

Is the Value Premium Smaller Than We Thought?

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March 3rd, 2021

Abstract

The construction of the original HML portfolio (Fama and French, 1993) includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives and construct HML portfolios. In sample, the average estimate of the value premium is dramatically smaller than the original estimate of the value premium. The difference is 0.09% per month and statistically significant. Out of sample, however, this difference is statistically indistinguishable from zero. These results suggest that the original value premium estimate is upward biased because of a chance result in the original research decisions.

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1 Introduction

The value premium compensates investors for a unit exposure to the value factor. Fama and French (1993) propose the HML portfolio as a proxy for the value factor and estimate a statistically significant value premium of 0.40% per month using data from July 1963 to December 1991.

The construction of this HML portfolio includes seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. For example, the decision to sort stocks into portfolios once a year at the end of June is just as reasonable as the alternative to sort stocks into portfolios at the end of each month. I expect ex ante that these decisions and their alternatives produce estimates of the value premium that are the same. Empirically, however, they may not be the same. If the decisions and their alternatives produce estimates of the value premium that are different, then the difference serves as an estimate for the bias that is due to chance in the original decisions. This new approach can be extended to any empirical study.

I study the original value premium estimate because of its academic importance. The Fama and French (1993) three-factor model, which includes the original HML portfolio as a proxy for the value factor, has been serving as a benchmark asset pricing model in empirical finance. Mutual fund studies on performance evaluation, for example Fama and French (2010), include the original HML portfolio as a right-hand side variable to proxy for the value factor. Theory papers, such as Zhang (2005), provide rationales for why the HML portfolio is a systematic risk factor. Bias in the original value premium estimate may therefore affect our inference of the three-factor model's importance as an asset pricing model, on mutual fund managers' abilities, and on the relevance of rationales for why the value factor is systematic.

I estimate the bias of the original value premium estimate that is due to chance in the original decisions, because a chance result is always possible in empirical research. Moreover, many

statistical biases are inherent to research and lead to biased estimates in published papers. Harvey's (2017) AFA Presidential Address elaborates on the file drawer effect, data-mining, multiple hypothesis testing, data-snooping, etc. McLean and Pontiff (2016), Harvey, Liu and Zhu (2016), and Linnainmaa and Roberts (2018) provide empirical evidence that statistical biases explain much of the anomaly returns in published papers.

In this paper, I focus on six seemingly innocuous decisions in the construction of the original HML portfolio. The first decision is about the timing of market equity, the second decision is about the timing of book equity, the third decision is about negative book equity, the fourth decision is about financial firms, the fifth decision is about portfolio sorting breakpoints, and the sixth decision is about the timing of market equity to account for the size effect. I propose alternatives that are just as reasonable, form all possible combinations of these six decisions and their alternatives, construct 96 HML portfolios, and collapse all HML portfolios in each month into an equally weighted average portfolio. This average HML portfolio is a valuable proxy for the value factor because it reflects an average decision that mitigates a bias due to chance in research decisions. The average return difference between the original HML portfolio and the average HML portfolio is therefore an estimate for the bias of the original value premium estimate.

I start my empirical analysis with the replication of the original HML portfolio as described in Fama and French (1993). I report that I can largely, but not perfectly, replicate the original HML portfolio. The HML portfolio has an average monthly return of 0.40% per month in the original study's sample from July 1963 to December 1991. The replicated HML portfolio has an average monthly return of 0.35% per month in the same sample period. The difference may be a result of updating the CRSP and Compustat datasets, different links for the merging of both datasets, adjusting returns for delisting, or omitting details of the precise construction.

In the baseline empirical test, I calculate the average monthly returns of the average HML portfolio and of the original HML portfolio in the original sample's study from July 1963 to December 1991. I find that the average HML portfolio has an average monthly return of 0.27%

per month (t -statistic of 1.79). The original HML portfolio has an average monthly return of 0.35% per month (t -statistic of 2.53). The average return difference between the original HML portfolio and the average HML portfolio is 0.09% per month (t -statistic of 1.88). These findings suggest that the original value premium estimate is upward biased, and they also raise doubts as to whether the original value premium may even be a false positive.

I also perform a White (2000) Reality Check Bootstrap to test the null hypothesis that the value premium is zero. This is important because the t -statistic of the average HML portfolio does not account for the fact that we have more information than just the average portfolio and because the t -statistic of the original HML portfolio does not account for the fact that a researcher has the freedom to choose the HML portfolio with the highest t -statistic as a proxy for the value factor. I find that the t -statistic of the original HML portfolio exceeds the critical value from the Reality Check Bootstrap assuming a confidence level of 95%, and thus it rejects the null hypothesis that the value premium is zero.

I compare the standard deviations of the original HML portfolio and the average HML portfolio to better understand whether the positive return difference is compensation for more risk. The original HML portfolio has a lower standard deviation than the average HML portfolio (2.57% versus 2.76% per month), and thus suggests that the positive return difference is not compensation for more risk.

I perform a principal component analysis of the monthly returns of the 96 HML portfolios to better understand whether the HML portfolios may be proxying for more than one underlying factor. The first principal component explains 91% of the variation of the HML portfolios, and thus suggests that they are proxying for one underlying factor.

I estimate the main empirical test using data that is out of sample. If the return difference between the original and the average HML portfolio is a bias that is due to chance in research decisions, then I expect the return difference to be zero out of sample. In the pre-sample, from July 1926 to June 1963, the return difference between the original and the average HML portfolio

is 0.08% per month (t -statistic 1.48). This pre-sample result is somewhat at odds with the idea of a bias. The pre-sample estimate, however, may include hindsight biases because Graham and Dodd (1934, 1962) and Graham (1949) already reported on value investing back then. In the post-sample, from January 1992 to December 2019, the return difference between the original and the average HML portfolio is 0.06% per month (t -statistic 0.84). The post-sample result is consistent with a bias.

I also estimate the main empirical test using the full sample from July 1926 to December 2019. The average HML portfolio has an average monthly return of 0.25% per month (t -statistic of 2.21). The original HML portfolio has an average monthly return of 0.33% per month (t -statistic of 3.31). The return difference between the original and the average HML portfolio on average is 0.08% per month (t -statistic of 2.27). The full sample results suggest that the original value premium estimate is upward biased.

In my last empirical test, I use the approach in Barillas and Shanken (2017) and the factors in Fama and French (2015) augmented with momentum to better understand if the original HML portfolio and the average HML portfolio are spanned. I find that the original and the average HML portfolios have almost the same intercepts and that both intercepts are statistically significant. I also find that the original HML portfolio's beta with the momentum factor is much more negative than the average HML portfolio's beta with momentum. These findings suggest that, unconditionally, the original HML portfolio has a higher average monthly return than the average HML portfolio because it avoids trading against momentum.

2 Related Literature

2.1 Robustness of the Original Value Premium Estimate

This paper is related to the literature on the robustness of the original value premium estimate to address concerns put forth by Black (1993) and by Lo and MacKinlay (1990) that the value premium is not real.

The tenor of this literature is that the original value premium estimate is robust. Davis, Fama, and French (2000) document a significant value premium estimate in the US equity market in the sample from 1929 to 1963 that precedes the original study's sample. Barber and Lyon (1997) document a significant value effect in the holdout sample of financial firms in the US equity market. Chan, Hamao, and Lakonishok (1991) report a significant value premium estimate in Japan's equity market, which is the second largest equity market in 1990. Fama and French (1998) document significant value premium estimates in international equity markets. Asness, Moskowitz, and Pedersen (2013) report significant value premium estimates in other asset classes. Fama and French (1992) report a significant value effect that is robust to the return predictability of leverage, as reported in Bhandari (1988), and of earnings to price, as reported in Basu (1977, 1983). Asness and Frazzini (2013) report a significant value premium estimate for an updated HML portfolio conditional on momentum. Kessler, Scherer, and Harries (2019) find significant returns for valuation-based portfolios with different "design choices." Fama and French (2008) report that the value effect exists in microcap stocks, small stocks, and big stocks, using portfolio sorts and cross-sectional regressions conditional on other stock return predictors, but Phalippou (2008) documents that the value effect exists only among some of the smallest stocks in the US equity market. Studies with more recent samples, however, find insignificant value premium estimates. Schwert (2003), Linnainmaa and Roberts (2018), and Fama and French (2020) report insignificant value premium estimates in the US equity market in samples

that follow the original sample's study. But Fama and French (2020) report a significant value premium estimate for the full sample from 1963 to 2019.

My contribution to the literature is the empirical finding that the value premium is smaller than we thought: The construction of the original HML portfolio (Fama and French, 1993) includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. In sample, the average estimate of the value premium is dramatically smaller than the original estimate of the value premium. The difference is 0.09% per month and statistically significant. Out of sample, the estimates of the value premium are similar. These results suggest that the original value premium estimate is upward biased due to chance in the original decisions. The result has far-reaching academic implications: An upward bias in the original value premium estimate reduces the importance of the Fama and French (1993) three-factor model as a benchmark asset pricing model, it affects our inference of mutual fund managers' abilities, and it reduces the importance of theories on why the value factor is a systematic risk factor.

