Reports of Value's Death May Be Greatly Exaggerated*

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ABSTRACT

Value investing has underperformed growth investing for over 12 years with a −39.1% drawdown from peak to trough using the classic Fama-French definition of the value factor. The second-longest duration of underperformance occurred during the tech bubble, and while deeper than the recent drawdown, lasted less than 4 years. As a result, many now argue, relying on a variety of narratives, that the value investing style is no longer viable. We examine some of these narratives and find them wanting. We use a bootstrap analysis to show that the likelihood (given the historical data) of observing such a large drawdown is about 1 in 20—unusual but not enough to support structural impairment. We then decompose the value–growth performance into three components: the migration of securities, a profit differential, and the change in a valuation spread. Our analysis of pre- and post-2007 data reveal no significant difference between the migration of stocks (from value to neutral or growth or from growth to neutral or value) in the two periods nor do we observe a difference in profitability. The drawdown is explained by the third component: value has become unusually cheap relative to growth with the valuation now in the 97th percentile of the historical distribution. Even given the noisy nature of returns, expected returns are always elevated when in the extreme tail of a distribution.

Keywords: Value investing, value factor, growth investing, value spread, revaluation, migration, profitability, HML, 3-factor model, iHML, intangibles, book value, intrinsic value, financial accounting, behavioral finance, crowding, data mining, structural change, drawdown.

JEL: G11, G12, G14, G23, G40, M40.

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Introduction

An investment style can suffer a period of underperformance for many reasons. First, the style—or factor—may have been a product of data mining (i.e., it only worked initially because of overfitting). Second, some structural changes in the market could render the factor newly irrelevant. Third, the trade can get crowded which leads to distorted prices and to low or negative expected returns. Finally, the recent performance of a factor might simply be the result of bad luck and/or the factor plumbing new lows in relative valuation. If the first three reasons (among others) might imply the style has stopped working and will not likely benefit investors in the future, the last reason has no such implications.

Many investors are reexamining their exposure to the value style given the extraordinary span—over 12 years—of underperformance relative to growth investing. Given the long historical record of value investing, and its solid economic foundations (dating back to the 1930s and, less formally, dating back centuries), it is unlikely that the period up to 2007 was a result of overfitting. The three other explanations, however, deserve a deeper examination. It is likely that no one story accounts for the underperformance; it is probably a combination of all three.

The performance of value versus growth is naturally disaggregated into three components: revaluation, migration, and profitability. Revaluation is simply the relative valuation of growth versus value. If growth stocks get relatively more expensive than value stocks, the mere process of value becoming cheaper relative to growth means that value will underperform growth. Indeed, revaluation accounts for about 70% of the performance differential over the past 12 years. This is not particularly surprising given that six stocks, which we describe as the FANMAG stocks[1] that comprise about 16% of US stock market capitalization, have appreciated nearly tenfold since 2007. Without the FANMAGs, the performance of the S&P 500 Index would have been over 3,000 basis points lower. None of these stocks is a value stock.

The two other performance components are also important. Migration occurs when a value stock becomes more valuable (i.e., trades at a higher price-to-book ratio) and moves from the value portfolio to the neutral or growth portfolio. Migration also occurs when a growth or neutral stock becomes cheaper and drops into the value portfolio. The latter type of migration is a large and reliable contributor to the relative performance of value versus growth. Our examination of the pre- and post-2007 data shows no significant difference in migration. Profitability is the third driver of relative performance, because most growth stocks are more profitable than most value stocks. Similar to the analysis of migration, we find little evidence of any change in the contribution of profitability to relative performance over the two periods.

Our paper is organized as follows. In the first section, we examine the details of the recent period of value's underperformance relative to its historical performance. We then introduce in the second section a return decomposition to study alternative drivers of value's performance. In the third section, we examine the role of intangibles in the definition of value. In the fourth section, using history as a guide, we study the expected future performance of value conditional on various scenarios of relative valuation. We offer some concluding remarks and suggestions for future research in the final section.

Our Approach: A Brief Overview

We begin the paper with an analysis of the likelihood of observing a drawdown of −39.1% using the bootstrap method detailed by Arnott et al. (2019). Interestingly, the current drawdown is not

[1] The FANMAG stocks combine the so-called FANG stocks (Facebook, Amazon, Netflix, and Google) with the winners from the tech bubble of 20 years ago, Apple and Microsoft, which are, for the moment, the two most valuable companies in the world and the only two companies worldwide with a market value of over US$1 trillion.

as large as the largest drawdown observed in the period June 1963–June 2007. Our analysis suggests that the probability of observing such a large drawdown is 4.9%, or roughly 1 out of 20. Whereas a 4.9% likelihood is low, it is not implausible; a statistical red flag might be a likelihood of 1.0% or less.

We then seek to measure the *structural alpha* of the value strategy by purging the revaluation component from the value-minus-growth return. Specifically, in 2007, the valuation spread (value minus growth) was narrow, in the top quartile (22nd percentile). By July 2019, the spread was very wide, with the value portfolio in its cheapest decile relative to growth (97th percentile). Such a widening naturally leads to value performing poorly relative to growth. The leftover return (the structural alpha) is a combination of the profitability difference and migration.

In the post-2007 period, we estimate structural alpha between −0.1% and 1.3% (compared to a pre-2007 estimate between 5.1% and 6.4%), depending on the method of estimation. We show that this low estimate, however, does not signify that long-run structural alpha has fallen. Rather, the estimate is low because the period we analyze—a steep drawdown—is not a random draw. We show that historically whenever value loses money, the structural alpha estimate often turns negative because these periods oversample bad luck. In short, our analysis attributes value's recent underperformance to two sources: the rising valuations of growth stocks and bad luck. Importantly, we estimate that the amount of bad luck required to explain this underperformance is nothing out of the ordinary given the historical ebbs and flows of value.

Our analysis subsumes a number of potential explanations of value's underperformance. For example, some have said the value trade has become crowded, distorting stock prices so that the factor generates a very small or negative expected return. Crowding should cause the factor to become more richly priced in relative value terms. A drop in the valuation spread, from the 22nd to the 97th percentile, however, does not seem consonant with crowding into the value factor.

Likewise, little evidence exists to suggest that the value strategy's long-run structural alpha has turned negative; in fact, we cannot reject the null hypothesis that value has the same structural alpha that it had before 2007. The main difference between "now" and "then" is the rise in valuations, both for growth relative to value, and for US stocks in general. Unless we choose to assume that the valuation spread between value and growth stocks will continue to widen indefinitely, our analysis suggests value is likely to outperform growth.

Many other stories have been told that purport to explain the 12-year shortfall in value's performance and to explain why value will not make a comeback. Some have argued that growth will be permanently more profitable than value in today's market environment. Others have argued that the extraordinarily low interest rates over the past 12 years have boosted the profitability of growth stocks. Our analysis shows little difference in overall profitability of the growth and value investing styles over the two periods, although unsurprisingly large-cap growth has been more profitable in the period since 2007 due to the FANMAG stocks.

Another important structural issue we address is the rapid movement from a manufacturing to a service and knowledge economy. In such an economy, there are economic reasons to believe that simple measures of value, such as the price-to-book ratio, are misleading. For example, a company presumably undertakes the creation of intangibles (e.g., research and development, patents, intellectual property, and so forth) because management expects them to add to shareholder value. These investments, however, are typically treated as an expense and are not accounted for as an amortizable asset on the balance sheet, effectively lowering book value by the amount of the intangibles. This accounting treatment leads to the stocks of many companies being classified as growth stocks because of low book values. Many of these stocks would have been classified as value stocks if the value of the internally generated intangible investments had instead been capitalized (thus increasing book value).

We have often argued that, absent an agreed-upon industry-wide measure of value, it is unwise to select a single measure such as book to market value for use in valuation, especially when strong reasons exist to believe that a company's book-value accounting measures do not accurately represent the company's financial position. We also believe it makes sense to capitalize intangible investments in order to have the most realistic measure of a company's capital. Our empirical work shows that, starting in the 1990s, had many of these companies capitalized intangibles, the average annual return of the standard HML (high-minus-low) factor of Fama-French (1993) would have increased by about 1.5%.

Value's Recent Travails

Value investing has deep roots and a long history. The idea of identifying relatively cheap companies for investment purposes is obvious and was in practice long before the first stock markets appeared.[2] Value as a systematic approach to equity investing dates back at least to the 1930s. Graham and Dodd, in their 1934 classic book *Security Analysis*, laid down the main principles of value investing. They defined the term *intrinsic value* as capturing the future discounted stream of a company's cash flows. By comparing the intrinsic value and the market's value of a company, investors can identify good buying and selling opportunities, which is the core of the value investing process. By the 1930s, asset managers were practicing value investing—first as fundamental analysis, later as quant active, and more recently as systematic smart beta and factor investing strategies—in their efforts to exceed the returns of a cap-weighted market portfolio.

Value is among the most studied and academically recognized factors. Basu (1977) was one of the first to empirically document a value premium by demonstrating that value stocks, defined as having a low price-to-earnings (P/E) ratio, outperform growth stocks, defined as having a high P/E ratio. In the next decade, multiple studies appeared showing that almost any definition of value that uses a fundamentals-to-price ratio produces a comparable return difference between value and growth stocks.[3] Following the studies by Fama and French (1992, 1993), the academic consensus settled on the price-to-book-value (P/B) ratio as the leading definition of value.

The source of the value premium is controversial. One camp led by the work of Fama and French (1992, 1993) views the premium as a compensation for bearing risk, while the other led by the research of Lakonishok, Shleifer, and Vishny (1994) argues that mispricing drives the premium. Although disagreement surrounds the source of the premium, most agree the premium exists and is not an artifact of a data-mining exercise. Indeed, the value effect is present in most asset classes (Asness, Moskowitz, and Pedersen, 2013), it is robust to perturbations in definition, and it does not require high transaction costs to execute (Beck et al., 2016).

Table 1 shows the performance characteristics of the value factor. We define this factor using the Fama-French (1992) method. We construct two portfolios, the highest 30% and the lowest 30% of the market chosen by book-to-price (B/P) ratio (hence, the factor name HML for high-minus-low B/P) and weighted by market capitalization. Then we take the difference in the performance of the two portfolios. We compare this "factor performance" with the performance of other leading

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[2] For example, around the turn of the 15th century, Jakob Fugger ("Fugger the Rich") accumulated vast wealth by lending to troubled businesses and countries, cherry picking their most discounted assets as repayment when his debtors could not repay.

[3] For example, Barbee et al. (1996) documented the value effect for the price-to-sales ratio; Stattman (1980) and Rosenberg, Reid, and Lanstein (1985) documented the value effect for the P/B ratio; and Naranjo, Nimalendran, and Ryngaert (1998) showed the value effect for the dividend yield. Jacobs and Levy (1988) demonstrated that many different definitions of value are related and that they produce correlated returns.

factors, many of which are constructed along similar lines, but use measures other than B/P to differentiate the favored stocks from the least favored. Over the 1963–2019 period of our analysis, value is one of the most attractive factors in terms of risk–return characteristics.

Table 1. Major Factor Performance, United States, Jul 1963–Sep 2019

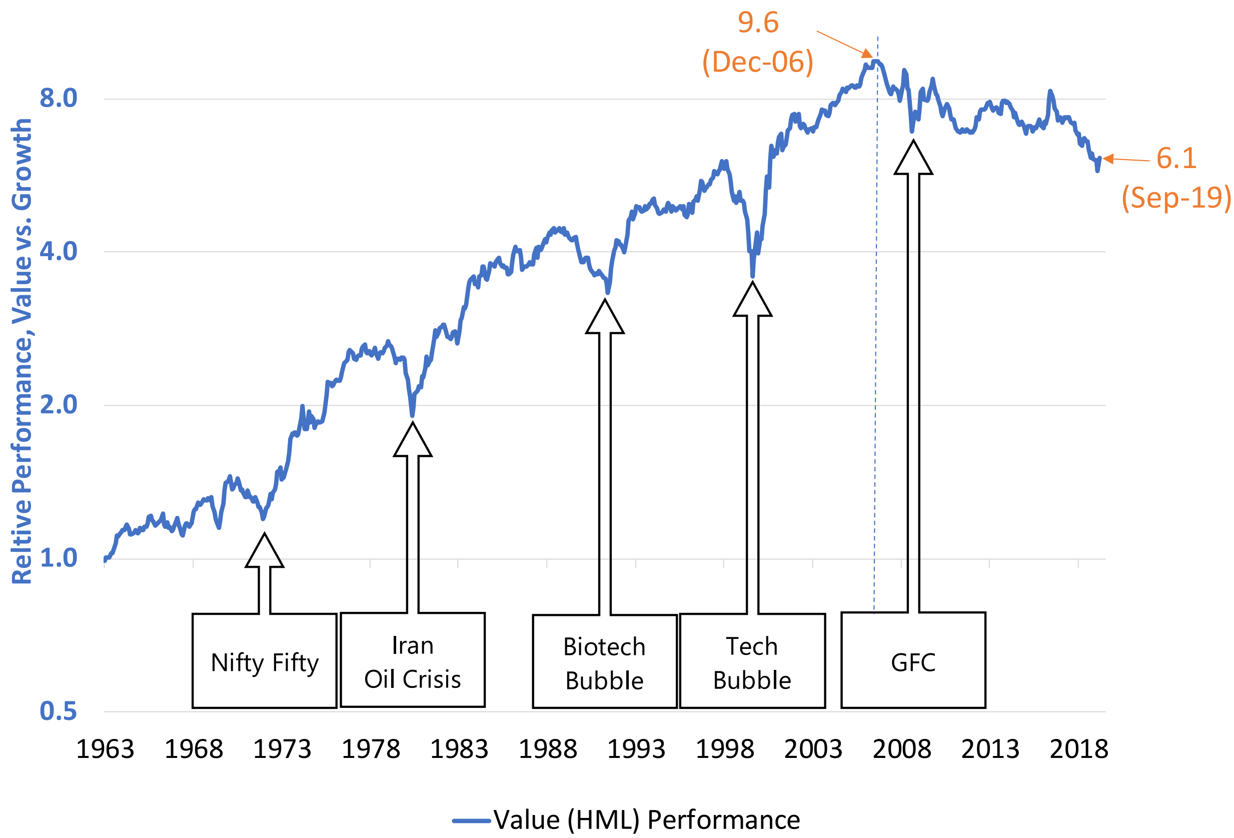
Factor	Year of Discovery	Average Return	Standard Deviation	*t* -value	CAPM Alpha	*t* -value
Market	1964	6.4	15.2	3.14		
Value	1977/90	3.7	9.6	2.87	4.7	3.78
Size	1975	2.2	10.4	1.61	1.0	0.71
Operating profitability	2013	2.8	7.6	2.77	3.6	3.56
Investment	2003	3.2	6.8	3.49	4.3	5.07
Momentum	1989	7.8	14.5	4.03	8.7	4.51
Low beta	1966	0.5	15.3	0.23	5.1	3.58

Source: Research Affiliates, LLC, using CRSP/Compustat data. Note: All factors are long–short strategies similar to the HML factor of Fama and French (1993).

