still is rebalanced less frequently than the valuation-based strategies, thus having lower transaction and tax costs.

Finally, panel D considers both more extreme (30%) shifts in asset allocation and wider (two standard deviation) bands around the long-term mean of multiples, in both cases relative to the base case. The overall results are nearly identical to those in panel C, and therefore very similar to the results of all the scenarios already considered.

In short, the evidence does not support the superiority of valuation-based strategies; if anything, it points moderately in the opposite direction. In fact, the slight advantage of the 60-40 portfolio does not even take into account that this strategy does not require investors to track the historical performance of multiples and to evaluate whether they signal overvaluation, undervaluation, or fair valuation. In other words, simplicity would add another vote for the 60-40 portfolio.

Further Discussion

The results just discussed are based on portfolios rebalanced once a year. Although Jaconetti et al. (2010) argue that for most individual investors annual rebalancing is enough, it can be argued that most institutional (and even many individual) investors tweak their asset allocation more often. Would the results just discussed change substantially if portfolios were rebalanced on a monthly basis? As Table 3 shows, that is not the case. Across all the four scenarios considered in the figure, which are the same scenarios considered in Table 2, the bulk of the evidence casts doubt once again on the success of valuation-based strategies.

The strategy based on P/E does have a slightly higher return and a slightly lower volatility, and therefore a slightly higher risk-adjusted return, than the other three strategies. However, it also triggers many more rebalancing events than the 60-40 strategy; as panels A-B (C-D) show, the P/E-based strategy is rebalanced 576 (226) times in 95 years, whereas the 60-40 portfolio is rebalanced only 66 times, thus having lower transaction and tax costs. Interestingly, although the P/E-based strategy performs slightly better under monthly rebalancing than under annual rebalancing, the opposite is the case for the other three strategies considered.

This evidence casting doubt on the success of valuation-based strategies is not necessarily at odds with previous findings. Malkiel (2004) compares valuation-based strategies to a buy-and-hold portfolio of stocks. His approach differs from the framework in this article mainly on two counts. First, he considers different valuation measures, including three versions of the Fed model. And second, he considers more extreme changes in asset allocation; in his framework,

Table 2 **Multiples and Asset Allocation – Annual Rebalancing**

This exhibit shows the results of the four strategies evaluated between the beginning of 1920 and the end of 2014. All strategies start with $100 at the beginning of 1920. The 60-40 portfolio is rebalanced at the end of each year considering 5% tolerance bands; the strategies based on P/D, P/E, and CAPE are rebalanced at the end of each year according to the rules in Table 1. The performance measures for the series of monthly returns include the arithmetic (AM) and geometric (GM) mean return, standard deviation (SD), minimum (Min) and maximum (Max) monthly return, risk-adjusted return (RAR=AM/SD), the terminal value of $100 after 30 years invested at the calculated GM (TV-30), and the number of times the portfolio is rebalanced during the evaluation period (N).

Panel A: 1 SD and 20% Shifts	**60-40**	**P/D**	**P/E**	**CAPE**
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.7%	0.7%
SD	3.2%	3.2%	3.1%	3.2%
Min	–17.2%	–19.9%	–19.9%	–17.2%
Max	23.1%	29.0%	23.1%	33.2%
RAR	0.22	0.22	0.22	0.22
Annualized GM	8.1%	7.9%	8.1%	8.1%
Annualized SD	11.0%	11.1%	10.9%	11.2%
TV-30	$1,023	$987	$1,048	$1,035
N	37	71	69	70
Panel B: 1 SD and 30% Shifts				
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.7%	0.7%
SD	3.2%	3.3%	3.2%	3.3%
Min	–17.2%	–22.2%	–22.2%	–19.7%
Max	23.1%	33.5%	23.1%	38.0%
RAR	0.22	0.21	0.22	0.21
Annualized GM	8.1%	7.9%	8.2%	8.1%
Annualized SD	11.0%	11.4%	10.9%	11.5%
TV-30	$1,023	$966	$1,060	$1,034
N	37	71	69	70
Panel C: 2 SDs and 20% Shifts				
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.6%	0.6%
SD	3.2%	3.1%	3.1%	3.1%
Min	–17.2%	–17.2%	–17.2%	–17.2%
Max	23.1%	23.1%	23.1%	23.1%
RAR	0.22	0.23	0.22	0.23
Annualized GM	8.1%	8.0%	7.9%	8.0%
Annualized SD	11.0%	10.6%	10.6%	10.6%
TV-30	$1,023	$1,001	$983	$1,011
N	37	56	48	45
Panel D: 2 SDs and 30% Shifts				
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.6%	0.6%
SD	3.2%	3.0%	3.0%	3.0%
Min	–17.2%	–17.2%	–17.2%	–17.2%
Max	23.1%	23.1%	23.1%	23.1%
RAR	0.22	0.23	0.22	0.23
Annualized GM	8.1%	7.9%	7.9%	8.0%
Annualized SD	11.0%	10.4%	10.5%	10.5%
TV-30	$1,023	$990	$966	$1,004
N	37	56	48	45