2.2 Approaches to Address Chance or Statistical Biases

This paper is also related to the literature on approaches to address bias in estimates of published papers that are due to chance or statistical biases.

Harvey, Liu, and Zhu (2016) propose a t -statistic of 3 as a simple critical value for future empirical asset pricing factors to account for multiple testing. They use the number of published empirical asset pricing factors over time as a conservative estimate for the number of tested asset pricing factors and study the approaches by Bonferroni (1936), Holmes (1979), and Benjamini and Yekutieli (2001). Chordia, Goyal, and Saretto (2020) simulate 2.4 million trading strategies, use a model to infer the number of strategies that are tested by financial economists, and propose a t -statistic of 3.8 as a critical value for hypothesis tests. Harvey and Liu (2020) use a bootstrap approach and propose t -statistics as critical values that depend on the researcher's

prior belief of the fraction of real anomalies and on their type I and type II error requirements. Harvey (2017) proposes Bayesianized p -values that take prior beliefs into account.

My contribution to the literature is a new approach to estimating the bias in the original estimate of the value premium that is attributable to chance in research decisions. This new approach is simple and intuitive: Ex ante, I expect that the decisions and their reasonable alternatives produce estimates of the value premium that are the same. If they are not the same, then the original estimate may be biased or even a false positive that occurs because of a chance result in the original decisions. This new approach is applicable in sample, and it can be extended to any empirical study.

My approach is related to robustness tests in general. Fama and French (1992), for example, report that the book-to-market effect is robust to replacing end of December market equity with fiscal year-end market equity. Pontiff and Singla (2019), as another example, report that the original estimate of the liquidity premium (Pastor and Stambaugh, 2003) is statistically insignificant when they introduce four modifications into the construction of the liquidity factor proxy that are expected to improve statistical power or to reduce estimation error. My approach is different, however, because it studies seemingly innocuous decisions that have alternatives that are just as reasonable and because it aggregates all decisions and alternatives into one estimate.

3 HML Portfolios

3.1 Definition of the Original HML Portfolio

The original HML portfolio is defined in Fama and French (1993). It uses data from the intersection of CRSP and Compustat. The sample is restricted to common ordinary US stocks (share code 10 or 11) that are trading on the NYSE, the NASDAQ, and the Amex (exchange code 1, 2, or 3) with non-missing and non-negative book equity, non-missing market equity at the end

of December of year $t-1$ and at the end of June of year t , and with at least two years of available Compustat data.

The original HML portfolio is the average return of a small and a big value portfolio minus the average return of a small and a big growth portfolio in each month. Formally, $HML = 1/2 (\text{Small Value} + \text{Big Value}) - 1/2 (\text{Small Growth} + \text{Big Growth})$. Stocks are sorted into six portfolios by independently sorting them on market equity into small and big stocks using the median market capitalization of all stocks traded on the NYSE as breakpoint and by independently sorting them on book-to-market equity into value, neutral, and growth stocks using the 30th and 70th percentiles of book-to-market equity of all stocks traded on the NYSE as breakpoints. The portfolios are constructed at the end of June of year t and are held from July of year t to June of year $t+1$. Market equity observed at the end of June of year t is used to sort stocks on size. The book equity of a firm's last fiscal year with fiscal year-end before the end of December of year $t-1$ divided by market equity at the end of December of year $t-1$ is used to sort stocks on value. The two neutral portfolios (Small Neutral and Big Neutral) are not used. The six portfolios are value weighted.

Book equity is defined as stockholder equity (*seq*), plus balance sheet deferred taxes and investment tax credit (*txditc*) if available, minus the book value of preferred stock. The book value of preferred stock is the redemption (*pstkrv*), liquidation (*pstkl*), or par value (*pstk*), if available, in that order. Market equity is price times shares outstanding.

3.2 Alternatives that are Just as Reasonable

The construction of the original HML portfolio includes seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I identified the following six decisions, and I propose alternatives that are just as reasonable.

The first decision is about the timing of book equity. The original HML portfolio uses the book equity of a firm's last fiscal year with fiscal year-end before the end of December of year $t-1$ to

sort stocks into value and growth portfolios from July of year t to June of year $t+1$. As an alternative that is just as reasonable, I use the book equity of a firm's last fiscal year six months after its fiscal year-end. Both specifications impose a minimum gap of six months for accounting information to become publicly available in order to address reporting issues documented in Alford, Jones, and Zmijewski (1992). Apple Inc., for example, has its last fiscal year-end on September 28th, 2019. The firm's press release on October 30th, 2019 gives relevant accounting information, including shareholders' equity. The original HML portfolio uses this book equity observation at the end of June of year 2020 for portfolio sorts, nine months after Apple Inc.'s fiscal year ended. The alternative decision uses book equity at the end of March 2020 for portfolio sorts, six months after the firm's fiscal year ended.

The second decision is about the timing of market equity. The original HML portfolio uses market equity at the end of December of year $t-1$ as a simple way to match the timing of book equity. Specifically, market equity at the end of December of year $t-1$ is used in the denominator of book-to-market equity to sort stocks into value and growth portfolios from July of year t to June of year $t+1$. As an alternative that is just as reasonable, I use market equity from the most recent month and skip one month. I skip one month to avoid the negative first-order serial correlation in monthly stock returns documented in Jegadeesh (1990). The alternative is similar to Asness and Frazzini (2013), who use market equity from the most recent month in the denominator of book-to-market equity to have a more updated value portfolio. They argue that a stock may be a growth stock at the end of December, but a value stock at the end of June or later if negative information about the firm emerges. They report average portfolio returns conditional on momentum, but they do not report average portfolio returns unconditionally and they do not motivate momentum as a right-hand side variable. Also, Fama and French (1992, p. 430) include a short discussion about potential issues regarding the timing of market equity. They mention that their results are robust to using market equity of a firm's fiscal year-end in the

denominator of book-to-market equity, but they do not mention the robustness to using market equity of a firm's more recent month.

The third decision is about firms with negative book equity. The original HML portfolio excludes stocks with negative book equity observations. As an alternative, I include them. Firms can naturally and legally have negative book equity under US GAAP. Revlon Inc., for example, reported negative shareholder equity in 2013. Hewlett-Packard, as another example, reported negative shareholder equity in 2016.

The fourth decision is about financial firms. The original HML portfolio includes financial firms. As an alternative, I exclude financial firms (defined as firms with a one-digit SIC code of 6). This alternative is consistent with the decision to exclude financial firms in Fama and French (1992, p. 429) "... because the high leverage that is normal for these firms probably does not have the same meaning as for nonfinancial firms, where high leverage more likely indicates distress." Barber and Lyon (1997) study the book-to-market equity effect for the holdout sample of financial firms and find empirical support for the value effect. They do not reject the null hypothesis that financial firms and non-financial firms have differential value effects.

The fifth decision is about the book-to-market equity breakpoints that are used to sort stocks into value, neutral, and growth portfolios. The original HML portfolio uses the 30th and 70th percentiles of book-to-market equity of all stocks trading on the NYSE as breakpoints. As an alternative, I use the 20th and 80th percentiles and the 40th and 60th percentiles of book-to-market equity of all stocks trading on the NYSE as breakpoints.

The sixth decision is about the timing of market equity to sort stocks into small and big portfolios in order to account for the size effect. The original HML portfolio uses market equity at the end of June of year t . As an alternative, I use market equity at the end of December of year $t-1$. Banz (1981) is the first study on the size effect, and it uses market equity at the end of December of year $t-1$ as a proxy for the size effect.

Many decisions in the definition of the original HML portfolio do not have an alternative that is just as reasonable. The decision to use book equity, for example, does not have an alternative that is just as reasonable because book equity is the firm's accounting value and it matches market equity as the firm's market value. Earnings, cashflows, or dividends are different accounting variables and lead to different anomaly portfolios, and thus they are not alternatives that are just as reasonable. If the value premium estimate decreases upon replacing book equity with earnings, cashflows, or dividends, then this decrease is not about a chance result in research decisions but about different anomaly portfolios. As a second example, replacing book-to-market equity with an industry-demeaned book-to-market equity, as in Asness, Porters, and Stevens (2000), is not an alternative that is just as reasonable because it accounts for the heterogeneity in accounting practices across industries. As a third example, excluding penny stocks is not an alternative that is just as reasonable because this is about stock return predictability among illiquid stocks and because it leaves out information in the construction of a proxy for a systematic risk factor. As a fourth example, using breakpoints that are not based on stocks trading on the NYSE is not an alternative that is just as reasonable because this is about stock return predictability among stocks that are costly to trade. See Hou, Xue, and Zhang (2018).

