Resurrecting the Value Factor from its Redundancy*

Manuel Ammann† Tobias Hemauer‡ Simon Straumann§

December 23, 2022

Abstract

The value factor has no incremental pricing power in the Fama-French (2015) five-factor model. Thereby, its pricing power is primarily subsumed by the investment factor. We show that the strong relationship between the two factors arises because their sorting variables—book-to-market and investment—are both driven by shocks to expected cash flows and discount rates. We document that only stocks driven by shocks to discount rates contain the factors' cross-sectional pricing information. The value and investment premia based on these stocks are more than 50% higher than the usual value and investment premia. Importantly, adjusted versions of the value and investment factors that use only such discount rate shock-driven stocks cannot subsume each other and improve the five-factor model's pricing power. Thus, a value factor built from stocks for which book-to-market is actually a good indicator of expected returns captures incremental pricing information and is no longer redundant. Consequently, multifactor models should include such a value factor.
Keywords: Fama-French five-factor model, value factor, investment factor, cash flow shocks, discount rate shocks
JEL Classification: G12, G14

*We thank Mikael Bask (discussant), Zhimin Chen (discussant), Jérôme Detemple, Maximilian Fuchs (discussant), Ralph Koijen, Theodosia Konstantinidi, Tim Kröncke, Manuel Leininger (discussant), Markus Leippold, Luca Liebi, Hannes Mohrschladt (discussant), Ioannis Psaradellis (discussant), Jonas Romer (discussant), Paul Söderlind, Niklas Trappe (discussant), Michael Verhofen, Dominik Walter (discussant), Michael Weber, and Chuyi Yang (discussant) as well as participants of the 2021 Annual Meeting of the German Finance Association (DGF), the 2022 Annual Meeting of the European Financial Management Association (EFMA), the 2022 European Conference of the Financial Management Association (FMAE), the 2022 World Finance Conference (WFC), the 2022 Annual Meeting of the Financial Management Association (FMA), the 2022 Annual Meeting of the Southern Finance Association (SFA), the 2022 Australasian Finance and Banking Conference (AFBC), the 2022 Paris Financial Management Conference (PFMC), the 2022 Swiss Finance Institute (SFI) Research Days, the doctoral seminar at the University of St.Gallen, the 2019 Topics in Finance Seminar, and the 2022 joint doctoral seminar of the University of St.Gallen and the University of Konstanz for helpful comments and suggestions. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. We declare that we have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The paper previously circulated under the title "On the Redundancy of the Value Factor". Send correspondence to Tobias Hemauer, University of St.Gallen, School of Finance, Unterer Graben 21, CH-9000 St. Gallen, Switzerland. Email: tobias.hemauer@unisg.ch. Phone: +41-71-224-7017.

†University of St.Gallen, School of Finance. Address: Unterer Graben 21, CH-9000 St. Gallen, Switzerland. Email: manuel.ammann@unisg.ch

‡University of St.Gallen, School of Finance. Address: Unterer Graben 21, CH-9000 St. Gallen, Switzerland. Email: tobias.hemauer@unisg.ch

§WHU - Otto Beisheim School of Management, Finance and Accounting Group. Address: Burgplatz 2, D-56179 Vallendar, Germany. Email: simon.straumann@whu.edu

1 Introduction

In this study, we resolve the recent controversy about the value factor, as raised in the studies of Fama and French (2015) and Hou et al. (2015). Fama and French (2015) provide a theoretical motivation for the value factor but find that the value factor captures no incremental pricing information in the presence of the investment factor. Hou et al. (2015) argue that the value effect is a manifestation of the investment effect, thereby questioning its theoretical motivation. By contrast, we show rigorously and conclusively that a value factor can capture incremental pricing information even beyond the investment factor if its construction differentiates between stocks that contain pricing information and stocks that do not. This finding has large implications for academia and practice given that the Fama-French (2015) five-factor model is arguably the leading factor model for determining risk-adjusted returns, estimating capital costs, and evaluating investment performance. In particular, the result that a value factor can capture incremental pricing information—while Fama and French's (2015) value factor does not—implies that the five-factor model fails to account properly for the value effect. Consequently, the five-factor model needs to include an improved value factor, such as the one we propose, to accurately assess risk-adjusted returns, capital costs, and investment performance.

Originally, Fama and French's (1993; 1996) value factor has been viewed as the main source of their three-factor model's explanatory power for the cross-section of stock returns. Therefore, Fama and French's (2015) finding that the value factor has no incremental pricing power, and is thus redundant, when the three-factor model is extended with profitability and investment factors came as a surprise. Fama and French (2015) motivate these additional factors as well as the value factor itself by showing, based on a manipulation of the dividend discount model, that book-to-market, profitability, and investment are all, in theory, related to expected returns. Yet, empirically, the value factor's pricing power is subsumed by the other factors, in particular by the investment factor.