valuation signals trigger switches between a portfolio fully invested in stocks and another fully invested in bonds. Focusing on terminal values, he concludes that the all-equity portfolio outperforms all the valuation-based strategies he considers except for one, which outperforms the all-equity portfolio by a very small margin.[4]

4. Table 3 in Malkiel (2004) shows that all the valuation-based strategies he considers slightly outperform the all-equity portfolio in terms of risk-adjusted returns, but he still concludes that valuation measures do not seem to provide enough predictability to articulate an effective market-timing strategy.

Table 3 **Multiples and Asset Allocation – Monthly Rebalancing**

This exhibit shows the results of the four strategies evaluated between the beginning of 1920 and the end of 2014. All strategies start with $100 at the beginning of 1920. The 60-40 portfolio is rebalanced at the end of each month considering 5% tolerance bands; the strategies based on P/D, P/E, and CAPE are rebalanced at the end of each month according to the rules in Table 1. The performance measures for the series of monthly returns include the arithmetic (AM) and geometric (GM) mean return, standard deviation (SD), minimum (Min) and maximum (Max) monthly return, risk-adjusted return (RAR=AM/SD), the terminal value of $100 after 30 years invested at the calculated GM (TV-30), and the number of times the portfolio is rebalanced during the evaluation period (N).

Panel A: 1 SD and 20% Shifts	**60-40**	**P/D**	**P/E**	**CAPE**
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.7%	0.6%
SD	3.3%	3.3%	3.1%	3.3%
Min	–18.3%	–19.6%	–15.1%	–18.3%
Max	24.8%	34.3%	24.2%	34.3%
RAR	0.21	0.20	0.23	0.21
Annualized GM	8.0%	7.8%	8.4%	7.7%
Annualized SD	11.3%	11.5%	10.7%	11.4%
TV-30	$1,005	$948	$1,117	$933
N	66	705	576	590
Panel B: 1 SD and 30% Shifts				
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.7%	0.6%
SD	3.3%	3.4%	3.1%	3.4%
Min	–18.3%	–22.1%	–15.1%	–20.5%
Max	24.8%	38.6%	24.2%	38.6%
RAR	0.21	0.20	0.24	0.20
Annualized GM	8.0%	7.7%	8.6%	7.6%
Annualized SD	11.3%	11.9%	10.7%	11.7%
TV-30	$1,005	$919	$1,173	$898
N	66	705	576	590
Panel C: 2 SDs and 20% Shifts				
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.7%	0.6%
SD	3.3%	3.2%	3.1%	3.1%
Min	–18.3%	–18.3%	–14.9%	–17.2%
Max	24.8%	30.8%	24.8%	24.8%
RAR	0.21	0.22	0.23	0.22
Annualized GM	8.0%	8.0%	8.1%	7.9%
Annualized SD	11.3%	11.1%	10.7%	10.9%
TV-30	$1,005	$1,005	$1,048	$978
N	66	279	226	220
Panel D: 2 SDs and 30% Shifts				
AM	0.7%	0.7%	0.7%	0.7%
GM	0.6%	0.6%	0.7%	0.6%
SD	3.3%	3.2%	3.0%	3.1%
Min	–18.3%	–20.5%	–14.9%	–17.2%
Max	24.8%	34.7%	24.8%	24.8%
RAR	0.21	0.22	0.23	0.22
Annualized GM	8.0%	8.0%	8.2%	7.8%
Annualized SD	11.3%	11.1%	10.5%	10.7%
TV-30	$1,005	$1,005	$1,064	$962
N	66	279	226	220

Fisher and Statman (2006*a*) compare valuation-based strategies based on D/P and P/E (which they consider indirect measures of sentiment) to a strategy based on the bullish sentiment index (a direct and contrarian measure of sentiment) and to a buy-and-hold portfolio of stocks. Like Malkiel (2004), they consider switches between portfolios fully invested in stocks and fully invested in bonds, and find that strategies based on P/E do not outperform an all-equity portfolio in terms of terminal wealth. However, they do find some support for strategies based on D/P, and stronger support for strategies based on the bullish sentiment index, but they ultimately conclude that market timing has been and will remain difficult.