Kessler, Scherer, and Harries (2019) study how "design choices" affect valuation-based portfolio returns. These design choices are not about alternatives that are just as reasonable. The design choices include different accounting variables (book equity, cyclically adjusted earnings, operating earnings, earnings, dividends, cash flows, earnings to growth, etc.), different sector adjustments (unadjusted, subtract the industry median, etc.), different transformations (unadjusted, z-score, percentile rank, etc.), using a different portfolio for the short leg (shorting the growth portfolio, shorting the market portfolio, etc.), different exposures (cash neutral, beta neutral, risk neutral, etc.), and different rebalancing frequencies (monthly, quarterly, annual).

3.3 Snapshot of Decisions in the Literature

Table I provides a snapshot of the decisions in the empirical literature on the value effect in the 1980s and early 1990s. The heterogeneity in researchers' decisions is consistent with alternatives that are just as reasonable.

[Table I here]

The table reports all empirical studies on the value effect that are referenced in Fama and French (1992, 1993) in order to include the most relevant of a large number of empirical studies. Column (1) lists the author(s), the publication year, and the academic journal. Column (2) reports the month in which the portfolio is rebalanced. Most studies rebalance their portfolios once a year at the end of December, March, April, or June. Rosenberg, Reid, and Lanstein (1985) sort stocks into portfolios at the end of each month. Column (3) reports on the timing of the accounting information. Studies use accounting information from fiscal year-ends before the end of December or March, from the previous fiscal year, or hand-collected accounting information from fiscal year-ends from the previous month. Column (4) reports on the timing of market equity. Studies use market equity at the end of December, June, March, or the previous month. Column (5) reports if observations with negative accounting information are excluded. Some studies include negative observations, some exclude negative observations, and some sort them into a separate portfolio. Column (6) reports if financial firms are excluded. Some studies include financial firms and some exclude them. Column (7) reports on the timing of market equity to account for the size effect. Studies use market equity at the end of December, March, June, or the previous month.

3.4 Replication Validation of the Original HML Portfolio

Table II reports the average monthly return of the original HML portfolio as reported in Fama and French (1993, p. 13) and the average monthly return of my replicated HML portfolio in the original study's sample from July 1963 to December 1991. The original HML portfolio has an average monthly return of 0.40%. The replicated HML portfolio has an average monthly return of 0.35% over the same time period. The difference is 0.05% per month. Therefore, I report that I can largely but not perfectly replicate the original HML portfolios.

[Table II here]

Next, I compare the average monthly return of my replicated HML portfolio with the average monthly return of the HML portfolios of eight studies that also replicate the original HML portfolio. Table II reports that my replicated HML portfolio has a monthly return that is, on average, 0.04% per month below that of the eight other studies.

What explains this difference? One explanation for the difference is the way CRSP and Compustat is merged. I merge them using links from the CRSP/Compustat Merged Database available on WRDS because the permno-gvkey links are researched by CRSP or by Compustat. A second explanation is that I use returns that are adjusted for delistings and for missing delistings. A third explanation for the difference is that the CRSP and Compustat datasets are updated over time. A fourth explanation is the details about the construction are left out, similar to many other studies.

I also noticed that the last five of the eight studies (marked with an asterisk) in Table II say that they replicate the HML portfolio as in Fama and French (1993) but then mention that they are using the book equity definition found in Davis, Fama, and French (2000). This book equity definition is more inclusive of smaller stocks for which the value effect is more pronounced. This is another explanation for why the average monthly return of my replicated HML portfolio is

lower compared to the other studies. The average difference is reduced to 0.01% per month once I use book equity as defined in Davis, Fama, and French (2000).

4 Is the Original Value Premium Estimate Biased?

4.1 Main Empirical Findings

Table III reports Fama and MacBeth (1973) regressions of the monthly returns of the 96 HML portfolios on a constant and a dummy variable that is one for the original HML portfolio and zero otherwise, from July 1963 to December 1991. Equation (1) defines the regression specification. The dependent variable, R_{it} , is the return of HML portfolio i in month t .

$$R_{it} = Constant + \beta \cdot Original\ HML\ Dummy_{it} + e_{it} \quad (1)$$

The constant is the average monthly return of the average HML portfolio, and thus an estimate for the value premium. If the value premium exists, I expect to find a constant that is statistically significant. If the value premium does not exist, however, I expect to find a constant that is insignificant.

The slope on the dummy variable for the original HML portfolio is the average monthly return difference between the original HML portfolio and the average HML portfolio in each month, and thus an estimate of the bias due to chance in the original decisions. If the original value premium estimate is biased, then I expect to find a slope estimate that is statistically significant. If the original value premium estimate is not biased due to chance in the original decisions, I expect to find a slope estimate that is insignificant.

Fama and MacBeth (1973) regressions produce t -statistics that account for the contemporaneous correlation in the residuals. Petersen (2009) shows analytically and

numerically that the standard errors of these estimates account for the cross-sectional correlation in the residuals.

[Table III here]

Column (1) estimates a constant of 0.27% per month with a *t*-statistic of 1.79 when all HML portfolios are used as proxies for the value factor. Column (2) estimates a value premium of 0.35% per month with a *t*-statistic of 2.53 when only the original HML portfolio is used as a proxy for the value factor. Column (3) reports a slope estimate of 0.09% per month with a *t*-statistic of 1.88. These findings suggest therefore that the original estimate of the value premium is upward biased. They also raise doubts as to the statistical significance of the original estimate.

My empirical findings are robust to using the book equity definition of Davis, Fama, and French (2000) in the definition of the HML portfolio. See Table II in the Appendix for the results.

4.2 Illustration of the Main Finding

Figure I shows a histogram of the monthly average returns of each of the 96 HML portfolios from July 1963 to December 1991. The original HML portfolio is marked with “HML”, and the average HML portfolio is marked with “AHML”.

The average monthly returns of the 96 HML portfolios range from 0.16% to 0.40%. I find that 86 of the 96 HML portfolios have returns that are below the original value premium estimate and that 10 HML portfolios have returns that are above it. The average return of the average HML portfolio is 0.27% per month and much lower than the average return of the original HML portfolio. This is consistent with the idea that the original estimate of the value premium is upward biased because of a chance result in the original decisions.

[Figure I here]

4.3 White (2000) Reality Check Bootstrap

I additionally perform the White (2000) Reality Check Bootstrap to test the null hypothesis that the value premium is zero. This is important because the t -statistic of the constant estimate does not account for the fact that we have more information that the just average portfolio (Table III, column 1) and because the t -statistic on the slope estimate (Table III, column 2) does not account for the fact that a researcher has the freedom to choose the HML portfolio with the highest t -statistic as a proxy for the value factor.

The White (2000) Reality Check Bootstrap provides a way to calculate a critical value for the null hypothesis that the value premium is zero that accounts for the researcher's freedom to choose the HML portfolio with the highest t -statistic as a proxy for the value factor. The bootstrap procedure works as follow: I first demean each of the 96 HML portfolios so that no value effect exists in my sample by construction. I then draw a random sample of months with replacement, calculate the average returns and the t -statistics of each of the 96 HML portfolios, and take the highest t -statistic as the t_{max} -statistic. I repeat this bootstrap 1,000 times. Eventually, I calculate the 95th percentile of all the t_{max} -statistics and use it as the critical value for the hypothesis test.

Figure II shows the histogram of the bootstrapped t_{max} -statistics under the null hypothesis that no value premium exists from July 1963 to December 1991. The 95th percentile of the t_{max} -statistics is 2.12. The original HML portfolio has a t -statistic of 2.53. This t -statistic exceeds the critical value and leads therefore to the rejection of the null hypothesis that the value premium is zero.

[Figure II]

4.4 Compensation for Risk

To address the concern that the higher returns of the original relative to the average HML portfolio may be compensation for more risk, I compare the return standard deviation and the Sharpe ratio of the original HML portfolio with the average HML portfolio (AHML) for the sample from July 1963 to December 1991. If the higher returns of the original HML portfolio are compensation for more risk, I expect to find a higher return standard deviation and a similar Sharpe ratio. Table IV reports that the standard deviation of the HML portfolio is lower than that of the average HML portfolio (2.57% versus 2.76% per month) and that the Sharpe ratio of the original HML portfolio is larger than that of the average HML portfolio (0.14 versus 0.10). These findings are difficult to reconcile with a risk explanation, but they are consistent with the explanation of a result occurring due to chance in research decisions.

[Table IV here]

4.5 One Common Factor

I study the common variation in the monthly returns of the 96 HML portfolios to better understand whether the 96 HML portfolios are proxying for one or for many risk factors.