In the 12+ years since 2007, the value factor appears to have reversed its previous course of strong performance. **Figure 1** illustrates the performance of the value factor from July 1963 through September 2019. Before December 2006, the value factor experienced steady growth, albeit temporarily interrupted by events such as the Nifty Fifty surge in the early 1970s, the biotech bubble in the early 1990s, and the tech bubble in the late 1990s.

A long portfolio of value companies (defined by high B/P ratios) held from July 1963 through December 2006 would have grown to 9.6 *times* the value of a long portfolio of growth companies held over the same period, before it contracted 39% by the end of August 2019. In the 12+ years since the start of 2007, although the value investor earned 36% less wealth than the growth investor, value did not stop delivering outperformance. Even with this large drawdown, the value investor is still 6.1 times as wealthy as the growth investor over the period from July 1963 through September 2019.

Figure 1. Value vs. Growth Historical Performance, United States, Jul 1963–Sep 2019



Source: Research Affiliates, LLC, using CRSP/Compustat data.

Table 2 describes the three deepest and three longest value drawdowns in our 56-year sample. The current drawdown at –39.1% is the second deepest, second (by a small margin) to the tech bubble, which at its bottom had a drawdown of –40.3%. The current drawdown of 12.8 years is (by a wide margin) the longest-lasting period of value underperformance. The second longest-lasting period of value underperformance was the biotech bubble in the early 1990s, which lasted for a much shorter 3.8 years from peak to trough to new high.[4,5]

[4] Other definitions of value give surprisingly different results. Fama and French equally weight the large-cap and small-cap strategies, but if we leave out small-cap stocks and focus on large-cap stocks, the tech bubble drawdown lasted over 13 years from late 1986 to early 2000, with the entire shortfall recovered in 16 months. An alternative composition based on measures of book to price, earnings to price, dividend yield, and sales to price and limited to large-cap stocks produced a 14-year drawdown from 1986 to 2000, even longer and deeper than the current value bear market, followed by a very rapid recovery.

[5] Unlike the previous episodes, which we measure peak to trough *to new high*, the current period of underperformance is not over, which will make the recent drawdown and eventual recovery even more remarkable. The end of the latest 12.8-year span appears (so far) to be only one month beyond the bottom of the drawdown. Thus, the final duration number is guaranteed to be longer than 12.8 years.

Table 2. Value vs. Growth Worst Drawdowns, United States, Jul 1963–Sep 2019

Panel A. Deepest Drawdowns

Rank	Event	Dates			Length in Years	Drawdown
		Start date	Bottom	End		
1	Tech Bubble	1998/08	2000/02	2001/02	2.4	-40.6%
2	Current	2006/12	2019/08		12.8	-39.1%
3	Iran Oil Crisis	1979/07	1980/11	1982/02	2.5	-28.6%

Panel B. Longest-Lasting Drawdowns

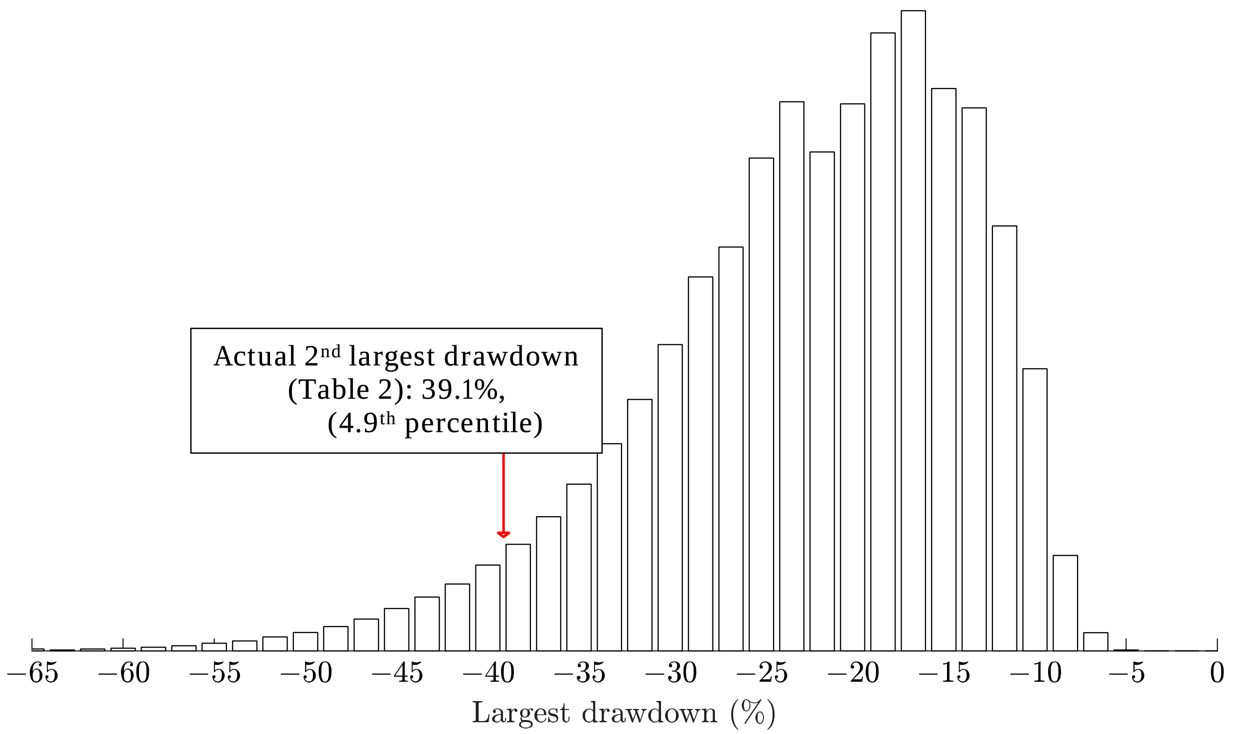
Rank	Event	Dates			Length in Years	Drawdown
		Start date	Bottom	End		
1	Current	2006/12	2019/08		12.8	-39.1%
2	Biotech Bubble	1989/03	1991/12	1993/02	3.8	-25.3%
3	Nifty Fifty	1970/08	1972/06	1973/04	2.6	-17.3%

Source: Research Affiliates, LLC, using CRSP/Compustat data.

Is the current episode of value underperformance an unlucky outcome in line with previous performance or is this time truly different? Specifically, if we use the pre-2007 characteristics of value for guidance, how likely are we to see a drawdown of –39.1% within a span of 12 years and nine months? We use a bootstrap simulation following Arnott et al. (2019) to answer this question. In the simulation, we resample the value factor returns 1,000,000 times by drawing six-month blocks of long–short returns using the historical sample up to December 2006, that is, a month before the current drawdown began. Each sample we create matches the length of the actual sample from January 2007 through September 2019. We then record, for each simulated sample, the size of the largest drawdown.

By counting the frequency of the largest drawdowns, those exceeding –39.1%, we can determine how unusual the actual post-2007 realization is. We display in **Figure 2** the distribution of the largest drawdowns in the simulations. Only 4.9%, or roughly 1 out of 20, of the simulated samples exceed the 39.1% drawdown. Although 4.9% is infrequent, it is not entirely improbable; drawing 1% or 0.5% would be much more consistent with a statistical red flag. Moreover, the analysis is perhaps biased toward a low probability: the reason we try to “explain” the January 2007–September 2019 sample is precisely because value performed so poorly over this period. That is, we are selecting the segment of the data that appears the most atypical.

Figure 2. Histogram of Second-Largest Drawdowns



Source: Research Affiliates, LLC, using CRSP/Compustat data. Note: We generate 1,000,000 alternative histories by bootstrapping July 1963 through December 2006 value versus growth returns. We use a circular block bootstrap with six-month blocks. Each simulated sample is 12 years and nine months long to match the length of the January 2007 through September 2019 sample. We compute the size of the largest drawdown in each simulated sample and compare it to the size of the actual January 2007 through September 2019 drawdown of –39.1%. *The spikes in the histogram correspond to the six-month periods in the historical data during which value performed very poorly. Value, for example, lost 28.0% between September 1999 and February 2000. When this six-month period is drawn in a simulation, it often represents the largest drawdown in the simulation. This particular six-month period represents the leftmost spike in the figure.*

The recent value underperformance raises a reasonable question: Is this time different and is this the new norm? Many narratives are being offered to answer this question and they generally fall into one of the following seven categories:

- *Crowded trade.* Value is a popular factor. Smart beta (or factor investing) has been one of the fastest growing strategies in terms of attracting asset flows. These flows have led to crowding so that stock prices are elevated and expected returns are consequently small or negative.
  - If the crowding narrative is correct, then we should expect that the value premium is structurally impaired for the period during which the crowding persists. Moreover, value investors' trades should push the prices (and valuation multiples) of value companies up, not down, relative to those of growth companies. Empirically, we would expect to have observed over the last 12 years a persistently narrow spread in valuation multiples between value and growth companies.
- *Technological revolution.* In the last decade, we have witnessed the emergence of the vast digital sector, which has driven many longstanding brick-and-mortar companies out of business. The recent success stories of the FANMAG stocks are captivating. These US-based tech companies are collectively vastly profitable. The combined capitalization of the

FANMAG stocks was US$4.7 trillion in October 2019, exceeding the capitalization of every stock market in the world except for those of the United States and Japan. The narrative suggests that in the presence of technological revolution the disruptive new technological leaders can drive outsized monopolistic profits, while the old brick-and-mortar value companies are choked into irrelevance.

  - If this narrative is correct, then we should expect that value investing may be structurally impaired for a prolonged period of time. Empirically, we should expect that growth companies relative to value companies will permanently become even more profitable than they were historically.

- *Low interest rates help growth stocks more than value stocks.* In the last decade, we have witnessed an unusually long period of zero or near-zero interest rates, with US$15 trillion of government bonds worldwide trading at negative yields as of early August 2019 (Fitzgerald, 2019). Liu, Mian, and Sufi (2019) have suggested that industry leaders can disproportionately benefit from low interest rates to generate outsized monopolistic profits.
  - Although the economic mechanism is different, the implications and empirical predictions of this narrative are equivalent to those suggested by the technological revolution narrative.
- *The growth of private markets.* The number of listed stocks has nearly halved in just 22 years, from over 7,500 in 1997 to less than 4,000 today. While the reasons for the decline (which includes the regulatory environment) are numerous, part of the decline may be due to the growth of private equity (PE) investors. This narrative suggests that PE investors buy potentially undervalued stocks and take them out of public markets. This activity leaves fewer value opportunities and lowers the expected return on value.
  - This narrative may have some merit, but it appears to suffer from a logical inconsistency. For example, given the growth of PE, the buying pressure should increase the prices of deep value stocks when they become and are the PE targets. So, on the one hand, some stocks that would fall into the value portfolio may disappear, but, on the other hand, the activities of PE investors should elevate the prices of certain value stocks *before* they disappear.
- *Less migration of value companies to growth and of growth companies to value.* According to this narrative, both the markets and the economy have evolved to a point where much less relative-valuation migration is happening. We hear narratives suggesting that migration may be slowing, in part, because of the more monopolistic structure of many industries compared to a few decades ago, making it harder for new companies to gain market share. The more-stable valuations could also, in part, be driven by market participants' increased sophistication, allowing them to more often "get it right" on the relative valuations of most companies.
  - If this narrative is correct, then we should observe fewer value stocks migrating to neutral and growth classifications than in the past (and vice versa, fewer growth stocks migrating to neutral and value classifications).
- *Book-to-price ratio does not capture intangibles.* According to this narrative, in moving toward a service-based economy, intangibles become the core of a company's ability to generate cash flows. Following current accounting treatment, the book value of equity typically does not include the value of internally generated intangibles, causing B/P to misclassify value stocks as growth stocks because these companies have smaller assets on their balance sheet than they truly have.
  - This narrative would not suggest that value investing is structurally impaired. Instead, it suggests that value metrics should be redesigned to capture the intangible capital. If this narrative is correct, we should expect that valuation

metrics that capture intangibles would have generated a higher premium relative to metrics that ignore intangibles.

- *Value has lagged because the value factor has become unusually cheap*. This does not mean that value stocks are cheap, only that they are unusually cheap relative to growth stocks; by historical standards, both growth and value are expensive relative to past norms. According to this narrative, value stocks can become relatively cheaper or more expensive over time compared to growth stocks as these investment styles come in and out of favor. When the value style is in favor, assets flow in, returns are good, and value becomes expensive based on relative valuation. When the market tide turns, the opposite happens: funds flow out of value stocks, these flows generate negative price pressure, and value becomes relatively cheap as returns fall.
  - If this narrative is correct, the falling relative valuation of value stocks versus growth stocks should be a temporary (albeit 12+ years long) headwind to the performance of value. Unless structural reasons exist for growth and value to have even wider valuation differences in future, this narrative would not imply that value is structurally impaired going forward. Empirically, we would observe that recent changes in relative valuations would fully explain the underperformance.