The contrast between the theoretical motivation for the value factor and its empirical redundancy as well as Fama and French's (2015) decision to keep it in their five-factor model has sparked controversy about the value factor.[1] On the one hand, the value factor had been considered the most important factor for explaining the cross-section of stock returns for a long time. The value premium is an established empirical finding, and Fama and French (2015) provide a profound theoretical motivation for the value factor. Other recently proposed factor models also comprise value factors (e.g., Barillas and Shanken, 2018; Daniel et al., 2020; Fama and French, 2020). On the other hand, Fama and French's (2015) value factor has no incremental pricing power in the presence of their investment factor. Moreover, Hou et al. (2015) derive an economic model that can motivate the profitability and investment factors but not the value factor. Their four-factor model, which does therefore not contain a value factor, performs similarly, if not better, than the Fama-French (2015) five-factor model. Consequently,

[1]Fama and French (2015) rationalize this decision by arguing that the value factor's documented redundancy "may be specific to this sample" (p. 2).

the theoretical motivation as well as the empirical usefulness of the value factor are both called into question.

We resolve this controversy about the value factor by uncovering the reasons for the close relation between the value and investment factors and by showing that a value factor can capture incremental pricing information beyond an investment factor. Our findings are important for at least three reasons. First, the value factor is one of few factors that can be theoretically motivated—especially based on such a fundamental principle like the dividend discount model. Requiring factors to have a solid theoretical motivation is critical to guard against including data-mined factors in multifactor models. While the issue of an ever-expanding factor zoo as outlined, for example, by Cochrane (2011) and Harvey et al. (2016) would suggest that getting rid of a factor is good news, losing a factor aiming to capture an effect that should theoretically exist is bad news. This is because failing to properly account for theoretically motivated effects, such as the value effect, lowers the bar for researchers to "detect" new factors. In this regard, it seems unreasonable that the investment factor is sufficient to account for the value effect, given that the value and investment factors are together motivated by the dividend discount model. We document that the investment factor is in fact insufficient to capture the value effect, and thus that a value factor is needed. Second, factor models are the workhorse approach in empirical asset pricing. It is critical to understand how to select and combine factors and how to construct them in such a way that they capture the intended effects. As the value and investment factors are together motivated by the dividend discount model, the value factor's empirical redundancy suggests that the factors' construction is flawed. Our result that a value factor captures incremental pricing information if its construction considers which stocks should actually contain pricing information provides guidelines on how to construct theoretically motivated factors effectively. Third, the investment management industry widely employs investment strategies based on factors, and the value factor is one of the most targeted factors. Our findings deliver important insights regarding how to design effective factor strategies and reveal that value and investment strategies can complement each other.

To uncover the reasons for the value factor's close relation to the investment factor, we propose and evaluate a simple and intuitive explanation for the association between their sorting variables—book-to-market and investment. Based on the dividend discount model and the net present value rule, we argue that both variables are driven by cash flow and discount rate shocks: negative cash flow shocks as well as positive discount rate shocks lead investors to lower their valuation of a given firm, implying an increase in the firm's book-to-market, and simultaneously prompt the firm to decrease investment.[2] This mechanism generates a negative relation between book-to-market and investment. Because the value factor is long in high book-to-market stocks and the investment factor is long in low investment stocks, this negative relation implies that both factors are likely to select similar stocks. This should in turn drive their positive comovement.

[2]The same reasoning applies analogously to positive cash flow shocks and negative discount rate shocks.

To evaluate this explanation, we construct proxies for firms' cash flow and discount rate shocks. Following Hou and van Dijk (2019), our proxy for firms' cash flow shocks is the profitability shock estimated from a cross-sectional profitability model. Moreover, we obtain a proxy for firms' discount rate shocks as the residual return from a cross-sectional regression of firms' contemporaneous stock returns on their estimated profitability shocks.

Our empirical evidence supports our theses. Specifically, we document a negative relation between book-to-market and investment which disappears when we orthogonalize both variables to our cash flow and discount rate shock proxies. Further corroborating the notion that the relation is due to cash flow and discount rate shocks, we demonstrate that mispricing or financial constraints are unlikely to cause the relation. As expected, the negative relation between book-to-market and investment gives rise to a substantial overlap between the value and investment factors' portfolios. The overlap is only due to stocks whose variation in book-to-market stems from market equity rather than book equity changes. This result is in line with our thesis as only market equity changes reflect cash flow and discount rate shocks. The overlap between the factors' portfolios is in turn the primary reason for the factors' strong comovement, which is the prerequisite that the investment factor subsumes the value factor.