Specifically, I perform a principal component analysis of the monthly returns of the 96 HML portfolios from July 1963 to December 1991. Table V reports that the first principal component explains 91% of the variation in the monthly returns, the second principal component explains 5%, the third principal component explains 1%, and each of the remaining 93 principal components explain less than 1% of the variation. These findings suggest that the 96 HML portfolios are proxying for one underlying risk factor and not for multiple risk factors.

[Table V here]

I also find an average pairwise correlation of 0.91 for the monthly returns of the 96 HML portfolios from July 1963 to December 1991. This correlation is high compared to the average pairwise correlations among different anomaly portfolios, and it suggests that the 96 HML portfolios are all proxies for one common factor. McLean and Pontiff (2016) report an average correlation of 0.03 across 97 different anomaly portfolios, and Green, Hand, and Zhang (2017) report an average correlation of 0.09 among 60 different predictor portfolios.

4.6 Out-Of-Sample Evidence

I estimate the main empirical test using data that is outside of the original study's sample period. If the value premium exists, I expect to find statistically significant constants out of sample. If the value premium does not exist, however, I expect to find constants that are statistically insignificant out of sample. If the original value premium estimate is biased due to a chance result in the original decisions, I expect to find an insignificant slope estimate out of sample. Otherwise, I expect to find a statistically significant slope estimates out of sample.

Table VI reports Fama and MacBeth (1973) regressions of the monthly returns of the 96 HML portfolios on a constant and a dummy variable that is one for the original HML portfolio and zero otherwise. The pre-sample is July 1926 to June 1963, and the post-sample is January 1992 to December 2019. The pre-Compustat book equity data is from Kenneth French's webpage, and I hand-collected fiscal year-end months from the Moody's Manuals that are available to me.

[Table VI here]

Columns (1) and (4) estimate a value premium of 0.33% per month with a t -statistic of 1.45 in the pre-sample and a value premium of 0.14% per month with a t -statistic of 0.75 in the post-sample. The pre-sample t -statistic suggests that the value premium exists, but the post-sample t -statistic suggests that the value premium does not exist.

Columns (2) and (5) estimate a value premium of 0.41% per month with a *t*-statistic of 1.99 in the pre-sample and 0.20% per month with a *t*-statistic of 1.16 in the post-sample when the original HML portfolio is used as a proxy for the underlying value factor. The pre-sample finding is consistent with Davis, Fama, and French (2000). The post-sample result is consistent with Fama and French (2020). They report an insignificant value premium of 0.10% per month for the post-sample period using the difference between a market value and a market growth portfolio as a proxy for the value factor (Table 1 on p. 15, $MV-MG = 0.11-0.01 = 0.10$). The post-sample findings are also consistent with Linnainmaa and Roberts (2018), who report that the original HML portfolio has an average monthly return of 0.31% per month with a *t*-statistic of 1.71 in the post-sample, and they are consistent with Schwert (2003), who reports an insignificant value effect for the sample from 1994 to 2002.

Columns (3) and (6) estimate a bias of 0.08% per month with a *t*-statistic of 1.69 in the pre-sample and a bias of 0.06% per month with a *t*-statistic of 0.76 in the post-sample. The pre-sample slope estimate is similar to the in-sample slope estimate, which is at odds with an estimation bias in the original value premium estimate. It is not clear, however, whether the pre-sample produces an independent estimate of the value premium because Graham and Dodd (1934, 1962) and Graham (1949) already reported on value investing for the pre-sample. The post-sample estimate is smaller and statistically insignificant, and thus suggests that the return difference between the original and the average HML portfolios is an estimate for the bias due to chance in the original decisions.

I also study the robustness of my findings to using different start dates. Davis, Fama, and French (2000) use July 1929 as a start date because they need the first three years to estimate betas. My results are robust to using July 1929 as start date. Cohen, Polk, and Vuolteenaho (2003) report that the Securities Exchange Act of 1934 was enacted to ensure accurate accounting information. They characterize the first two years after that act as an enforcement period and

determine that accounting information from 1937 is of sufficiently high quality for empirical research. My results are robust to using July 1938 as the start date.

I also acknowledge that the positive return difference between the original and the average HML portfolio in the pre- and in the original sample period, and the lower return difference in the post-sample period are consistent with McLean and Pontiff's (2016) assertion that sophisticated investors learn about stock return predictability due to mispricing and start to trade on it. Fama and French (2020) argue that the post-sample decline of value minus growth portfolios is economically large but not statistically significant.

4.7 Individual Decisions

I study how much each of the six decisions accounts for the return difference between the original and the average HML portfolio. Table VII reports Fama and MacBeth (1973) regressions of the monthly returns of the 96 HML portfolios on a constant and six dummy variables for each of the six decisions, from July 1963 to December 1991.

[Table VII here]

Columns (1) to (5) report estimates of the six dummy variables individually, and column (6) reports estimates for the six dummy variables jointly. Four out of six slope estimates are close to zero, which is consistent with the researcher's expectation that alternative decisions will lead to the same empirical finding as the original decisions. The slope on the second dummy variable about the timing of market equity in the denominator of book-to-market equity is 0.11% per month with a t -statistic of 1.62. This effect is economically large but is not statistically significant at the 95 percent confidence level. The slope on the sixth dummy variable about the timing of market equity to account for the size effect is 0.05% per month with a t -statistic of 2.96. This effect is statistically significant at the 5% significance level. This finding is related to Gerakos and

Linnainmaa (2018), who report that most of the value premium estimate is driven by changes in market equity. The empirical findings also suggest that decisions with more “degrees of freedom”, for example decisions that use monthly stock market data compared to annual accounting data, are more likely to pick up a result due to chance in research decisions.

4.8 Robustness to Cross-Sectional Slope Estimates

The empirical tests use monthly portfolio returns as the dependent variable. As a robustness test, I use the monthly slope estimates from cross-sectional regressions of one-month ahead returns on each of the individual value measures as the dependent variable. Fama (1976) argues that these slope estimates are returns from long-short portfolios with an exposure of one to the underlying value factor.

Specifically, I estimate monthly cross-sectional regressions of one-month ahead returns on the natural logarithm of each of 48 value measures and on the natural logarithm of market equity using all but microcap stocks from July 1963 to December 1991. Microcap stocks are defined as stocks with market equity below the 20th percentile of market equity using all stocks trading on the NYSE. I have 48 value measures compared to the 96 HML portfolios, because the fifth decision on breakpoints to sort stocks into value, neutral, and growth portfolios is not used in cross-sectional regressions. I exclude microcap stocks as a simple way to account for the unique weighting that is used in the construction of the original HML portfolio. The original HML portfolio is constructed by equal weighting two long and two short portfolios (Small Value and Big Value, Small Growth and Big Growth), and these four portfolios are constructed by value weighting stocks.

Table VIII reports Fama and MacBeth (1973) regressions of the monthly slope estimates on a constant and a dummy variable that is one for the slope estimates that are consistent with the original HML portfolio returns. The *t*-statistics are based on Newey-West adjusted standard errors with six monthly lags.

[Table VIII here]

Column (1) estimates a value premium of 0.18% per month with a t -statistic of 1.94. Column (2) estimates a value premium of 0.26% per month with a t -statistic of 2.83 for the value measure that is consistent with the original HML portfolio. Column (3) estimates a bias of 0.08% per month with a t -statistic of 3.68. My main results are therefore robust to using monthly slope estimates from cross-sectional regressions instead of portfolios returns.

4.9 Full Sample Evidence

I estimate the main regression specification using data from the full sample from July 1926 to December 2019. Table IX reports the empirical results. Column (1) estimates a value premium of 0.25% per month with a t -statistic of 2.06. Column (2) estimates a value premium of 0.33% per month with a t -statistic of 2.85 when the original HML portfolio is used as a proxy for the value factor. Column (3) estimates a bias of 0.08% per month with a t -statistic of 2.32. These findings suggest that the value premium exists, but that the original estimate of the value premium is upward biased due to chance in the original decisions.

Figure III shows the histogram of the t_{max} -statistics from the White (2000) Reality Check Bootstrap under the null hypothesis that no value premium exists from July 1926 to December 2019. The 95th percentile of the t_{max} -statistics is 1.95. The original HML portfolio has a t -statistic of 3.13. This t -statistic exceed the critical value and leads therefore to the rejection of the null hypothesis that the value premium is zero.

[Figure III]

5 Spanning Regressions

I use the approach in Barillas and Shanken (2017) and the Fama and French (2015) five-factor model augmented with momentum to assess whether the original HML portfolio and the average HML portfolio are spanned by the model. I use asset pricing factor returns from Kenneth French's website.

[Table X here]

Table X reports the empirical results. First, I find that the original HML portfolio and the average HML portfolio are not priced by the five-factor model augmented with momentum in most of the subsamples and in the full sample. The portfolios, however, are priced in the post-sample. And the original HML portfolio is also priced in the Compustat sample. This is consistent with Fama and French's (2015) finding that the HML portfolio is redundant in the five-factor model. This finding suggests that the original and the average HML portfolio help explain expected returns conditional on the factors in the augmented five-factor model.