Fisher and Statman (2006*b*) extend their previous study

for the U.S. to Germany, Japan, and the UK, and focus on strategies based on D/P and P/E. They find that valuation-based strategies would have outperformed an all-equity portfolio in terms of terminal wealth in all three markets, but that the successful strategies would have been different across markets. As in their previous article, they remain pessimistic about the past and future success of market timing strategies.

Pfau (2012) finds some support for strategies based on CAPE, relative to both an all-equity portfolio and a 50-50 stock-bond portfolio. However, he argues that implementing a CAPE-based strategy would have been psychologically very difficult, as it would have implied taking contrarian positions that would have paid off only in the long term. Similarly, Kantor and Holdsworth (2014) argue that P/E and CAPE may take a very long time to mean revert, thus making it very difficult for investors to pinpoint the best times to enter and exit the market.

Thus, the bulk of the evidence on valuation-based strategies seems to suggest that, with the benefit of hindsight, it may be possible to find some trading rule that would have outperformed an all-equity portfolio or a balanced portfolio in the past. However, the evidence also seems to suggest that such rules would have been nearly impossible to determine ex-ante, in addition to being psychologically very difficult to implement. The evidence in this article adds to the doubts about the past and future success of valuation-based strategies.

Assessment

Multiples such as D/P, P/E, and CAPE have long been used to forecast long-term returns, although their inability to forecast short-term returns is well known. The ultimate issue addressed in this article is whether these multiples generate valuation signals that enable investors to implement a successful asset allocation strategy. The evidence discussed here suggests that this is by and large not the case.

Over the 95 years between 1920 and 2014, and regardless of whether portfolios are rebalanced annually or monthly, valuation-based strategies and the much simpler 60-40 static portfolio have had very similar performance, before transaction and tax costs. Of course, it is always possible to look back and find some thresholds for the multiples that would have produced valuable signals and successful strategies, but that was not the goal here. As most researchers are well aware, if the data is tortured enough, it will confess.

The fact that multiples are not helpful for asset allocation should not be interpreted as suggesting that they are not helpful for forecasting long-term returns. In fact, the evidence in Figure 1 suggests that multiples do have predictive power in the long term. Furthermore, Solow et al. (2011) show that between 1926 and 2010, the five-year annualized returns following periods of high (top-decile) and low (bottom-decile) CAPE were 1.03% and 18.69%, a large difference by any measure. In other words, in terms of expected returns, it does make a difference whether long-term investors enter the market when it is cheap or expensive.

What explains the failure of multiples to produce valuation signals that could be used to implement successful asset allocation strategies? One reason may be that multiples have forecasting power in the long term but investors adjust their portfolios frequently. Hence, there is a mismatch between the length of the period for which the valuation signals are useful and the holding period of most portfolios. Put differently, the evidence suggests that although multiples may help long-term investors, they are unlikely to help short-term traders.

Another reason may be that simplicity is often underrated; simple static strategies (balanced portfolios) have been shown to perform well, and often better, than more complex strategies in a wide variety of settings.[5] They also require from investors less information, less knowledge, and less work to remain on track, and nowadays they even come neatly packaged in low-cost index funds and ETFs.

In short, just as it is better to have the discipline to regularly follow a balanced diet than going from one fad diet to the next, it may be better for investors to avoid excessive trading based on short-term valuation signals and stick to a simple balanced portfolio for the long term.

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5. To illustrate, a 60-40 allocation compares favorably to several other asset allocation strategies both when saving for retirement and when spending during retirement. For comprehensive international evidence, see Estrada (2014) for the accumulation period and Estrada (2015) for the distribution period.

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Journal of Applied Corporate Finance (ISSN 1078-1196 [print], ISSN 1745-6622 [online]) is published quarterly by Wiley Subscription Services, Inc., a Wiley Company, 111 River St., Hoboken, NJ 07030-5774.

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