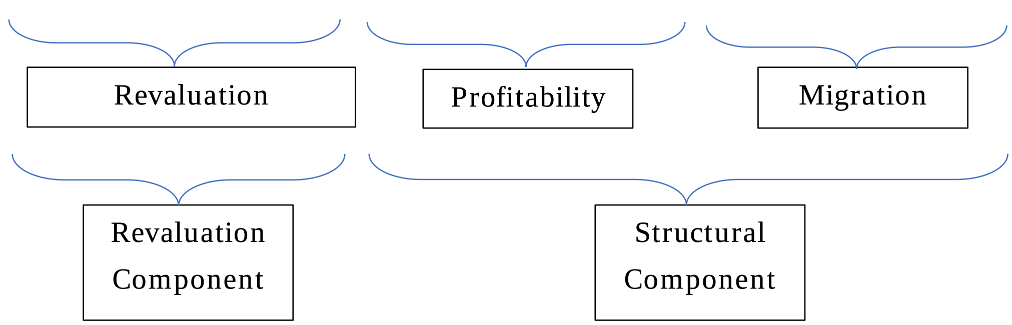
Most of these narratives can be tested. Most, except for the last, are only weakly supported, if at all.

Is Value Dead?

Although the popular narratives propose very different mechanisms for why value has underperformed growth, the implications of the narratives can be described by viewing value factor returns (the performance difference between the value portfolio and the growth portfolio) as emanating from three elements: 1) migration, 2) profitability, and 3) changes in aggregate valuation, or revaluation.[6] If these elements vary over time—for example, if a structural break permanently alters them—then the returns on value investing will vary as well. Using an accounting identity (derivation details are in **Appendix A**), we can attribute the value factor's return to these three elements, as follows:

$$\log(1 + r_{t^+}) =$$

$$= \left[\log\left(\frac{P_{t^+}}{B_{t^+}}\right) - \log\left(\frac{P_{t-1}}{B_{t-1}}\right)\right] + \left[\log\left(\frac{B_{t^-}}{B_{t-1}}\right) + \log\left(1 + \frac{D_{t^-}}{P_{t^-}}\right)\right] + \left[\log\left(\frac{P_{t^-}}{B_{t^-}}\right) - \log\left(\frac{P_{t^+}}{B_{t^+}}\right)\right]$$



where

r_{t^+} = return from time $t - 1$ to time t on the portfolio formed at time $t - 1$;

[6] The idea to decompose the return of equity factors into structural and revaluation alpha was first introduced by Arnott, et al. (2016). This exact decomposition is original to that article.

D_{t^-} = dividend distributions from time $t-1$ to time t from the portfolio formed at time $t-1$;

P_{t-1} = portfolio-weighted market capitalization at time $t-1$ of the portfolio formed at time $t-1$;

B_{t-1} = portfolio-weighted book value of equity at time $t-1$ of the portfolio formed at time $t-1$;

B_{t^-} = portfolio-weighted book value of equity at time t of the portfolio formed at time $t-1$;

P_{t^-} = portfolio-weighted market capitalization at time t of the portfolio formed at time $t-1$;

P_{t^+}= portfolio-weighted market capitalization at time t of the portfolio formed at time t;

B_{t^+} = portfolio-weighted book value of equity at time t of the portfolio formed at time t.

where P, B, and D represent market capitalization, book value, and dividends, respectively. The – and + notations represent the instants before and after rebalancing the long and the short portfolios.

This decomposition holds exactly for a stock's or a portfolio's log return. To apply this decomposition to the HML factor, we first approximate the simple return on a portfolio as

$$r_{t^+} \approx \left[\frac{P_{t^+}}{B_{t^+}} \Big/ \frac{P_{t-1}}{B_{t-1}} - 1\right] + \left[\left(\frac{B_{t^-}}{B_{t-1}}\right)\left(1 + \frac{D_{t^-}}{P_{t^-}}\right) - 1\right] + \left[\frac{P_{t^-}}{B_{t^-}} \Big/ \frac{P_{t^+}}{B_{t^+}} - 1\right]$$

Fama and French (1992) constructed their value factor, HML, as a strategy that is long, with equal weights, a small value portfolio and a big value portfolio, and is short, again with equal weights, a small growth portfolio and a big growth portfolio. Letting SV, BV, SG, and BG denote these four portfolios, respectively, we can decompose the HML factor's return as

$$\begin{aligned} HML_{t^+} &= \frac{1}{2}\left(r_{t^+}^{SV} + r_{t^+}^{BV}\right) - \frac{1}{2}\left(r_{t^+}^{SG} + r_{t^+}^{BG}\right) \\ &\approx \left[\frac{1}{2}\left(\frac{P_{t^+}^{SV}}{B_{t^+}^{SV}} \Big/ \frac{P_{t-1}^{SV}}{B_{t-1}^{SV}} + \frac{P_{t^+}^{BV}}{B_{t^+}^{BV}} \Big/ \frac{P_{t-1}^{BV}}{B_{t-1}^{BV}}\right) - \frac{1}{2}\left(\frac{P_{t^+}^{SG}}{B_{t^+}^{SG}} \Big/ \frac{P_{t-1}^{SG}}{B_{t-1}^{SG}} + \frac{P_{t^+}^{BG}}{B_{t^+}^{BG}} \Big/ \frac{P_{t-1}^{BG}}{B_{t-1}^{BG}}\right)\right] + \cdots \end{aligned}$$

The three elements in the decomposition have the following interpretations:

- *Migration* (stock-level mean reversion). Fama and French (2007) introduced the concept of migration as a term in the return attribution for the performance of value relative to growth portfolios.[7] They examined stocks' movements across the six portfolios (small-cap value, neutral, and growth, and large-cap value, neutral, and growth) that underlie their value factor, HML, and they attributed most of the value factor's performance to the mean reversion in the stocks' style. For example, value stocks, on average, migrate toward the

[7] An awareness of the migration concept dates back to the early days of the Russell growth and value indices, launched in 1979. By the early 1980s, hedge funds began forecasting migration ahead of the annual June rebalance and trading in advance of the changes in index composition. These changes occur, for example, as value stocks come into vogue and become priced (and so recategorized) as growth stocks, while growth stocks can fall out of favor so that their valuation multiples fall and thus be recategorized as value stocks. The value index therefore replaces the stocks with newly elevated valuation multiples with stocks that are newly cheaper, creating an instantaneous "pop" upward in the B/P or E/P ratio of the index, and the opposite happens in the growth index, at every annual rebalance.

neutral or growth portfolios, and growth stocks, on average, migrate toward the neutral or value portfolios.

- *Profitability*. Cohen, Polk, and Vuolteenaho (CPV) (2003) showed that about half of the information contained in the P/B differences between value and growth stocks is attributable to the differences in their future profitability. CPV found that persistence in growth stocks' valuations reflects their future expected (15-year) profitability, which tends to support their trading more expensively than value stocks. Profitability partially offsets the migration component.
- *Revaluation*. Over long periods, if differences in valuations are stationary—that is, if they mean revert—changes in valuations should not contribute significantly to a factor's performance. In the short run—and, to be clear, short run can mean decades of a factor's performance—changes in valuations of all value and growth stocks can contribute significantly to the profitability of value investing. That is, if the average value stock grows more expensive relative to its fundamentals than the average growth stock, this tailwind benefits the value factor.
    - We later show that revaluation explains about 70% of the monthly variance in the HML factor's performance. Based on their studies of equity asset-class performance, Fama and French (2002) and Arnott and Bernstein (2002) suggested that the equity risk premium can significantly benefit or lose from changes in valuations, even when the premiums are measured over many decades.[8] They argue that the returns induced by the changes in the valuations should be purged from the estimates of the risk premium because there is no *a priori* reason why this component would reappear in the future. Following Arnott et al. (2016), we extend this argument to the estimation of the cross-sectional factor premium.

The migration and profitability components are at the core of the value premium—combined, they form what we call the structural component of the value premium. Because the changes in aggregate valuations cannot trend indefinitely—equivalent to saying that no bubble can last forever—the revaluation component should average roughly zero over a sufficiently long period. That said, relative valuations of value and growth stocks could drift to a "new normal," and the value factor would as a result earn an abnormal (good or bad) return during this transition period.

We display results of the value factor's return decomposition in the pre- and post-2007 samples in **Table 3**. Because our value strategy—HML—is rebalanced annually at the end of June, and because our decomposition uses the observations between rebalancing points, in our analysis we focus on the periods between rebalancing points. Specifically, for the pre-2007 period, we examine the period from July 1963 through June 2007, and for the post-2007 period, we examine the period from July 2007 through June 2019. Unless otherwise specified, we follow this convention for the remainder of the article.

Consistent with the prior literature, we observe that growth stocks on average are more profitable than value stocks. On average, the profitability difference contributed –15.0% a year to the value-minus-growth return in the pre-2007 period. Over the same period, the migration component, at

[8] One of our favorite examples is the 50-year performance of stocks relative to bonds from 1950 to 1999. After stocks beat bonds by 7.9% a year over this period, we began to hear the "Why bother with bonds?" narrative in the 2000s, reminiscent of today's "Why bother with value?" conversation. For the 50-year period ending 1999, almost exactly half of stocks' outperformance was due to the dividend yield plummeting from 8.0% to 1.1% (as the Shiller P/E ratio soared from 10.5 to 44 times 10-year average real earnings). Meanwhile, as interest rates rose, the 10-year bond yield increased from 1.9% to 6.6%, sapping bond returns by about 0.5% a year. So, absent upward revaluation of stocks and downward revaluation of bonds, the 7.9% "risk premium" turns out to have been just 3.5%. An excess return of 3.5% is still highly profitable, but it is less than half of what many investors were expecting at the peak of the tech bubble.

20.1% a year, more than compensated for the difference in profitability. Combining the profitability and migration components, we observe a structural value premium of 5.1% a year. In this computation, a headwind of revaluation contributed –0.7% over the 44 years ending June 2007.[9] The structural and revaluation components add up *approximately* to the 5.9% average value premium for the pre-2007 period, but they do not add up *exactly* to the total returns reported in Table 3 because we approximate log returns with simple returns. In Appendix A, in which we report the decomposition results for log returns, the decomposition is exact.

Table 3. Value Return Decomposition, United States, Jul 1963–Jun 2019

Panel A. Return Decomposition in the Pre-2007 Period

Size	Valuation	Total Return	Revaluation Alpha	Structural Alpha	= Profitability	+ Migration
Small	Growth	12.0%	4.5%	10.1%	20.8%	-10.8%
	Neutral	17.6%	3.2%	14.1%	9.8%	4.3%
	Value	20.1%	3.0%	17.6%	0.6%	17.0%
	Value-Growth	*8.1%*	*-1.5%*	*7.5%*	*-20.2%*	*27.8%*
Big	Growth	11.5%	2.8%	10.1%	16.6%	-6.5%
	Neutral	12.7%	2.2%	10.9%	11.3%	-0.4%
	Value	15.3%	2.9%	12.9%	7.0%	5.9%
	Value-Growth	*3.8%*	*0.2%*	*2.7%*	*-9.7%*	*12.4%*
Average	***HML***	***5.9%***	***-0.7%***	***5.1%***	***-15.0%***	***20.1%***

Panel B. Return Decomposition in the Post-2007 Period

Size	Valuation	Total Return	Revaluation Alpha	Structural Alpha	= Profitability	+ Migration
Small	Growth	9.1%	2.9%	8.5%	18.7%	-10.2%
	Neutral	9.6%	0.3%	9.5%	6.3%	3.2%
	Value	7.4%	-0.5%	10.2%	-5.8%	15.9%
	Value-Growth	*-1.8%*	*-3.4%*	*1.7%*	*-24.4%*	*26.1%*
Big	Growth	11.6%	4.5%	7.7%	13.4%	-5.7%
	Neutral	7.7%	0.2%	8.0%	7.1%	0.9%
	Value	7.1%	-0.5%	8.6%	3.5%	5.1%
	Value-Growth	*-4.5%*	*-5.0%*	*0.9%*	*-9.9%*	*10.8%*
Average	***HML***	***-3.1%***	***-4.2%***	***1.3%***	***-17.1%***	***18.4%***

Source: Research Affiliates, LLC, using CRSP/Compustat data.