Second, I find that the intercepts of the average HML portfolio are similar or slightly larger than the intercepts of the original HML portfolio. This suggests that the incremental value of the average HML portfolio over the original HML portfolio is zero or small conditional on the augmented five-factor model.

Third, I find that the average HML portfolio has a much more negative beta with the momentum factor compared to the original HML portfolio. This suggests that the original HML portfolio has higher unconditional returns than the average HML portfolio, because it avoids trading against momentum.

The question whether momentum is an asset pricing factor is under debate. On the one hand, Fama and French (2018, p. 237) are reluctant to accept momentum as an asset pricing factor,

arguing that momentum lacks economic motivation as an asset pricing factor and that recognizing momentum as an asset pricing factor marks the beginning of mining the data for factors. Griffin, Ji, and Martin (2003) argue that international momentum portfolios are not related to macroeconomic risk factors. On the other hand, Barberis, Jin, and Wang (2019) argue that momentum can be motivated as an asset pricing factor in a model in which investors evaluate risk according to prospect theory. Jegadeesh and Titman (2010) document that momentum returns are also statistically significant after the publication of their 1993 paper.

6 Conclusion

The value premium compensates investors for a unit exposure to the value factor. Fama and French (1993) propose the HML portfolio as a proxy for the value factor and estimate a statistically significant value premium of 0.40% per month using data from July 1963 to December 1991.

The construction of this HML portfolio includes seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I expect *ex ante* that these decisions and their alternatives produce estimates of the value premium that are the same. If the estimates are not the same, however, then the difference is an estimate for the bias that is due to chance in the original decisions. This new approach can be extended to any empirical study.

I study the value premium because of its academic importance. Bias in the original value premium estimate affects our inference on the importance of the Fama and French (1993) three-factor model, on the abilities of mutual fund managers, and on the relevance of theories that provide rationales for why the value factor is a systematic risk factor. I study the bias of the original value premium estimate that is due to chance in research decisions, because a chance result is always possible in empirical research. Moreover, many statistical biases are inherent to research and lead to biased estimates in published papers. Harvey's (2017) AFA Presidential Address elaborates on some of these biases, including the file drawer effect, data-mining, multiple hypothesis testing, data-snooping, etc.

In this paper, I focus on six seemingly innocuous decisions in the construction of the original HML portfolio. The first decision is about the timing of market equity, the second decision is about the timing of book equity, the third decision is about negative book equity, the fourth decision is about financial firms, the fifth decision is about portfolio sorting breakpoints, and the sixth decision is about the timing of market equity to account for the size effect. I propose alternatives that are just as reasonable, create all possible combinations of the decisions and

their alternatives, construct 96 HML portfolios, and eventually collapse the 96 HML portfolio in each month into an average HML portfolio. This average HML portfolio is a valuable proxy for the value factor because it reflects an average decision that mitigates a bias due to chance in research decisions. The average return difference between the original HML portfolio and the average HML portfolio is therefore an estimate for the bias of the original value premium estimate.

The average HML portfolio has an average monthly return of 0.27% per month (t -statistic of 1.79) in the original study's sample. The original HML portfolio has an average monthly return of 0.35% per month (t -statistic of 2.53). The average return difference between the original and the average HML portfolio is 0.09% per month (t -statistic of 1.88). These findings suggest that the original value premium is positively biased.

The White (2000) Reality Check Bootstrap also leads to the rejection of the null hypothesis that the value premium is zero. This is important because the t -statistic of the average HML portfolio does not account that we have more information than just the average portfolio and because the t -statistic of the original HML portfolio does not account for a researcher's freedom in choosing the HML portfolio with the highest t -statistic as a proxy for the underlying value factor.

I estimate the main empirical test using data that is out of sample. If the return difference between the original and the average HML portfolio is a bias that is due to chance in research decisions, then I expect the return difference to be zero out of sample. In the pre-sample, from July 1926 to June 1963, the return difference between the original and the average HML portfolio is 0.08% per month (t -statistic of 1.48). This pre-sample result is somewhat at odds with the idea of a bias. The pre-sample estimate, however, may include hindsight biases, because Graham and Dodd (1934, 1962) and Graham (1949) already reported on value investing back then. In the post-sample, from January 1992 to December 2019, the return difference between the original and the average HML portfolio is 0.06% per month (t -statistic of 0.84). The post-sample result is consistent with a bias.

In the full sample, from July 1927 to December 2019, the average HML portfolio has an average monthly return of 0.25% (t -statistic of 2.21) and the average return difference between the original and the average HML portfolio is 0.08% per month (t -statistic of 2.27). This suggests that the original value premium estimate is upward biased but the original estimate is not a false positive.

In my last empirical test, I use the approach in Barillas and Shanken (2017) and the factors in Fama and French (2015) augmented with momentum to better understand if the original HML portfolio and the average HML portfolio are spanned. I find that the original and the average HML portfolios have almost the same intercepts and that both intercepts are statistically significant. I also find that the original HML portfolio's beta with the momentum factor is much more negative than the average HML portfolio's beta with momentum. These findings suggest that, unconditionally, the original HML portfolio has a higher average monthly return than the average HML portfolio because it avoids trading against momentum.

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Figure I

Seemingly Innocuous Decisions in the Construction of the HML Portfolio, 1963 to 1991

This histogram shows the average monthly returns of 96 HML portfolios from July 1963 to December 1991. The construction of the original HML portfolio (Fama and French, 1993) includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios. The original HML portfolio (marked as “HML”) has an average monthly return of 0.35% per month (t -statistic of 2.53). The average HML portfolio (marked as “AHML”) has an average monthly return of 0.27% per month (t -statistic of 2.53). The average return difference between the original and the average HML portfolio is 0.09% per month (t -statistic of 1.88).