In the post-2007 sample, the profitability and migration components are close to their values in the pre-2007 sample. This similarity suggests that the narratives about a radical change in the profitability of growth relative to value and of a slowing in the migration between growth and value are not supported by the data. Furthermore, despite the slightly smaller magnitudes of both

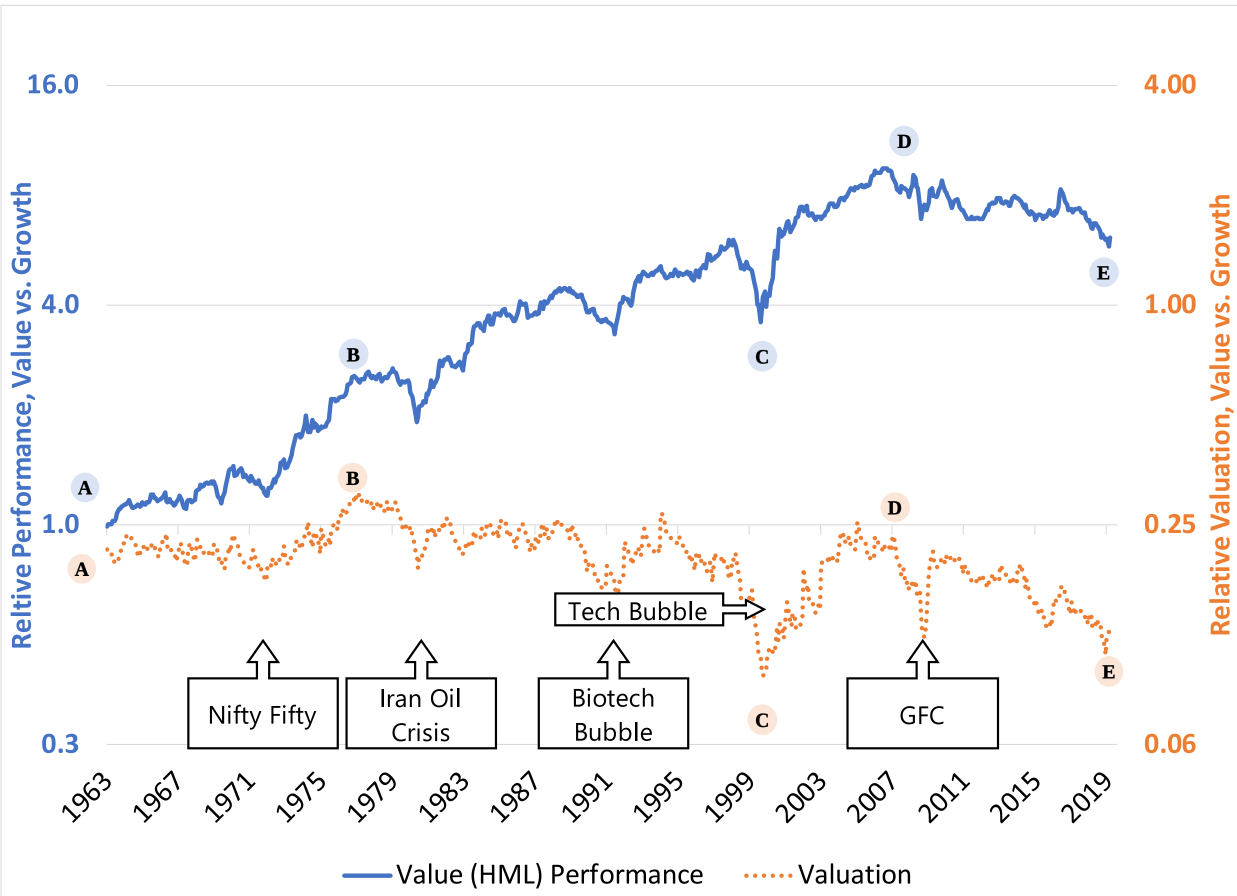
[9] Value stocks were slightly more expensive relative to growth stocks at the end of June 2007 than they were at the end of June 1963. The average revaluation term in Table 3 is negative because we compute averages of *simple* annual returns. In Appendix A we show the decomposition results using log-returns instead of simple returns. In our analysis the average revaluation term is +0.2% a year.

profitability and migration, the migration component still easily overcomes the profitability difference between value and growth. Their sum, the structural alpha, is distinctly smaller than before 2007, at 1.3% versus 5.1%, but is still positive and economically meaningful.

Revaluation contributed –4.2% to the return, down from –0.7% before 2007. As a result, the total value premium flips from 5.9% in the first 44 years to an annualized shortfall averaging –3.1% in the last 12 years. Since 2007, well over 100% of the shortfall of value relative to growth is due to value becoming relatively cheaper. Put another way, it took value cheapening by 4.2% a year to create a performance shortfall of 3.1% a year. In the most recent 12-year period, the revaluation component appears to be the key to understanding why growth stocks outperformed value stocks.

Figure 3 illustrates the evolution of the cumulative value premium (solid line, left axis), which is the same as in Figure 1, and the value–growth relative valuation (dotted orange line, right axis).[10]

Figure 3. Value vs. Growth Performance and Relative Valuations, United States, Jul 1963–Sep 2019



Source: Research Affiliates, LLC, using CRSP/Compustat data.

[10] We compute the relative valuations each month by constructing a monthly rebalanced version of HML. The signal is the book value of equity from a fiscal year that ended at least six months earlier divided by the market value of equity lagged by six months. This signal matches the signal of the canonical, annually rebalanced HML: when HML rebalances

The relative valuation is the ratio of P/B for the value portfolio to P/B for the growth portfolio.[11] If the P/B ratio of the value portfolio is 0.5, and the P/B ratio of the growth portfolio is 2.5, then the relative valuation is 0.2. The median relative valuation is 0.21, which means that growth stocks are, on average, about 4.8 times more expensive than value stocks measured by P/B.[12] As Figure 3 shows, however, the relative valuations of value and growth stocks fluctuate widely over time.

When we put the performance and the revaluation charts together, the short-term movements of the two appear to be joined at the hip. In the short run, the revaluation component (changes in the P/B of value relative to growth) is the dominant driver of the value portfolio's performance relative to growth. Over the long run, however, the two diverge. This divergence suggests that the value premium is driven by structural alpha and is not a lucky discovery due to a highly transitory revaluation component. We observe what seems to be a pronounced trend, which may reflect the waning relevance of classically defined book value as a valuation metric. That said, even a very substantial trend over the past 56 years amounts to only a 0.8% negative annualized slope[13]—and the valuation spreads at the start and end of the series could be abnormally high or low.

The relative valuation in 1963 (point A in Figure 3) is a little higher than the time-series median of 0.21. The relative valuation varies from 0.31 (point B, when value was only 3.3 times as expensive as growth after the Nifty Fifty bubble burst) to 0.10 (point C, when growth stocks were 10.4 times as expensive as value at the peak of the dot-com bubble).[14] A decline in relative valuations characterizes every episode when value substantially underperforms growth. That is, every time value stocks lag growth stocks by a meaningful margin, a key driver of the lag is value stocks becoming cheaper relative to growth stocks.

Over the period we examine in our decomposition, which starts at point D (July 2007)in Figure 3 and runs to point E (June 2019), very close to the most recent low point in value's relative performance, the value factor lost a cumulative 36.3% in performance, or −3.5% a year.[15] From July 2007, to June 2019, the relative valuation has moved from 0.23, which is relatively expensive at the 22nd percentile of the distribution, to 0.12, at the 97th percentile.[16] At the current valuation level, growth stocks trade at about 8 times the valuations of value stocks. The relative valuation has been wider only in two episodes over the 56-year history of our analysis: the peak of the dot-com bubble and the nadir of the Global Financial Crisis. Our decomposition indicates that the

at the end of June in year t, the book value of equity is from the fiscal year that ended in year $t-1$, and the market value is from the December of year $t-1$. By defining this monthly version of HML, we can match the HML valuations at the rebalancing points, while still tracing out valuations at a monthly frequency. An alternative method for constructing a timely measure of value (and valuations) is "Devil's HML," which divides the lagged book value of equity with the current price (Asness and Frazzini, 2013). We use the standard HML because of its prominence in both academic and practitioner literature.

[11] In accordance with Fama and French (1993), the value portfolio equally weights its component large and small value portfolios, and the growth portfolio equally weights its component large and small growth portfolios.

[12] We report relative-valuation summary statistics, such as median or values at specific percentiles, using the monthly observations of relative valuations. The monthly observations relative to the annual observations have a natural upward bias due to average migration between the rebalancing points. For the attribution analysis, we use the annual observations, which are not biased by the migration.

[13] We obtain the slope by regressing the log valuation ratio on the annualized time trend. We interpret the slope to mean, on average, the valuation has been declining by about 0.8% a year over the 56-year sample.

[14] Point B in Figure 3 is the point at which Basu (1977) first documented the value premium.

[15] This differs from the 39.1% drawdown discussed earlier, because here the period is from July 2007 through June 2017, instead of the peak-to-trough drawdown from February 2007 through August 2017.

[16] The historical relative-valuation levels have a very dense distribution around the median and have quite fat tails in both directions, which explains why even with a significant move in terms of percentile, from the 50th—median—to the 22nd percentile, the relative valuation only increased from 0.21 to 0.23. We illustrate the relative-valuation historical distribution in Appendix B.

change in the relative valuation from point D to point E contributed –5.2% a year and turned the 2.5% structural alpha into the −3.1% a year realized value premium.

Modeling the Three Components of the Value Premium

We examine what may have changed in 2007 and how that could impact the relative valuation of value compared to growth by introducing a regression-based model that accounts for the correlations of the three components of the value premium.

Estimating a Revaluation Model

The accounting identity decomposition fully attributes the changes in relative valuations, between the start and endpoint of the portfolio observations, to the portfolio returns. The full attribution would be more intuitive if the strategy had little turnover; that is, the stocks the portfolios hold next year are the same as they hold today. In the presence of turnover, however, the stocks held in the strategy portfolios do not fully benefit (or suffer) from the revaluations of the value and growth stocks.

To illustrate, suppose we track the valuation of a group of small value stocks from year t to year $t + 1$. Assume also that the valuation of these stocks increases by 10%. In the case of no migration (i.e., every stock in the small value portfolio today is in the small value portfolio next year, and there are no new entrants), a strategy that holds this group of small value stocks will gain 10% from the change in valuation. In the presence of migration, however, the 10% change in valuation will not apply to all of the portfolio held at year t; some of the small value stocks may have moved into the small neutral category and some big neutral stocks may have moved into the small value category, while some new stocks may have entered the small value stock universe from the large stock universe or from the previously excluded tiny stocks.

In the decomposition, the revaluation term is still 10%, but now the migration term accounts for the difference in the year $t + 1$ valuations between the stocks held in year t and those held after the rebalance in year $t + 1$. We might find, for example, a migration term of –2%. We would interpret this as meaning that, because of turnover, the valuations of the stocks we bought did not benefit quite as much from the changes in the valuations of value and growth stocks.

We take this turnover effect into account by estimating the average relationship between the revaluation component and the value (HML) factor's return. Specifically, we define the independent variable as the revaluation term from the preceding decomposition as:

$$\Delta bm_t = \left[\frac{P_{t^+}/B_{t^+}}{P_{t-1}/B_{t-1}} - 1 \right],$$

and use the full sample to run a regression with HML as the dependent variable. We account for serial correlation in the data by computing Newey–West standard errors with one annual lag. The estimates from this linear regression (estimated using annual data from June 1963 through June 2019) are as follows:

$$HML_t = \underset{(4.36)}{0.051} + \underset{(8.33)}{0.78} \times \Delta bm_t + e_t; \quad R^2 = 0.62\,.$$

t-values: (4.36) (8.33)

Setting aside the technical details, this regression provides an answer to the simple question: If the valuations of value stocks relative to those of growth stocks change, what is the average return of HML? What is it then we are trying to estimate? To illustrate the issue, suppose we invest in a portfolio with a valuation ratio of P/B and this valuation ratio increases by 10%. The change in the valuation ratio alone does not tell us how much the stock's price changed; we would need to know the change in the book value of equity, the denominator, to back out the change in price, the numerator. For example, if we know the book value of equity remained unchanged at B, then the price must have changed by the full 10%. Or, if we know the book value of equity decreased by 3%—which, by itself, would increase the valuation ratio—then the price must have changed by only (1 + 10%) × (1 + –3%) – 1 = 6.7%.

The regression resolves this ambiguity by measuring the *average* relationship between valuation changes and price changes. Specifically, the regression slope of 0.78 says that when the valuations of value stocks increase by 10% relative to those of growth stocks, HML *on average* returns 7.8%.[17] The regression also shows that revaluations have a significant link to the returns of HML. The R^2 of 62% means that changes in the relative valuations of value and growth stocks explain approximately two-thirds of the variance in the HML factor's returns.

How do we interpret the estimate of 0.78 for the post-2007 sample? As shown in Table 3, the revaluation term averages –4.2% a year over this period. Taking the estimate together with the regression estimates, we attribute approximately 0.78 x (–4.2%) = –3.3% a year to a headwind created by rising valuations. Because the average loss for HML each year over this period was 3.1%, our back-of-the-envelope computation suggests that revaluation alone accounts for *all* of value's negative returns from July 2007 through June 2019.[18] The regression also reveals that *most* of the variation in the HML factor's return can be explained by changes in the revaluation term. That is, by knowing what happens to the relative valuations of value and growth stocks, we can explain approximately two-thirds of the variation in how well the value strategy performs.

Table 4 shows the regression estimates separately for the pre- and post-2007 samples as well as for the full sample. The association between the return of HML and revaluation is quite similar around the 2007 breakpoint: the estimated slope is 0.77 before 2007 and 0.73 after. We are tempted to interpret the intercepts from these regressions as estimates of counterfactual returns on value; that is, how should the value strategy have performed in the absence of any revaluation? In the pre-2007 sample, this intercept is 6.4%; in the post-2007 sample, it is –0.1%. Although the post-2007 sample has only 12 data points and is not significant, the estimate raises a further issue. Does the estimate imply that value would have earned nothing even in the absence of the 4.2% revaluation each year? If this interpretation is correct, should we expect zero structural alpha going forward?

This interpretation is overly simplistic. HML revaluation and HML return are not the same because of the relative-growth component. If revaluation is downward, and the value portfolio has slower growth in book value than the growth portfolio, then the HML return will actually be worse than the downward revaluation. Therefore, the –0.1% structural alpha is artificially depressed by this asymmetry.

[17] The regression models the relationship between the HML *return* and the changes in the relative valuations of value and growth stocks—that is, the relationship modeled is not about the *price change*. The regression slope of 0.78 is inclusive of dividends: if we know the change in relative valuations, the model predicts that the HML return, not the price change, is 0.78 times this change.
[18] We also use similar regressions to examine the performance of two alternative value strategies—value relative to neutral and neutral relative to growth—and found that the results are symmetric.

Table 4. Revaluation Model: Pre- and Post-2007

Independent variable	June 1963 - June 2007	July 2007 - June 2019	June 1963 - June 2019
Revaluation	0.77	0.73	0.78
	(7.42)	(3.91)	(8.33)
Alpha	6.4%	-0.1%	5.1%
	(5.22)	(-0.03)	(4.36)
N	44	12	56
Adj. R2	63.2%	55.0%	61.7%

Source: Research Affiliates, LLC, using CRSP/Compustat data.

When we explicitly analyze drawdowns, we are introducing selection bias by picking the sample to analyze based on the values of the dependent variable. In this case, we choose the most recent 12-year period precisely because value performs so poorly. Although value's poor performance may result in part from revaluation headwinds—perhaps as much as two-thirds of the variation, according to Table 4—we may also be oversampling bad luck in terms of the profitability and migration components as opposed to finding persistently lower structural alpha. In terms of econometrics, the issue is that we are probably choosing, in part, the last 12 years because of the negative residual realizations.

We demonstrate this issue in **Table 5** by introducing an explicit, but comparable, selection bias into the pre-2007 data. Specifically, we split the data into years in which the HML factor's return is positive or negative. In these regressions the intercept is positive and statistically significant when HML does well, and negative and statistically significant when HML does poorly. This result is not surprising. Because value's performance, in part, emanates from the differences in profitability and migration rates, its performance *net* of revaluation is still, on average, poor if we insist on studying a period during which value underperforms—the migration and profitability components do well when we look at years in which value outperforms. More importantly, because we use the pre-2007 period in this analysis—a period during which the unconditional structural alpha is positive—we know that the negative structural alpha in the underperforming periods is not a sign of broken structural alpha. Rather, it is a sign that when we select periods during which value underperforms we are oversampling bad luck.

Table 5. Revaluation Model: Alphas Conditional on HML

Independent variable	June 1963 - June 2007	
	HML < 0	HML > 0
Revaluation	0.30	0.74
	(2.78)	(2.34)
Alpha	-3.6%	8.3%
	(-1.97)	(5.25)
N	15	29
Adj. R2	35.4%	34.9%

Source: Research Affiliates, LLC, using CRSP/Compustat data.

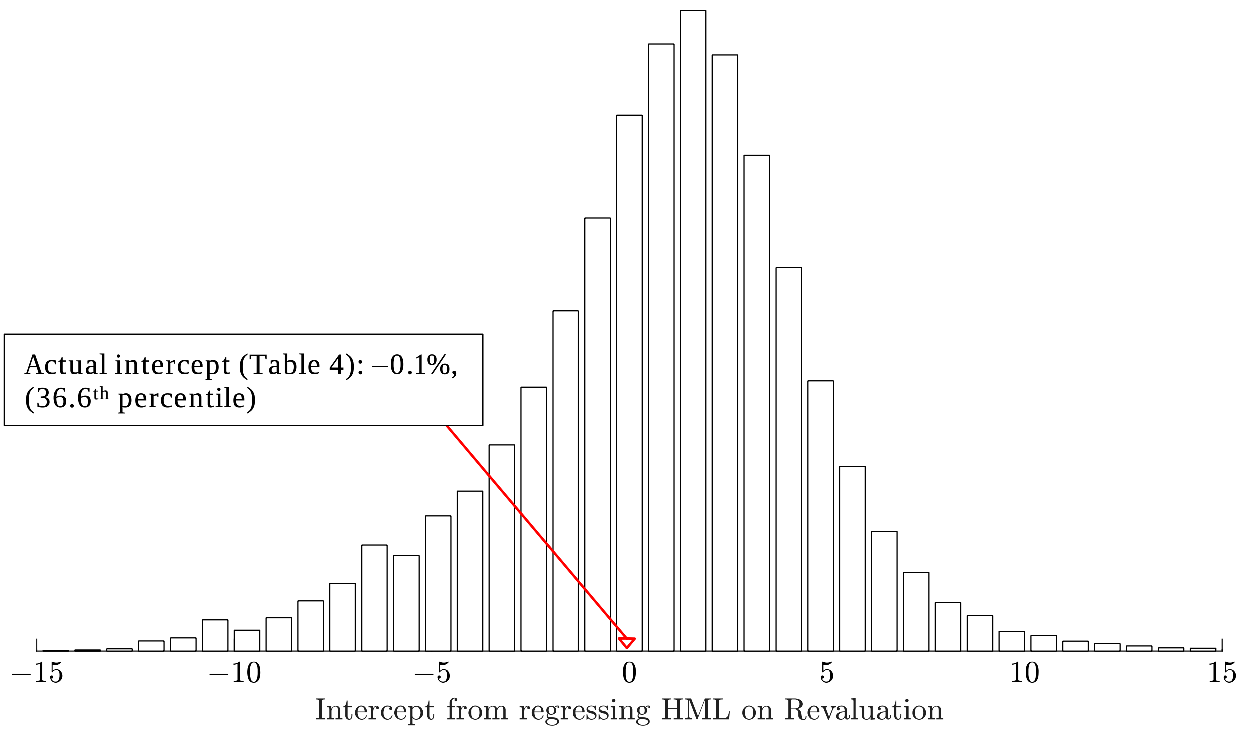
In this sense, the –0.1% structural alpha for the most recent 12 years is actually a very good outcome. If structural alpha in the negative return years for HML pre-2007 was –3.6%, which set the stage for a powerful 8.3% structural alpha when HML turned positive, then the results for the 12 years post-2007 are arguably 3.5% better than they should have been. This suggests that the –0.1% structural alpha in this most recent period materially understates the likely structural alpha over a full HML cycle, what we call long-term structural alpha.

Although this mechanism is intuitive, an important question remains: Is the intercept of –0.1% in the post-2007 period evidence of exceptionally improbable bad luck or just ordinary bad luck that we might expect to encounter when we examine any drawdown? We examine this question in **Figure 4** by using an alternative bootstrap scheme.

In this analysis, our goal is to create a set of simulated drawdowns that resemble the post-2007 drawdown, but to do so by resampling the pre-2007 data. Specifically, we first take the annual July 1963–June 2007 data with the HML returns and revaluation terms and create 1,000,000 simulated samples. Each sample length is 56 years. Within each sample, we identify all drawdowns that last longer than 10 years. If there are no such drawdowns, we discard the sample, and if there are many such drawdowns, we retain the one that comes the closest to matching the magnitude of the actual post-2007 drawdown. Within each drawdown, we then focus on the period from peak to trough. The purpose of this step is to mimic the actual data of value's fall from its peak in 2007 to its trough in 2019. Finally, we regress these peak-to-trough returns against the revaluation terms and retain the intercepts. We plot the distribution of these intercepts in Figure 4.

The actual intercept of –0.1% in Table 4 lies at the 36.6th percentile of the resulting distribution. This analysis tells us that if we take the pre-2007 value-versus-growth returns and find drawdowns that approximately resemble the actual post-2007 drawdown, value's performance *net* of the revaluation effects would often be just as underwhelming as what it was in the actual data.

Figure 4. Histogram of Drawdown Intercepts Estimated Using Bootstrapping



Source: Research Affiliates, LLC, using CRSP/Compustat data. Note: We generate 1,000,000 alternative histories by bootstrapping annual July 1963 through June 2007 value vs. growth returns. Each simulated sample is 56 years long. In each sample, we identify drawdowns that last at least 10 years to mimic the recent post-2007 drawdown; if there is no such drawdown, we discard the sample and draw a new one. If there are multiple drawdowns which last longer than 10 years, we retain the drawdown the closest in magnitude to the post-2007 drawdown. In each sample, we select the peak-to-trough period—which mimics the July 2007 through June 2019 period—and estimate a univariate regression of HML against the revaluation term. This figure reports the histogram of the resulting intercepts.

Taken together, Table 4 and Figure 4 attribute value's poor performance in the post-2007 period to two sources. The first is the systematic underperformance from rising valuations of growth stocks. These increasing valuations created a headwind that accounted for all of value's losses over the past 12 years. The second source of value's poor performance is that we, in effect, oversample bad luck because we are analyzing exactly the period during which value underperforms. We are not attempting to explain value's performance over a randomly chosen period, but rather to explain precisely the one period in which performance stands out as being particularly weak. Our bootstrap analysis indicates that, when we account for this selection bias, the post-2007 period does *not* stand out. Had we experienced a similar drawdown in the pre-2007 data, almost the same amount of bad luck would have been required then as well.

Alternative Examination of Migration

Fama and French (2007) demonstrated that stocks' migrations from one style to another, from value to neutral or growth, for example, are the core of the value premium. Convenient for our purposes, the post-2007 period is completely out of sample relative to the original study. In **Table**

6, we show the year-over-year rates of stock migration between the six portfolios that compose the HML factor. We show the estimates separately for the pre- and post-2007 samples.

In **Panels A** and **B,** we track the percentage of stocks originating in each of the six portfolios that remains in the same portfolio the next year (e.g., pre-2007, 77% of stocks in the small value portfolio in the current year remained in the small value portfolio the next year, and post-2007, 79% of stocks in the small value portfolio in the current year remained in the small value portfolio the next year). Each row in Panels A and B sums to 100%. We restrict the sample to stocks that existed in both (current and next) years as publicly traded firms.

Panel C reports the differences in the migration rates between the pre- and post-2007 tables. The biggest change, a difference of 4% highlighted in Panel C, is that the big growth portfolio has experienced slightly less migration over the post-2007 period. More generally, the pre- and post-2007 migration numbers are very similar. These estimates confirm that the migration of stocks from one style, or classification, to another has not materially slowed down and that this driver of the structural value premium appears quite robust.

Table 6. Migration Rates Pre- and Post-2007, United States, Jul 1963–Jun 2019

Panel A. Jul 1963-Jun 2007 Migration Rates

Current portfolio		Portfolio next year: Small Growth	Small Neutral	Small Value	Big Growth	Big Neutral	Big Value
Small	Growth	69%	23%	5%	3%	0%	0%
	Neutral	15%	57%	25%	1%	2%	0%
	Value	3%	18%	77%	0%	1%	1%
Big	Growth	6%	2%	0%	78%	13%	0%
	Neutral	1%	4%	2%	12%	70%	11%
	Value	0%	1%	6%	1%	24%	68%

Panel B. Jul 2007-Jun 2019 Migration Rates

Current portfolio		Portfolio next year: Small Growth	Small Neutral	Small Value	Big Growth	Big Neutral	Big Value
Small	Growth	67%	23%	5%	5%	0%	0%
	Neutral	13%	60%	24%	1%	2%	0%
	Value	2%	17%	79%	0%	1%	1%
Big	Growth	4%	2%	0%	82%	12%	1%
	Neutral	0%	5%	2%	15%	67%	11%
	Value	0%	1%	8%	1%	24%	67%

Panel C. Differences in the Pre- and Post-Jun 2007 Migration Rates

Current portfolio		Portfolio next year: Small Growth	Small Neutral	Small Value	Big Growth	Big Neutral	Big Value
Small	Growth	-1%	0%	0%	1%	0%	0%
	Neutral	-2%	3%	-1%	0%	0%	0%
	Value	-1%	-1%	2%	0%	0%	0%
Big	Growth	-2%	-1%	0%	**4%**	-1%	0%
	Neutral	0%	0%	1%	2%	-2%	-1%
	Value	0%	0%	2%	0%	0%	-1%

Source: Research Affiliates, LLC, using CRSP/Compustat data. Note: Each row in Panels A and B totals to 100%.

Alternative Examination of Profitability

Growth companies' valuations reflect their higher average profitability. Many of the post-mortem narratives about value have centered on growth companies being potentially more permanently profitable than value companies. The accounting decomposition reveals no economically significant difference in the profitability term between pre- and post-2007 samples.

In **Table 7,** we show two profitability measures: return on equity (ROE) and earnings yield (E/P). The largest difference we observe between the pre- and post-2007 periods is for the large-cap growth and small-cap growth portfolios. Whereas the historical average ROE for large and small growth portfolios was 19% and 16%, respectively, leading up to 2007, these metrics are 25% and 6%, respectively, in the post-2007 era. Other than these two outlier portfolios, the profitability estimates for the pre- and post-2007 periods are similar. When the individual portfolios are averaged and differenced in the same way the HML factor is constructed, we find the average ROE difference between value and growth is almost the same before and after 2007: –11% versus –12%.

Also, the post-2007 period is characterized by a roughly 50% drop in earnings yields across the board, reflecting the broad upward revaluation of markets over the last 50 years, but the ratio of the yields has stayed relatively unchanged. The data do not support the narrative that growth companies have become permanently more profitable.

Table 7. Pre- and Post-2007 Profitability, United States, Jul 1963–Jun 2019

	ROE		Earnings Yield	
	Pre-2007	Post-2007	Pre-2007	Post-2007
Growth	18%	16%	5%	3%
Neutral	11%	9%	8%	5%
Value	7%	4%	9%	5%
Small-Growth	16%	6%	5%	1%
Small-Neutral	10%	6%	7%	3%
Small-Value	5%	1%	7%	1%
Big-Growth	19%	25%	5%	5%
Big-Neutral	12%	12%	8%	6%
Big-Value	8%	7%	10%	8%
HML	-11%	-12%	4%	2%
H/L	0.37	0.26	1.70	1.50

Source: Research Affiliates, LLC, using CRSP/Compustat data. Note: H/L reports the ratio of the metrics for the high and low portfolios.

The Trouble with Intangibles

Whether we use the accounting decomposition or the regression-based model, the changes in relative valuations for the value portfolio relative to the growth portfolio explain the bulk of value's bleak performance over the most recent 12-year period. At the same time, several findings indicate a possible reduction in structural alpha in the post-2007 period:

- The decomposition suggests a 3.8%-5.2% reduction in structural alpha.[19]
- The detailed examination of migration suggests that large-cap growth companies experienced marginally lower rates of migration by about four percentage points.
- The detailed examination of profitability suggests that large-cap growth has experienced a higher-than-average profitability (ROE of 25% versus 19% in the pre-2007 sample). But, it bears mention that small-cap growth shows the opposite effect, with sharply lower profitability than in the past (6% versus 16%).

[19] The accounting decomposition suggests a 5.1% – 1.3% = 3.8% reduction in structural alpha, and the regression-based decomposition suggests a 5.1% – (–0.1%) = 5.2% reduction.