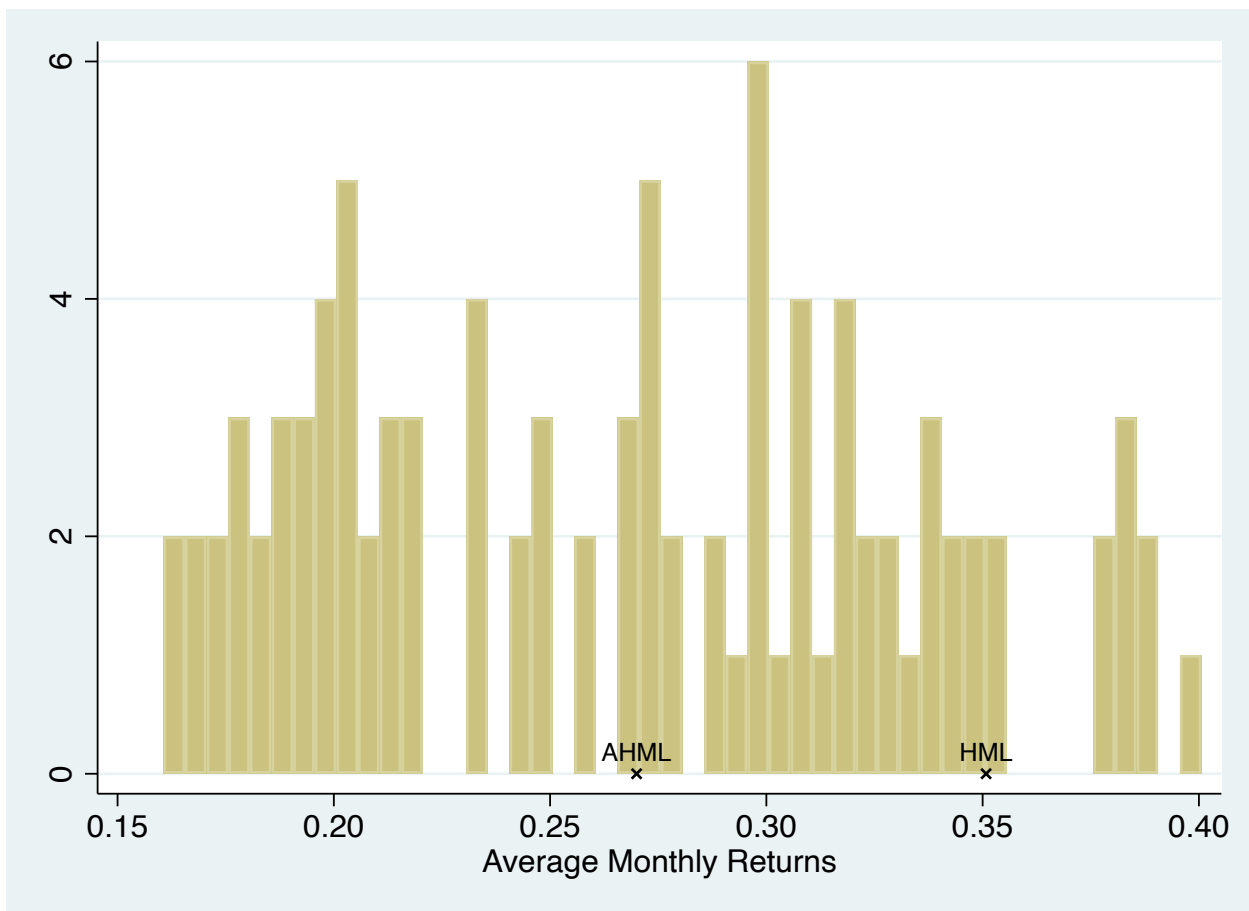


Figure II

Reality Check Bootstrap for the Original HML Portfolio, 1963 to 1991

This histogram shows bootstrapped t_{max} -statistics of a White (2000) Reality Check Bootstrap for the 96 HML portfolios under the null hypothesis that the value premium is zero. The original HML portfolio (marked as "HML") has t -statistic of 2.53. The 95th percentile of the t_{max} -statistics is 2.12 and marked with a red line. It serves as the critical value of a hypothesis test that considers multiple testing and that assumes a confidence level of 95%. The White (2000) reality check bootstrap procedure is as follows: I first demean each of the 96 HML portfolios. I then bootstrap months with replacement, calculate the mean return and its t -statistic for each of the 96 portfolios, and use the largest absolute t -statistics as the t_{max} -statistic. I repeat the bootstrap 1,000 times.

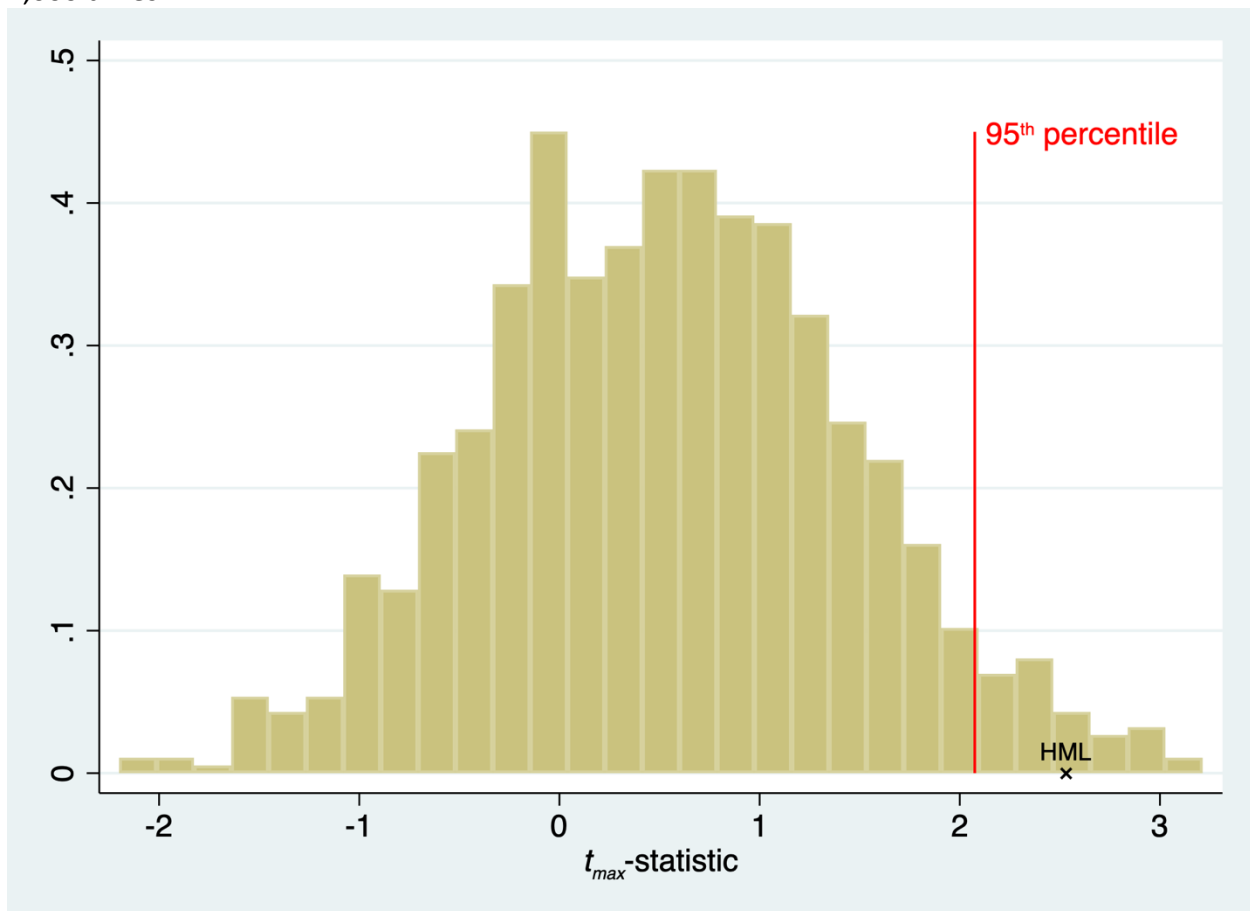


Figure III

Reality Check Bootstrap for the Original HML Portfolio, 1963 to 2019

This histogram shows bootstrapped t_{max} -statistics of a White (2000) Reality Check Bootstrap for the 96 HML portfolios under the null hypothesis that the value premium is zero. The original HML portfolio (marked as "HML") has t -statistic of 3.13. The 95th percentile of the t_{max} -statistics is 1.95 and marked with a red line. It serves as the critical value of a hypothesis test that considers multiple testing and that assumes a confidence level of 95%. The White (2000) reality check bootstrap procedure is as follows: I first demean each of the 96 HML portfolios. I then bootstrap months with replacement, calculate the mean return and its t -statistic for each of the 96 portfolios, and use the largest absolute t -statistics as the t_{max} -statistic. I repeat the bootstrap 1,000 times.

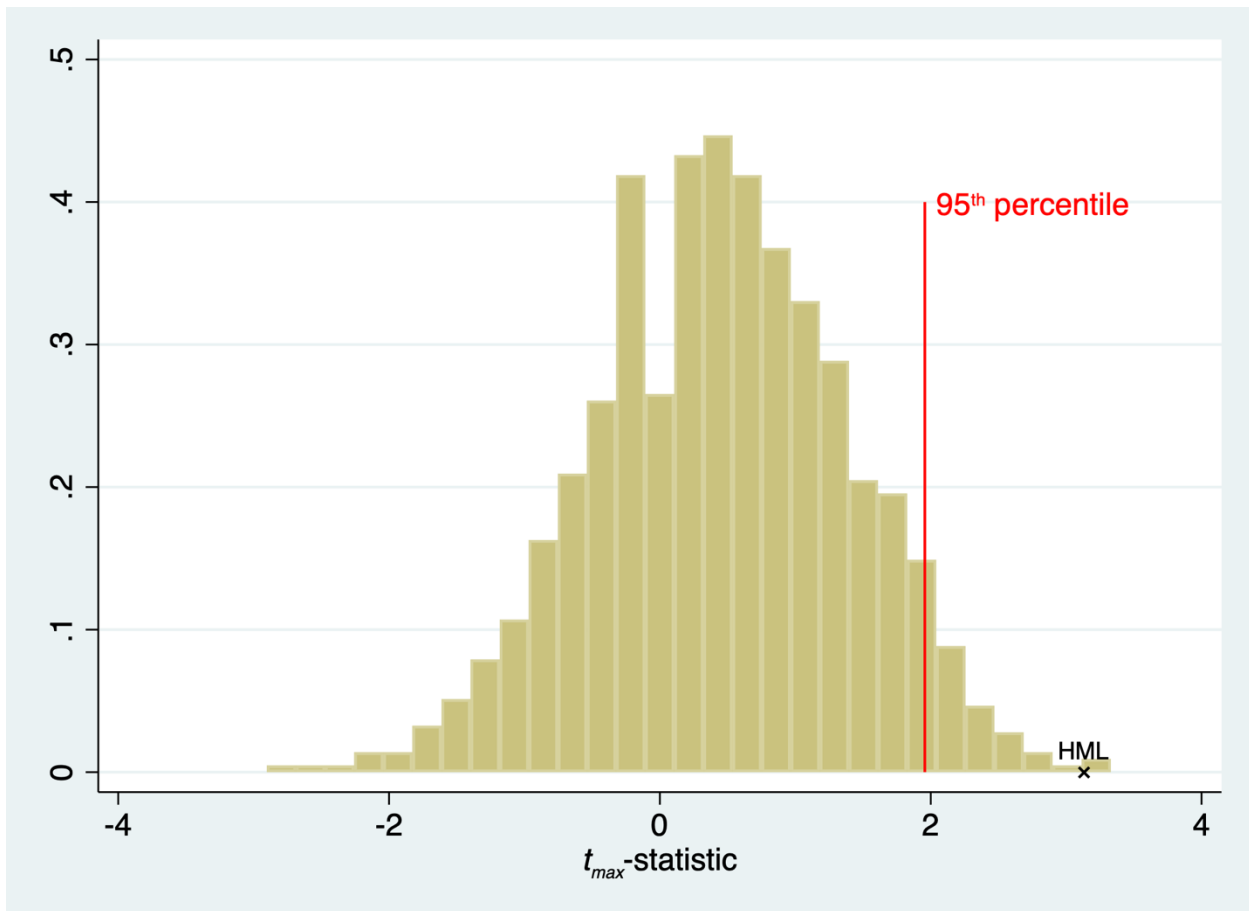


Table I
Snapshot of Decisions in the Related Studies, 1981 to 1993

This table provides a snapshot of the decisions in the empirical literature. I report all empirical studies on valuation anomalies that are referenced in Fama and French (1992, 1993) to include the most relevant empirical studies as of the beginning of the early 1990s. Column (1) names the author(s), the publication year, and the academic journal. Column (2) reports the month in which stocks are sorted into portfolios. Column (3) reports the month from which the accounting variable is that is used for the portfolio sorts. Column (4) reports the month from which month market equity is that is used for the portfolio sorts. Column (5) reports if observations with negative accounting information are excluded. Column (6) reports if financial firms are excluded. Column (7) reports the month from which market equity is to control for the size effect.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Study	Rebalancing Month	Timing of Accounting	Timing of ME	Negative Accounting	Financial Firms	Timing of Size Effect
Fama and French (1993, JFE)	Jun t	Dec t-1	Dec t-1	Exclude	Include	Jun t
Fama and French (1992, JF)	Jun t	Dec t-1	Dec t-1	Exclude	Exclude	Jun t
Chan, Hamao, and Lakonishok (1991, JF)	Jun t	Mar t	Jun t	Separate	Include	Jun t
Jaffe, Keim, and Westerfield (1989, JF)	Mar t	Dec t-1	Mar t	Separate	Include	Mar t
Bhandari (1988, JF)	Dec t	Prev. FYE	Prev. FYE	Include	Include	Dec t
Banz and Breen (1986, JF)	Dec t	Prev. FYE	Prev. FYE	Separate	Include	Dec t
Rosenberg, Reid, and Lanstein (1985, JPM)	Monthly	Prev. Month	Prev. Month	Include	Include	Prev. Month
Basu (1983, JFE)	Apr t	Dec t-1	Dec t-1	Exclude	Exclude	Dec t-1

Table II
Replication Validation

This table reports the average monthly return (in percentages) of the original HML portfolio reported in Fama and French (1993, p. 13) and compares it with the average monthly return of the replicated HML portfolio, as well as with the average monthly returns of HML portfolios reported in eight additional papers. Column (1) names the authors, the publication year, and the academic journal of the study. Column (2) reports the time horizon that is used in each study. Column (3) reports the average monthly return of the HML portfolio over the time horizon of the study as reported in the study. Column (4) reports the average monthly return of my replicated HML portfolio over the same time horizon as in each study. The last five studies use the book equity definition as in Davis, Fama, and French (2000), which is different from the book equity definition that is used for the original HML portfolio as in Fama and French (1993). I mark these five studies with an asterisk.

Study	Time Period of Each Study	HML Return in Each Study	Replicated HML Return	Diff.
Fama and French (1993, JFE)	07/63-12/91	0.40	0.35	-0.05
Fama and French (1995, JF)	07/63-12/92	0.44	0.40	-0.04
Fama and French (1996, JF)	07/63-12/93	0.46	0.43	-0.03
Fama and French (1997, JFE)	07/63-12/94	0.45	0.41	-0.04
Davis, Fama, and French (2000, JF)*	07/63-06/97	0.43	0.39	-0.04
Fama and French (2015, JFE)*	07/63-12/13	0.37	0.35	-0.02
Linnainmaa and Roberts (2018, RFS)*	07/63-12/16	0.36	0.34	-0.02
Gerakos and Linnainmaa (2018, RFS)*	07/63-12/16	0.37	0.34	-0.03
Ball, Gerakos, Linnainmaa, and Nikolaev (2019, JFE)*	07/64-12/17	0.37	0.31	-0.06
Average		0.41	0.37	-0.04

Table III

Seemingly Innocuous Decisions in the Construction of the HML Portfolio, 1963 to 1991

This table reports Fama and MacBeth (1973) regressions of the monthly returns (in percentage) of 96 HML portfolios on a constant and on a dummy variable that is one for the original HML portfolio, from July 1963 to December 1991.

$$R_{it} = Constant + \beta \cdot Original\ HML\ Dummy_{it} + e_{it}$$

The construction of the original HML portfolio (Fama and French, 1993) includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios. Note that column (2) suppresses the constant in the regression. *t*-statistics are reported in parentheses. White (2000) Reality Check Bootstrap *p*-values are reported in square brackets.

	(1)	(2)	(3)
Constant	0.27 (1.79)		0.27 (1.79)
Original HML Dummy		0.35 (2.53)	0.09 (1.88)
Months	342	342	342

Table IV
Compensation for Risk Explanation, 1963 to 1991

This table reports the average monthly return, standard deviation, and the Sharpe ratio of the original HML portfolio and of the average HML portfolio in the original study's sample from July 1963 to December 1991. The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, construct 96 HML portfolios, and finally collapse the 96 HML portfolios in each month into an equally weighted average HML portfolio.

Portfolio	Average	Standard Deviation	Sharpe Ratio
Original HML Portfolio	0.35	2.57	0.14
Average HML Portfolio	0.27	2.76	0.10

Table V
Principal Component Analysis of 96 HML Portfolios, 1963 to 1991

This table reports estimation results of a principal component analysis of the monthly returns of 96 HML portfolio in the original study's sample from July 1963 to December 1991. The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, construct 96 HML portfolios. Note that I only report the first three principal components, because the other principal components account for less than one percent of the variation.

Principal Component	Proportion of Variance Explained
First	0.91
Second	0.05
Third	0.01

Table VI

Pre- and Post-Sample Evidence, 1926 to 1963 and 1992 to 2019

This table reports Fama and MacBeth (1973) regressions of the monthly returns (in percentage) of 96 HML portfolios on a constant and a dummy variable that is one for the original HML portfolio using out of sample data. The pre-sample is July 1926 to June 1963, and the post-sample is January 1992 to December 2019.

$$R_{it} = \text{Constant} + \beta \cdot \text{Original HML Dummy}_{it} + e_{it}$$

The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios. Note that columns (2,5) suppress the constant in the regression. *t*-statistics are reported in parentheses. White (2000) Reality Check Bootstrap *p*-values are reported in square brackets.

	(1)	(2)	(3)	(4)	(5)	(6)
<u>Sample</u>	<u>July 1926 to June 1963</u>			<u>January 1992 to December 2019</u>		
Constant	0.33 (1.45)		0.33 (1.45)	0.14 (0.75)		0.14 (0.75)
Original HML Dummy		0.41 (1.99)	0.08 (1.48)		0.20 (1.16)	0.06 (0.84)
Months	444	444	444	336	336	336

Table VII
Individual Decisions, 1963 to 1991

This table reports Fama and MacBeth (1973) regressions of the monthly returns (in percent) of 96 HML portfolios on a constant and six dummy variables for each of the six decisions of the original HML portfolio from July 1963 to December 1991. The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.26 (1.79)	0.21 (1.28)	0.27 (1.80)	0.26 (1.74)	0.26 (1.77)	0.24 (1.62)	0.18 (1.09)
Dummy for Timing of BE	0.00 (0.28)						0.00 (0.28)
Dummy for Timing of ME		0.11 (1.50)					0.11 (1.50)
Dummy for Neg. BE			-0.00 (-0.66)				-0.00 (-0.66)
Dummy for Financials				0.00 (0.17)			0.00 (0.17)
Dummy for BE/ME Breakpoints					0.00 (0.09)		0.00 (0.09)
Dummy for Timing of Size						0.05 (3.35)	0.05 (3.35)
Months	342	342	342	342	342	342	343

Table VIII

Robustness to Cross-sectional Slope Estimates, 1963 to 1991

This table reports Fama and MacBeth (1973) regressions of monthly slope estimates on a constant and a dummy variable that is one for the value measure that is consistent with the original HML portfolio and zero otherwise.

$$\hat{\gamma}_{it} = \text{Constant} + \beta \cdot \text{Original HML Dummy}_{it} + e_{it}$$

The dependent variable, $\hat{\gamma}_{it}$, is the monthly slope estimates of monthly cross-sectional regressions in which one-month ahead returns are regressed on a constant, on the natural logarithm of each of 48 value measures, and on the natural logarithm of market equity, excluding microcap stocks. Microcap stocks are defined as stocks with end of June market capitalization below the 20 percent breakpoint of all stocks trading on the NYSE. Fama (1976) shows that these slope coefficients are returns of long-short portfolios with an exposure of one to the value measure. I exclude microcaps as a simple way to account for the equal and value weighting of stocks that is used in the construction of the original HML portfolio. I have 48 value measures (instead of 96 HML portfolios) because the fifth decision about the breakpoints to sort stocks into value and growth portfolios is not applicable here. *t*-statistics are reported in parentheses.