None of these changes is statistically significant, although they lend mild (but conflicting) support to the "value is dead" narrative, that growth stocks of today are perhaps modestly better than the growth stocks of the past. However, the magnitude of the effect is only enough to diminish the value premium, not to kill or reverse it. When we examine these narratives, the common theme is that current economic conditions are good for growth companies, that is, companies with high P/B ratios. Should we interpret this as bad news for value investing?

The P/B ratio is just one of many ways to define value. Intrinsic value is another definition, introduced in 1934 by Graham and Dodd. Graham and Dodd specifically cautioned against the use of P/B as a substitute for intrinsic value (emphasis added):

> In general terms [intrinsic value] is understood to be that value which is justified by the facts, e.g., the assets, earnings, dividends, definite prospects, as distinct, let us say, from market quotations established by manipulation or distorted by psychological excesses. But it is a great mistake to imagine that intrinsic value is as definite and as determinable as is the market price. Some time ago intrinsic value (in the case of common stock) was thought to be the same as **"book value,"** i.e., it was equal to the net assets of the business, fairly priced. This view of intrinsic value was quite definite, but it proved **almost worthless** as a practical matter because neither the average earnings nor the average market price evinced any tendency to be governed by book value.

Book value captures the traditional capital locked in cash, bricks, and mortar. In today's economy, a company's intangible assets—patents, brands, software, human capital, customer relationships, and so forth—are at the core of its ability to generate and maintain profit margins. Is there a better, more objective measure of a company's assets, including its intangibles? Following Peters and Taylor (2017), we capitalize research and development (R&D) expenditures as knowledge capital, and apply a fraction of selling, general, and administrative (SG&A) expenditures as capital related to the human capital, brand, and distribution network.[20]

In **Figure 5,** we report the fraction of the capitalized intangible capital to the total capital of an average company. Total capital includes both intangible capital and physical capital, the latter defined as the book value of property, plant, and equipment. Figure 5 plots the ratio of the intangible capital to the sums of intangible and physical capital for all publicly traded companies in the United States. We equally weight these observations and calculate this ratio separately for companies classified as value and growth based on their P/B ratio. As of June 1998, the fraction of intangibles reaches 50%, and for growth companies the fraction is somewhat higher. The issue then, from a value investing viewpoint, is that book value obviously captures very little of the value of the intangibles. From an accounting viewpoint, book value can only capture the value of intangibles through contributed capital.[21] This makes the P/B ratio vulnerable to misclassifying intangibles-heavy companies as expensive and traditional assets–heavy companies as cheap. The

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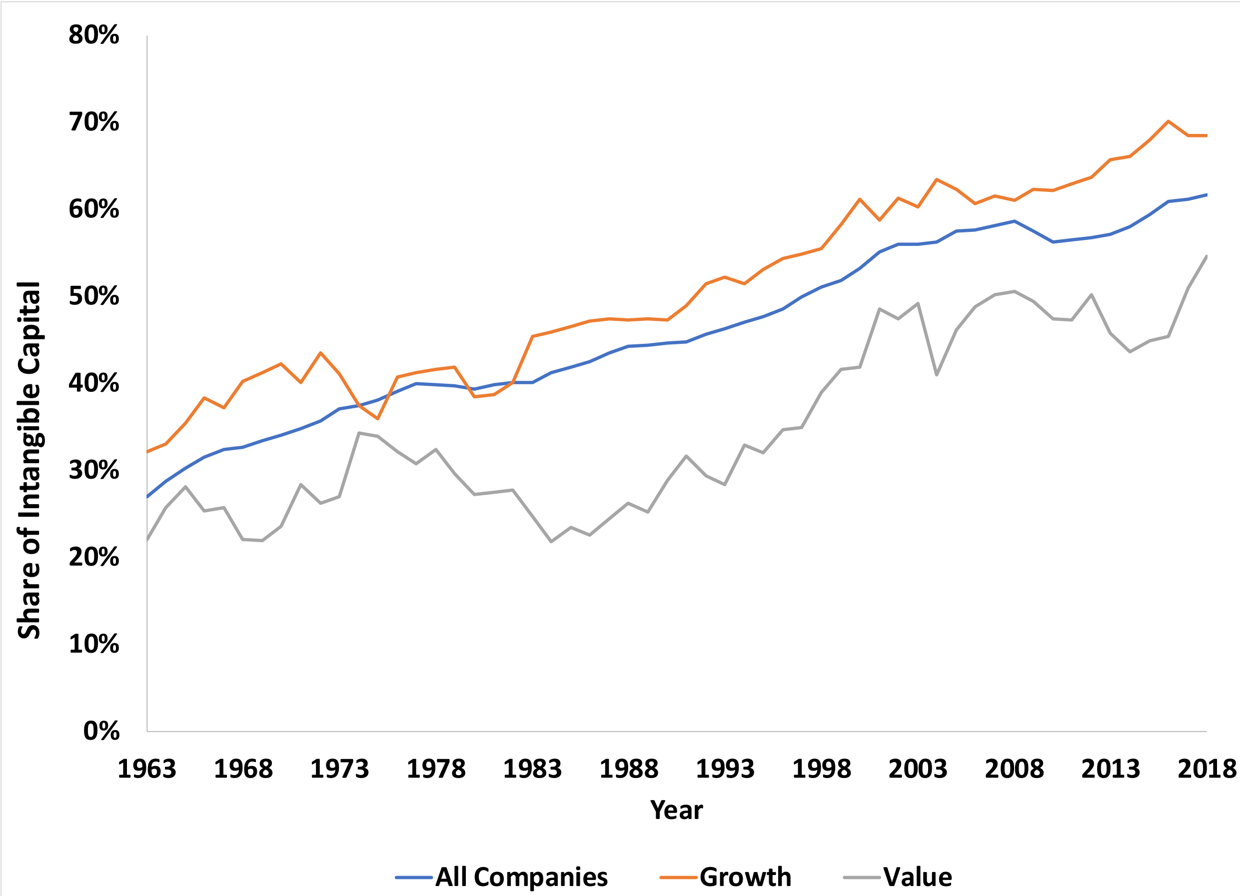
[20] Following Peters and Taylor (2016) we capitalize R&D expenses by applying the perpetual inventory method to a company's past R&D: $G_{i,t} = (1-\delta)G_{i,t-1} + R\&D_{i,t}$, where $G_{i,t}$ is the end-of-period stock of knowledge capital for company i, δ is the industry-specific discount rate, and $R\&D_{i,t}$ is the real company R&D expenditures during the year. We apply the Bureau of Economic Analysis (BEA)–estimated discount rates for R&D for different industries. Examples of R&D expenses include patents, software, and internal knowledge development costs. The R&D capitalized measure could be interpreted as the replacement cost of the knowledge capital. Similarly, we capitalize a fraction of SG&A. Just like with R&D, the capitalized SG&A expense could be interpreted as the replacement cost for recreating brand awareness, training costs to build human capital, and so forth.

[21] Ball et al. (2019) discuss the meaning of the book value of equity from an accounting perspective. The two main components of the book value of equity are contributed capital and retained earnings. Contributed capital represents the net contribution of capital from the company's shareholders through initial or seasoned public offerings in excess of share repurchases, and retained earnings are the earnings accumulated since the company's inception less accumulated dividends.

structural alpha associated with P/B may in turn have decreased over time, because this measure increasingly misclassifies some value firms as growth firms, and vice versa.

Figure 5. Share of Intangibles in Total Company Capital, United States, Jul 1963–Jun 2019



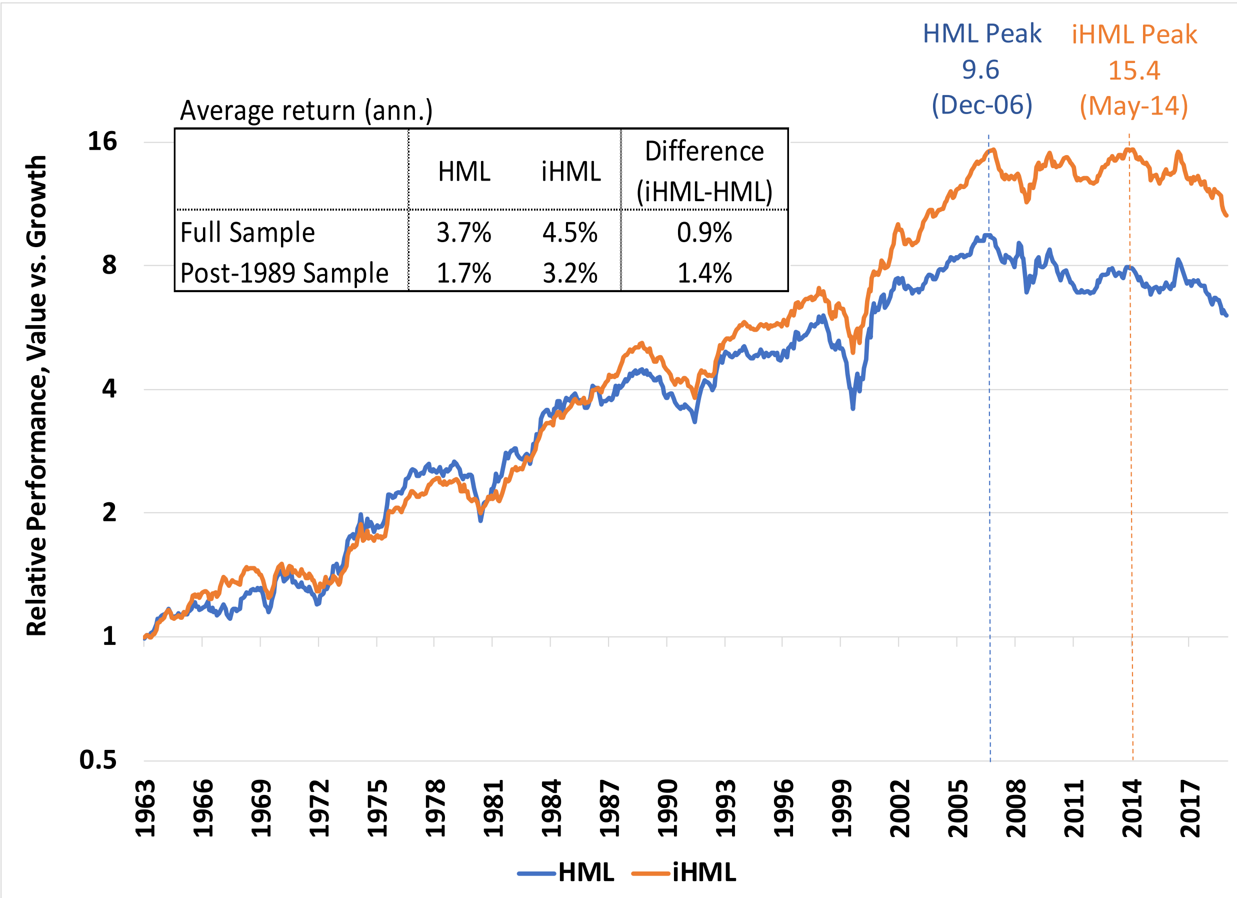
Source: Research Affiliates, LLC, using CRSP/Compustat data.

What if we were to define value as the measure of a company's capital that includes both physical and intangible capital? To answer this question, we construct an iHML factor following the same rules we used to construct the regular HML factor, with only one change. Instead of using the book-to-market ratio to define value, we use the total q defined as the firm's total market value (book value of debt plus market value of equity) divided by the sums of intangible and physical capital. In this terminology, q stands for Tobin's (1969) q, which relates to a firm's investment decisions: if a firm's market value exceeds the replacement cost of its capital, the firm should invest more.[22] Peters and Taylor (2017) explore the extent to which the investment-q relationship grows stronger when the q measure accounts for intangible assets. We examine how the same adjustment alters the performance of value investing. **Figure 6** plots the cumulative performance

[22] The idea that a firm's investment should respond to q was first introduced by Hayashi (1982).

– the difference between the performance of the value portfolio, relative to the performance of the growth portfolio – for the HML and iHML factors.[23]

Figure 6. HML and iHML Performance, United States, Jul 1963–Jun 2019



	HML	iHML	Difference (iHML-HML)
Full Sample	3.7%	4.5%	0.9%
Post-1989 Sample	1.7%	3.2%	1.4%

Source: Research Affiliates, LLC, using CRSP/Compustat and Peters–Taylor data.

In the full sample, iHML – the factor based on book-to-price, adjusted for intangibles – outperforms the traditional value factor by 0.9% a year, but almost all of this difference is in the second half of our 56-year span. The two definitions of value are more-or-less equally effective before the late 1980s. When the share of intangible capital was less than 20% of a company's capital, value's performance was not sensitive to the inclusion of intangibles. Beginning in the 1990s, when the internet revolution reduced the relevance of book value for large segments of the economy iHML value beats growth by a larger margin than classically defined HML. and by far more in the 2000s.

From 1990 onward, the iHML version of value outperformed the traditional value portfolio by 1.5% a year. Some high price-to-book growth stocks are not nearly as expensive once we make this change. In fact, the 12+-year drawdown for value, from 2007 to 2019, becomes a five-year

[23] We thank Ryan Peters and Lucian Taylor for providing the firm-level estimates of intangible capital. Because these data end in December 2017, we end the iHML sample in June 2019 to avoid using unduly stale accounting information.

drawdown for value, once we incorporate intangibles into our book value measure, with the last new high for value relative to growth occurring in mid-2014 instead of mid-2007.

If one US dollar was invested in each strategy at the end of June 1963, by the end of June 2019 the ending value of iHML would have been $10.50 compared to $6.10 for traditional HML. The iHML strategy subsumes HML, but not vice versa. Once we control for HML and other traditional factors, including momentum, the outperformance of the iHML factor, relative to HML, is marginally statistically significant (at the 5% significance level). These results are reported in in **Table 8.**[24]

Table 8. HML vs. iHML: Spanning Tests, United States, July 1963–Jun 2019

	Dependent variable: HML			Dependent variable: iHML		
	(1)	(2)	(3)	(4)	(5)	(6)
Alpha, ann.	3.70	4.75	0.73	4.52	4.74	1.36
(T-value)	(2.88)	(3.81)	(1.05)	(4.19)	(4.35)	(2.21)
Market		-0.17	-0.11		-0.03	0.06
(T-value)		(-7.05)	(-8.18)		(-1.58)	(4.76)
Size			-0.15			0.12
(T-value)			(-7.70)			(7.11)
Value-HML						0.72
(T-value)						(38.62)
Value-iHML			0.94			
(T-value)			(38.68)			
Momentum			-0.03			-0.02
(T-value)			(-2.44)			(-1.62)
N	672	672	672	672	672	672
Adj. R2		6.8%	73.2%		0.2%	70.7%

Source: Research Affiliates, LLC, using CRSP/Compustat data.

Note: The numbers (1) through (6) innumerate the individual models in the spanning test. In columns (1)-(3), traditional HML is regressed on the market, size, momentum, as well as iHML. When iHML is included, the alpha is not significantly different from zero implying that iHML subsumes HML. In columns (4)-(6), iHML is the dependent variable and is regressed on the market, size, momentum, as well as traditional HML. In this, case the alpha is significant at the 5% under the assumption of a single hypothesis test. This is consistent with iHML subsuming HML but not the opposite.

It is important to note that iHML, just like traditional HML, would have experienced a significant setback over the past five years, as illustrated in Figure 6. iHML has underperformed by 32% from its peak in May 2014 through June 2019, not much better than the 36% drawdown of HML from its peak in December 2006 to the same endpoint of June 2019. This drawdown, however, is not

[24] In the post-1989 sample the spanning results are even stronger: alpha on test (3) becomes negative at -0.31% and on test (6) goes up to 1.57%. In the post-1989 sample the t-value on test (6) is 1.91—the reduction from the full sample t-value of 2.21 is driven entirely by the reduction in the sample size by about half (the full sample equivalent t-value would have been 2.64).

surprising: iHML, just like its traditional counterpart, suffered from the same revaluation headwind. Going forward, incorporating intangibles in the definition of the value factor would help protect the structural alpha because a measure that includes intangibles runs a lower risk of misclassifying value stocks as growth stocks and vice versa. Including intangibles would do little to insulate against the peril of revaluations.

What to Expect from Value?

Over the last 12 years, the relative valuation of value and growth moved from the 21st percentile to the 97th percentile. This revaluation explains most of value's underperformance. Today, the relative valuation level is very near the most attractive valuation level in history. Given the historical relationship between value's return and valuation levels, what is the future expected value premium? We can determine the forward-looking expected estimates of the value premium using the profitability-migration-profitability decomposition.

We cannot, of course, simply assume a revaluation return to the historical median and keep the other components at their historical averages. As discussed earlier, the three terms in the decomposition correlate significantly. Over the 1963–2019 sample, the correlation between the profitability and revaluation terms is −0.44, that between the profitability and migration terms is −0.31, and that between the revaluation and migration terms is −0.21.[25] These negative correlations mean that when the HML factor benefits from revaluation tailwinds, lower profitability and migration terms typically offset some of these tailwinds.

The question we want to answer is, what is the expected return on HML *conditional* on a particular revaluation? Conveniently, if we use historical data as a guide and model the conditional expected returns using a linear regression, this problem is equivalent to the regression model we have already introduced. We can directly regress the HML return on revaluation and use the estimates from the model to make predictions about the factor's performance.[26]

Historically, relative HML and iHML valuations have shown a tendency to mean revert. In a regression of the book-to-price relative HML valuation against the year-earlier valuation, we get an intercept of −0.41 (t-value = −2.54) and a slope of 0.73 (t-value = 6.85). The slope roughly corresponds to a rapid 2.2-year half-life mean-reversion rate.[27] These are average historical tendencies, which never play out exactly. A more interesting exercise is to ask the question, what would the HML return be in a year when a specific scenario is realized? We display the estimated results in **Table 9**.[28]

At this time, quite a bit of premium is stored in the value factor, due to the current abnormally wide valuation dispersion between value and growth stocks. PIMCO coined the term *stored alpha*

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[25] These are our own estimates not reported separately. The results are available on request.
[26] The expected return on HML conditional on a particular draw of revaluation is

$$E[\text{HML}_t | \text{Revaluation}_t] = E[\text{Revaluation}_t + \text{Profitability}_t + \text{Migration}_t | \text{Revaluation}_t],$$

where, on the right-hand side, we apply the accounting identity we developed. This conditional expectation simplifies to

$$E[\text{HML}_t | \text{Revaluation}_t] = \text{Revaluation}_t + E[\text{Profitability}_t | \text{Revaluation}_t] + E[\text{Migration}_t | \text{Revaluation}_t],$$

that is, in order to estimate the HML return given a particular realization of revaluation, we need to have an expectation of how the profitability and migration terms perform conditional on this revaluation.
[27] A slope less than 1.0 would be associated with mean reversion, a slope greater than 1.0 would be associated with momentum, and a slope not significantly different from 1.0 would imply no autocorrelation.
[28] In the scenario analysis shown in Table 9, we consider movements in an estimated theoretical distribution of relative valuations. The realized distribution of valuations, shown in Figure 3, is viewed as one draw from this theoretical distribution. We provide additional details in Appendix B.

as a way of explaining why they as an investor stay the course in adversity and buy assets that have had poor past performance. The value locked up in value—its stored alpha—is a vivid example.

Full reversion to the median, if it happened overnight, would require value to beat growth by 45%. If this were to happen over several years, the structural alpha of the value factor would add to this every year, generating an even larger gain (although a lower annualized gain). Even a move to the historical 75th percentile, half-way between cheapest ever and median valuation for value relative to growth, would imply 34% relative performance for value over growth. A modest improvement from the current 96.7nd percentile to the 95th percentile would result in alpha of about 9%. Finally, even if valuations where to stay at current levels, the model suggests a positive 5.1% premium, driven largely by structural alpha.

Table 9. Forward-Looking Expected Returns Conditional: Scenario Analysis

Directional Change	Scenario End Point	Relative Valuation	Log-Relative Valuation Z-score	Percentile	Return
Expanding Relative Valuations	Extreme Historical 100%-ile	0.091	-4.09	100.0%	-19.5%
	Zero Premium	0.117	-2.86	98.0%	0.0%
No Change	*Stay at 96.7%-ile*	*0.125*	*-2.54*	*96.7%*	*5.1%*
Contracting Relative Valuations	Move to 95%-ile	0.132	-2.29	95.0%	9.1%
	Move to 90%-ile	0.145	-1.80	90.0%	16.9%
	Move to 75%-ile	0.181	-0.72	75.0%	34.1%
	Move to 50%-ile	0.208	-0.04	50.0%	44.9%

Source: Research Affiliates, LLC, using CRSP/Compustat data.

Suppose the "value is dead" narrative is correct, at least for the next few years. What if relative valuation spreads between growth and value stocks become even wider than the current relative-valuation ratio? Because of the presence of structural alpha, it would take a further valuation decline from the current 96.7th percentile to at least the 98th percentile over the next year in order for value to have a zero or negative premium. Finally, a return to the extreme historical valuation spread reached at the height of the tech bubble in March 2000 when growth was about 10 times as expensive as value would cost investors about 20%.

Conclusion

Many narratives purport to explain why "this time is different," that value is structurally impaired. These narratives include the new-normal interest rate environment, growth of private markets, crowding, and technological change, among others. We examine these explanations and argue that there is insufficient evidence to declare a structural break.

We offer a simple model that decomposes the returns of value relative to growth. The framework attributes the relative performance to three components: migration, profitability, and change in relative valuation. Our evidence suggests that migration (e.g., individual value stocks becoming growth stocks) and profitability are stable over the pre- and post-2007 periods. These two components are a net positive contributor to the value premium and we refer to them as structural alpha. The reason value has suffered a –39% drawdown is the collapse of relative valuations. Over the drawdown period, relative valuations have moved from the 22nd to the 97th percentile.

Our analysis focuses on another explanation—bad luck. Our initial bootstrap analysis, which does not account for the changes in valuations, suggests that the current drawdown is 4.9% probable given the historical data. While this 1-in-20 outcome is relatively improbable, it seems insufficiently improbable to declare a structural break. And when we modify the bootstrap to account for the changes in relative valuations, this probability increases 36.6%; that is, a very "ordinary" amount of bad luck seems to suffice to explain why value has underperformed growth.

We also address the important issue of the measurement of value. The classic measure of value, which uses the book value of equity, was designed at a time when the economy was much more oriented toward manufacturing. In today's economy, intangible investments play a crucial role, yet these investments when internally created are ignored in book value calculations. We capitalize intangibles and show that this measure of value outperforms the traditional measure, particularly post-1990. Nevertheless, this improved measure of value is similar to the classic definition in that it, also, has recently suffered a substantial drawdown.

Overall, relative valuations are in the far tail of the historical distribution. This implies that the expected returns are elevated. Indeed, we show that even if the relative valuation remains in the 97th percentile, the other contributors (migration and profitability) should offer a positive overall return. That said, let us emphasize two important points. First, the percentiles are backward looking; it is possible to cross into unexplored territory. Second, returns are very noisy. While expected returns of value relative to growth are high, the role of luck (both good and bad) creates a wide distribution of outcomes over the next five years. That is, although value strategies seem (almost) as attractive as ever, we must advise caution: an elevated *expected* return is not a guarantee that value *must* outperform growth in the short run.

Literature

Arnott, Rob, Noah Beck, Vitali Kalesnik, and John West. 2016. "How Can 'Smart Beta' Go Horribly Wrong?" Research Affiliates Publications (February).

Arnott, Robert, and Peter Bernstein. 2002. "What Risk Premium is 'Normal'?" *Financial Analysts Journal*, vol. 58, no. 2 (March/April):64–85.

Arnott, Rob, Campbell R. Harvey, Vitali Kalesnik, and Juhani Linnainmaa. 2019. "Alice's Adventures in Factorland: Three Blunders That Plague Factor Investing." *Journal of Portfolio Management*, vol. 45, no. 4 (April): 18–36.

Asness, Clifford, and Andrea Frazzini. 2013. "The Devil in HML's Details." *Journal of Portfolio Management*, vol. 39, no. 4 (July):49–68.

Asness, Clifford, Tobias Moskowitz, and Lasse Heje Pedersen. 2013. "Value and Momentum Everywhere." *Journal of Finance*, vol. 68, no. 3 (June):929–985.

Ball, Ray, Joseph Gerakos, Juhani Linnainmaa, and Valeri Nikolaev. 2019. "Earnings, Retained Earnings, and Book-to-Market in the Cross Section of Expected Returns." *Journal of Financial Economics* (forthcoming). Available on SSRN.

Barbee, Jr., William C., Sandip Mukherji, and Gary A. Raines. 1996. "Do Sales-Price and Debt-Equity Explain Stock Returns Better than Book-Market and Firm Size?" *Financial Analysts Journal*, vol. 52, no. 2 (March/April):56–60.

Basu, Sanjoy. 1977. "Investment Performance of Common Stocks in Relation to their Price–Earnings Ratio: A Test of the Efficient Market Hypothesis." *Journal of Finance*, vol. 32, no. 3 (June):663–682.

Beck, Noah, Jason Hsu, Vitali Kalesnik, and Helga Kostka. 2016. "Will Your Factor Deliver? An Examination of Factor Robustness and Implementation Costs." *Financial Analysts Journal*, vol. 72, no. 5 (September/October):55–82.

Cohen, Randolph B., Christopher Polk, and Tuomo Vuolteenaho. 2003. "The Value Spread." *Journal of Finance*, vol. 58, no. 2 (April):609–642.

Fama, Eugene F., and Kenneth R. French. 1992. "The Cross-Section of Expected Stock Returns." *Journal of Finance*, vol. 47, no. 2 (June):427–465.

———. 1993. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics*, vol. 33, no. 1 (February):3–56.

———. 2002. "The Equity Premium." *Journal of Finance*, vol. 57, no. 2. (April):637–659.

———. 2007. "The Anatomy of Value and Growth Stock Returns." *Financial Analysts Journal*, vol. 63, no. 6 (November/December):44–54.

Fitzgerald, Maggie. 2019. "Amount of Global Debt with Negative Yields Balloons to $15 Trillion." CNBC.com (August 7).

Graham, Benjamin, and David Dodd. 1934. *Security Analysis*. New York: McGraw-Hill.

Hayashi, Fumio. 1982. "Tobin's Marginal *q* and Average *q*: A Neoclassical Interpretation." *Econometrica*, vol. 50, no. 1 (January):213–224.

Henderson, Daniel, and Christopher Parmeter. 2015. *Applied Nonparametric Econometrics*. Cambridge University Press.

Jacobs, Bruce I., and Kenneth N. Levy. 1988. “Disentangling Equity Return Regularities: New Insights and Investment Opportunities.” *Financial Analysts Journal*, vol. 44, no. 3 (May/June):18–43.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny. 1994. “Contrarian Investment, Extrapolation, and Risk.” *Journal of Finance*, vol. 49, no. 5 (December):1541–1578.

Lui, Ernest, Atif Mian, and Amir Sufi. 2019. “Low Interest Rates, Market Power, and Productivity Growth.” Working paper. Available on SSRN.

Naranjo, Andy, M. Nimalendran, and Mike Ryngaert. 1998. “Stock Returns, Dividend Yields, and Taxes.” *Journal of Finance*, vol. 53, no. 6 (December):2029–2057.

Peters, Ryan H., and Lucian A. Taylor. 2017. “Intangible Capital and the Investment-q Relation.” *Journal of Financial Economics*, vol. 123, no. 2 (February): 251–272.