	(1)	(2)	(3)
Constant	0.18 (1.94)		0.18 (1.91)
Original HML Dummy		0.26 (2.83)	0.08 (3.68)
Months	342	342	342

Table IX
Full Sample Evidence, 1926 to 2019

This table reports Fama and MacBeth (1973) regressions of the monthly returns (in percentage) of 96 HML portfolios on a constant and on a dummy variable that is one for the original HML portfolio, from July 1926 to December 2019.

$$R_{it} = \text{Constant} + \beta \cdot \text{Original HML Dummy}_{it} + e_{it}$$

The construction of the original HML portfolio (Fama and French, 1993) includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios. Note that column (2) suppresses the constant in the regression. *t*-statistics are reported in parentheses. White (2000) Reality Check Bootstrap *p*-values are reported in square brackets.

	(1)	(2)	(3)
Constant	0.25 (2.21)		0.25 (2.21)
Original HML Dummy		0.33 (3.13)	0.08 (2.27)
Months	1,122	1,122	1,122

Table X
Spanning Regressions, 1927 to 2019

This table reports spanning regressions of the original and the average HML portfolios using the approach in Barillas and Shanken (2017) and the factors in Fama and French (2015) augmented with momentum over different time periods from January 1927 to December 2019. The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, construct 96 HML portfolios, and finally collapse the 96 HML portfolios in each month into an average HML portfolio (“AHML”). The factor returns are from Kenneth French’s webpage. *t*-statistics are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Sample</u>	<u>1927 to 1963</u>		<u>1963 to 1991</u>		<u>1992 to 2019</u>		<u>1927 to 2019</u>		<u>1963 to 2019</u>	
<u>Portfolio</u>	<u>AHML</u>	<u>HML</u>	<u>AHML</u>	<u>HML</u>	<u>AHML</u>	<u>HML</u>	<u>AHML</u>	<u>HML</u>	<u>AHML</u>	<u>HML</u>
Constant	0.41 (2.21)	0.38 (2.02)	0.32 (3.12)	0.24 (2.35)	-0.06 (-0.55)	-0.14 (-1.13)	0.52 (4.92)	0.47 (4.17)	0.12 (1.61)	0.04 (0.47)
Mkt-RF	0.20 (4.86)	0.20 (4.90)	-0.09 (-3.10)	-0.06 (-2.07)	0.03 (0.75)	0.07 (1.74)	0.03 (1.03)	0.05 (1.54)	-0.04 (-1.48)	0.00 (-0.09)
SMB	0.23 (3.14)	0.23 (2.85)	0.05 (1.21)	0.03 (0.65)	-0.04 (-0.91)	-0.06 (-1.44)	0.04 (0.52)	0.02 (0.33)	-0.02 (-0.54)	-0.04 (-1.05)
CMA			0.76 (11.36)	0.77 (10.85)	0.87 (14.70)	0.92 (13.30)			0.95 (21.85)	0.99 (20.83)
RMW			-0.34 (-4.74)	-0.33 (-4.34)	0.37 (6.13)	0.38 (5.69)			0.19 (3.03)	0.20 (3.25)
UMD	-0.44 (-6.20)	-0.30 (-3.82)	-0.23 (-5.58)	-0.05 (-1.42)	-0.34 (-13.02)	-0.12 (-4.73)	-0.45 (-8.89)	-0.28 (-4.81)	-0.32 (-12.08)	-0.12 (-4.81)
Months	438	438	342	342	336	336	1'116	1'116	678	678

Appendix - Table I
Replication Methodology, 1963 to 1991

This table compares the summary statistics of the reported and the replicated HML portfolios. Column (1) reports summary statistics of the HML portfolio as reported in Fama and French (1993, p. 13, Table 2). Column (2) reports the summary statistics of the replicated HML portfolio. Column (3) reports the summary statistics of the replicated HML portfolio, but uses the book equity definition, as in Davis, Fama, and French (2000). The sample goes from July 1963 to December 1991. Note: Fama and French (1993) define book common equity as stockholder equity (*seq*), plus balance-sheet deferred taxes and investment tax credit (*txditc*) if available, minus the book value of preferred stock. The value of preferred stock is the redemption (*pstkrv*), liquidation (*pstkl*), or par value (*pstk*), if available, in that order. Davis, Fama, and French (2000) define book equity as stockholder book equity plus balance sheet deferred taxes and investment tax credit (*txditc*), if available, minus the book value of preferred stock. Stockholder equity is the value reported by Compustat (*seq*). If not available, stockholders' equity is measured as the book value of common equity (*ceq*) plus the par value of preferred stock (*pstk*), or the book value of assets minus total liabilities (*at-lt*), in that order. The book value of preferred stock is measured as redemption (*pstkrv*), liquidation (*pstkl*), or par value (*pstk*), if available and in that order, for the book value of preferred stock.

	(1)	(2)	(3)
Methodology	Original HML portfolio as Reported in Fama and French (1993, p. 13, Table 2)	Replication of the original HML portfolio as in Fama and French (1993)	Replication of the original HML portfolio, but using the book equity definition as in Davis, Fama, and French (2000)
Mean	0.40	0.35	0.39
St. Dev.	2.54	2.56	2.53
<i>t</i> -statistic	2.91	2.52	2.86
Autocorr. Lag 1	0.18	0.17	0.17
Autocorr. Lag 2	0.06	0.03	0.04
Autocorr. Lag 12	0.07	0.08	0.09
Corr. with SMB	-0.08	-0.10	-0.11
Corr. with MKTRF	-0.38	-0.36	-0.37
Observations	342	342	342

Appendix - Table II
Robustness Test for Seemingly Innocuous Variation in the
Construction of the Original HML Portfolio, 1963 to 1991

This table reports Fama and MacBeth (1973) regressions of the monthly returns (in percentage) of 96 HML portfolios on a constant and on a dummy variable that is one for the original HML portfolio from July 1963 to December 1991. The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios.

$$R_{it} = \text{Constant} + \beta \cdot \text{Original HML Dummy}_{it} + e_{it}$$

I define book equity as in Davis, Fama, and French (2000) as stockholders' book equity plus balance sheet deferred taxes and investment tax credit (if available) minus the book value of preferred stock. Stockholder equity is the value reported by Compustat. If not available, stockholder equity is measured as the book value of common equity plus the par value of preferred stock, or the book value of assets minus total liabilities (in that order). The book value of preferred stock is measured as redemption, liquidation, or par value (if available, in that order). Note that column (2) suppresses the constant in the regression. *t*-statistics are reported in parentheses.

	(1)	(2)	(3)
Constant	0.30 (2.07)		0.30 (2.07)
Original HML Dummy		0.39 (2.87)	0.09 (1.97)
Months	342	342	342

Appendix - Table III
Robustness Test for Post-Sample Evidence, 1992 to 2019

This table reports Fama and MacBeth (1973) regressions of the monthly returns (in percentage) of 96 HML portfolios on a constant and on a dummy variable that is one for the original HML portfolio from January 1992 to December 2019. The construction of the original HML portfolio includes six seemingly innocuous decisions that could easily have been replaced with alternatives that are just as reasonable. I propose such alternatives, form all possible combinations of the six decisions and their alternatives, and construct 96 HML portfolios.

$$R_{it} = Constant + \beta \cdot Original\ HML\ Dummy_{it} + e_{it}$$

I define book equity as in Davis, Fama, and French (2000) as stockholders' book equity plus balance sheet deferred taxes and investment tax credit (if available) minus the book value of preferred stock. Stockholder equity is the value reported by Compustat. If not available, stockholder equity is measured as the book value of common equity plus the par value of preferred stock, or the book value of assets minus total liabilities (in that order). The book value of preferred stock is measured as redemption, liquidation, or par value (if available, in that order). Note that column (2) suppresses the constant in the regression. *t*-statistics are reported in parentheses.

	(1)	(2)	(3)
Sample	<u>January 1992 to December 2019</u>		
Constant	0.13 (0.75)		0.13 (0.75)
Original HML Dummy		0.20 (1.16)	0.06 (0.84)
Months	336	336	336