Rosenberg Barr, Kenneth Reid, and Ronald Lanstein. 1985. “Persuasive Evidence of Market Inefficiency.” *Journal of Portfolio Management*, vol. 11, no. 3 (Spring):9–16.

Stattman Dennis. 1980. “Book Values and Stock Returns.” *The Chicago MBA: A Journal of Selected Papers,* vol. 4:25-45.

Tobin, James. 1969. “A General Equilibrium Approach to Monetary Theory.” *Journal of Money, Credit, and Banking*, vol. 1, no. 1 (February):15–29.

Appendix A. Return Decomposition Details

In the section "Is Value Dead?" we decompose a portfolio's return into three parts: the revaluation, profitability, and migration components. In this appendix we derive this decomposition by starting from the definition of log returns. We then show the decomposition results for the value and growth portfolios' log returns as well as for "log HML." The decomposition we derive holds as an identity for the portfolios' log returns. In Table 3 in which we decompose the HML factor's return (not the log return), it holds as an approximation.

Notation:

r_{t^+} = return from time $t-1$ to time t on the portfolio formed at time $t-1$;

D_{t^-} = dividend distributions from time $t-1$ to time t from the portfolio formed at time $t-1$;

P_{t-1} = portfolio-weighted market capitalization at time $t-1$ of the portfolio formed at time $t-1$;

B_{t-1} = portfolio-weighted book value of equity at time $t-1$ of the portfolio formed at time $t-1$;

B_{t^-} = portfolio-weighted book value of equity at time t of the portfolio formed at time $t-1$;

P_{t^-} = portfolio-weighted market capitalization at time t of the portfolio formed at time $t-1$;

P_{t^+} = portfolio-weighted market capitalization at time t of the portfolio formed at time t;

B_{t^+} = portfolio-weighted book value of equity at time t of the portfolio formed at time t.

With this notation, a return on a portfolio can be represented as

$$\log(1+r_{t^+}) =$$

$$= \log\left(\frac{P_{t^-}+D_{t^-}}{P_{t-1}}\right)$$

$$= \log\left(\frac{P_{t^-}\cdot\left(1+\frac{D_{t^-}}{P_{t^-}}\right)}{P_{t-1}}\right)$$

$$= \log\left(\frac{P_{t^-}}{P_{t-1}}\right)+\log\left(1+\frac{D_{t^-}}{P_{t^-}}\right)$$

$$= \left[\log\left(\frac{P_{t^-}}{P_{t-1}}\right)+\log\left(1+\frac{D_{t^-}}{P_{t^-}}\right)\right]+\left[\log\left(\frac{B_{t^-}}{B_{t-1}}\right)-\log\left(\frac{B_{t^-}}{B_{t-1}}\right)\right]+\left[\log\left(\frac{P_{t^+}}{B_{t^+}}\right)-\log\left(\frac{P_{t^+}}{B_{t^+}}\right)\right]$$

$$= \left[\log\left(\frac{P_{t^-}}{P_{t-1}}\right)-\log\left(\frac{B_{t^-}}{B_{t-1}}\right)\right]+\left[\log\left(\frac{B_{t^-}}{B_{t-1}}\right)+\log\left(1+\frac{D_{t^-}}{P_{t^-}}\right)\right]+\left[\log\left(\frac{P_{t^+}}{B_{t^+}}\right)-\log\left(\frac{P_{t^+}}{B_{t^+}}\right)\right]$$

$$= \left[\log\left(\frac{P_{t^-}}{B_{t^-}}\right)-\log\left(\frac{P_{t-1}}{B_{t-1}}\right)\right]+\left[\log\left(\frac{B_{t^-}}{B_{t-1}}\right)+\log\left(1+\frac{D_{t^-}}{P_{t^-}}\right)\right]+\left[\log\left(\frac{P_{t^+}}{B_{t^+}}\right)-\log\left(\frac{P_{t^+}}{B_{t^+}}\right)\right]$$

$$= \left[\log\left(\frac{P_{t^+}}{B_{t^+}}\right)-\log\left(\frac{P_{t-1}}{B_{t-1}}\right)\right]+\left[\log\left(\frac{B_{t^-}}{B_{t-1}}\right)+\log\left(1+\frac{D_{t^-}}{P_{t^-}}\right)\right]+\left[\log\left(\frac{P_{t^-}}{B_{t^-}}\right)-\log\left(\frac{P_{t^+}}{B_{t^+}}\right)\right]$$

$$= \underbrace{\underbrace{\left[\log\left(\frac{P_{t^+}}{B_{t^+}}\right) - \log\left(\frac{P_{t-1}}{B_{t-1}}\right)\right]}_{\text{Change in Aggregate Valuation}}}_{\text{Revaluation Component}} + \underbrace{\underbrace{\left[\log\left(\frac{B_{t^-}}{B_{t-1}}\right) + \log\left(1 + \frac{D_{t^-}}{P_{t^-}}\right)\right]}_{\text{Profitability}} + \underbrace{\left[\log\left(\frac{P_{t^-}}{B_{t^-}}\right) - \log\left(\frac{P_{t^+}}{B_{t^+}}\right)\right]}_{\text{Migration}}}_{\text{Structural Component}}$$

This decomposition holds as an identity for a portfolio's log returns. For the purposes of Table 3, we use this identity to obtain an *approximate* decomposition of a portfolio's simple returns. We then apply these approximations to the four portfolios included in the HML factor—small value, big value, small growth, and big growth—to decompose the HML return into the three components. Because of the approximation step, the three components on the right-hand side in Table 3 do not exactly add up to the HML return.

Table A1 decomposes the return on log HML to avoid the approximation step. We define log HML as

$$\log HML_{t^+} = \frac{1}{2}\left(\log\left(1 + r_{t^+}^{SV}\right) + \log\left(1 + r_{t^+}^{BV}\right)\right) - \frac{1}{2}\left(\log\left(1 + r_{t^+}^{SG}\right) + \log\left(1 + r_{t^+}^{BG}\right)\right)$$

With this definition, the decomposition holds as an identity: the three components on every row add up to the return of the portfolio (or log HML). Although this decomposition holds as an identity, the results of the decomposition are less interpretable as returns on long–short portfolios, unlike the approximate decomposition in Table 3.

Table A1. Value Return Decomposition Using Logs-on-Logs Method, United States, Jul 1963–Jun 2019

Panel A. Return Decomposition in the Pre-2007 Period

Size	Valuation	Total Return	Revaluation Alpha	Structural Alpha	= Profitability	+ Migration
Small	Growth	8.2%	1.2%	7.1%	18.8%	-11.7%
	Neutral	14.5%	1.3%	13.2%	9.2%	4.0%
	Value	16.8%	1.3%	15.5%	0.2%	15.3%
	Value-Growth	*8.6%*	*0.1%*	*8.4%*	*-18.6%*	*27.0%*
Big	Growth	9.4%	1.1%	8.3%	15.3%	-7.0%
	Neutral	11.0%	1.0%	10.0%	10.6%	-0.6%
	Value	13.2%	1.4%	11.8%	6.4%	5.3%
	Value-Growth	*3.7%*	*0.3%*	*3.5%*	*-8.9%*	*12.4%*
Average	***HML***	***6.1%***	***0.2%***	***5.9%***	***-13.7%***	***19.7%***

Panel B. Return Decomposition in the Post-2007 Period

Size	Valuation	Total Return	Revaluation Alpha	Structural Alpha	= Profitability	+ Migration
Small	Growth	7.2%	1.0%	6.1%	17.0%	-10.9%
	Neutral	7.7%	-1.5%	9.2%	6.0%	3.1%
	Value	4.9%	-3.1%	8.0%	-6.6%	14.6%
	Value-Growth	*-2.3%*	*-4.1%*	*1.8%*	*-23.6%*	*25.4%*
Big	Growth	10.1%	3.6%	6.5%	12.5%	-6.0%
	Neutral	5.9%	-1.3%	7.3%	6.7%	0.6%
	Value	5.0%	-2.8%	7.8%	3.1%	4.7%
	Value-Growth	*-5.1%*	*-6.4%*	*1.3%*	*-9.4%*	*10.6%*
Average	***HML***	***-3.7%***	***-5.2%***	***1.6%***	***-16.5%***	***18.0%***

Source: Research Affiliates, LLC, using CRSP/Compustat data.

Appendix B. Historical Distribution of Relative Valuations

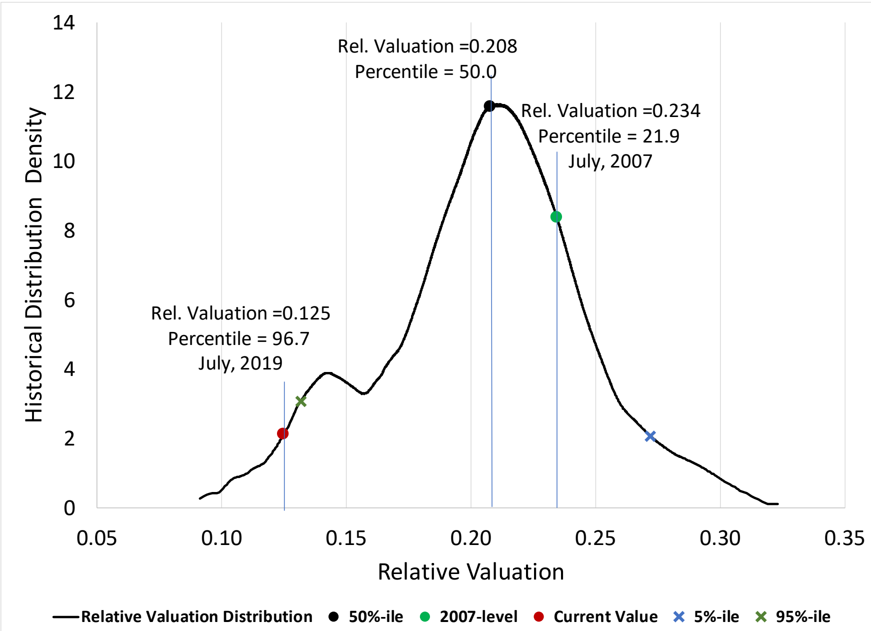
In Table 9 we provide forward-looking expected returns for the value strategy or factor, HML, under different scenarios. These scenarios relate to possible future changes in relative valuations. In this computation the scenarios correspond to movements in the *theoretical* distribution of valuation ratios. To understand the need for defining this theoretical distribution, consider the *realized historical* distribution of valuations shown in Figure 3. If we were to refer to this realized distribution in our scenario analysis, we would have to conclude, for example, that relative valuations can never fall below 0.1; this was the point at the peak of the dot-com bubble at which growth stocks were the most expensive relative to value stocks. The realized distribution of valuations should be viewed, however, as just one draw from the theoretical distribution of valuations. It is conceivable, for example, that growth stocks could have become even more expensive.

In our scenario analysis, we assume that the historical distribution is a single draw from the theoretical distribution and, assuming that the theoretical distribution remains unchanged, we estimate the theoretical distribution of valuations using kernel density estimation. We take the realized distribution of valuations from Figure 3 and use the Epanechnikov kernel with optimal bandwidth.[29] This method can be viewed as fitting a smooth "density" over the historical histogram of valuations; it fills the gaps and makes educated guesses about the distribution outside the highest and lowest historical valuations. **Figure B1** plots the density (**Panel A**) and the relative valuation percentiles (**Panel B**) for this (estimated) theoretical distribution of valuations. It also places the July 2007 and July 2019 relative valuations on this distribution. The chart in Panel A illustrates that most of the historical observations of relative valuations (about 70% of historical observations) are concentrated between the values of 0.17 and 0.25 (and 90% observations between the values of 0.13 and 0.27). Outside this 70% range, the historical observations have quite fat tails in both directions.

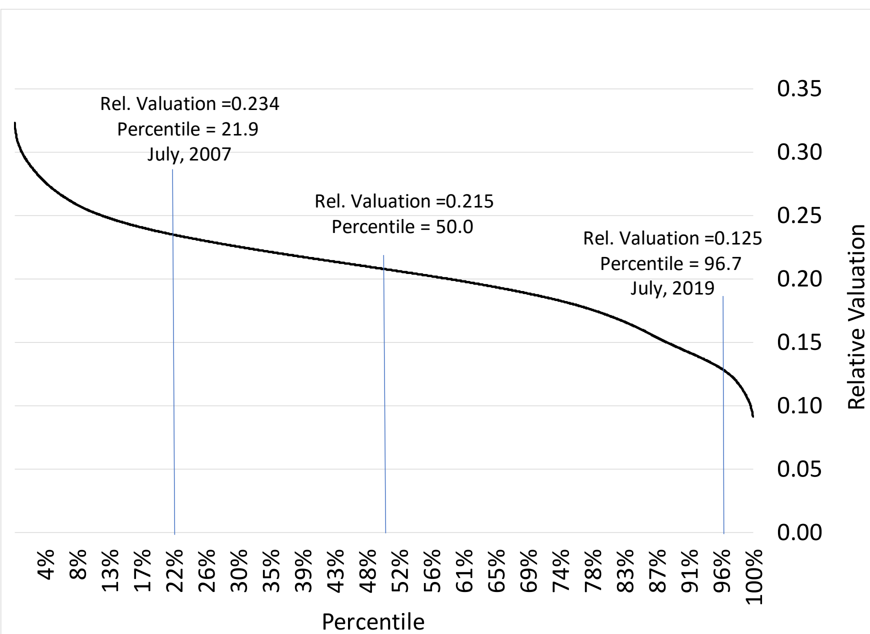
[29] See, for example, Henderson and Parmeter (2015) on kernel density estimation and the Epanechnikov kernel.

Figure B1. Distribution of Relative Valuations

Panel A. Relative-Valuation Historical Distribution Density



Panel B. Relative-Valuation Percentiles



Source: Research Affiliates, LLC, using CRSP/Compustat data.