In theory, only differences in discount rates are associated with differences in expected returns. Thus, high book-to-market and low investment should only be associated with higher future returns if they are high respectively low because of discount rate shocks rather than cash flow shocks. Consequently, only those stocks whose variation in book-to-market and investment stems from discount rate shocks—and thus from differences in expected returns—should contain the value and investment factors' pricing information for the cross-section of stock returns.

Our cash flow and discount rate shock proxies successfully identify the variation in book-to-market and investment that is informative about expected returns. Specifically, we show that only stocks whose book-to-market and investment are more likely to be driven by discount rate shocks than cash flow shocks earn the value and investment premia. By contrast, the value and investment premia are weak to non-existent for stocks whose book-to-market and investment are driven by cash flow shocks. The value and investment premia of discount rate shock-driven stocks are around 6.0% and 3.6% p.a., respectively, corresponding to an increase of roughly 50% compared to the standard value and investment premia. Moreover, contrary to the standard premia, the discount rate shock-driven value and investment premia represent largely independent sources of excess returns.

The differences between the discount rate shock- and cash flow shock-driven value and investment premia are arguably due to differences in expected returns. Nevertheless, the Fama-French (2015) five-factor model fails to explain why only discount rate shock-driven stocks earn value and investment premia while cash flow shock-driven stocks do not. Thus, the Fama-French (2015) five-factor model cannot distinguish whether high book-to-market and low investment stem from high expected returns or low expected profitability.

Motivated by our findings, we construct adjusted versions of the value and investment factors that employ only stocks whose book-to-market and investment are driven by discount rate shocks. These discount rate shock-driven value and investment factors strongly outperform their standard counterparts. Importantly, we find that the discount rate shock-driven value factor cannot be subsumed by the other factors, including the discount rate shock-driven investment factor. Contrary to Fama and French's (2015) value factor, our discount rate shock-driven value factor thus captures incremental pricing information and is not redundant. The value factor's incremental pricing information is hidden in its standard version because of the cash flow shock-driven part. This part contains hardly any pricing information but strongly contributes to the comovement with the investment factor.

We further show that our discount rate shock-driven value and investment factors can capture the entire pricing information of the standard value and investment factors, but not vice versa. Consequently, an adjusted five-factor model that uses the factors' discount rate shock-driven versions exhibits a better pricing performance than the standard five-factor model. In particular, the adjusted five-factor model can explain why discount rate shock-driven stocks earn value and investment premia while cash flow shock-driven stocks do not.

Furthermore, we evaluate why the value factor rather than the investment factor is the redundant factor in the Fama-French (2015) five-factor model. We document three reasons. First, the value factor comprises the noisy book equity-driven part that reflects other effects than its market equity-driven part or the investment factor. Second, the value factor captures the effects with more noise than the investment factor, especially during periods of market-wide distortions. Third, the value factor is a worse hedge for the three remaining factors of the five-factor model (i.e., market, size, and profitability) than the investment factor. We present evidence suggesting that the second and third reasons may be specific to our sample period from 1963 to 2019. Thus, the value factor does not need to remain the redundant one of the two factors going forward.

Finally, we use the disconnect between our discount rate shock- and cash flow shock-driven value and investment premia to evaluate the three-beta ICAPM of Campbell et al. (2018) as an explanation for the value and investment effects. We find that our discount rate shock-driven value and investment factors have similar exposures to the model's factors as their cash flow shock-driven counterparts, meaning that the three-beta ICAPM cannot explain their disconnect. Contrary to earlier evidence from the literature, this finding implies that exposure to the factors of the three-beta ICAPM cannot rationalize the value and investment effects.

Our study contributes to four strands of literature. First, it resolves the recent controversy about the inclusion of a value factor in a multifactor model, as raised in the studies of Fama and French (2015) and Hou et al. (2015). While Fama and French (2015) motivate their factors based on the dividend discount model, Hou et al. (2015) motivate their factors based on an economic model inspired by q-theory and production-based asset pricing. Both approaches agree that discount rates, and thus expected returns, should be related to investment and profitability. However, Hou et al.'s (2015) model does not yield an independent relation between book-to-market and expected returns. Hou et al. (2015) instead argue that the value effect is a manifestation of the investment effect, suggesting that a value factor is not only empirically but also theoretically redundant. In line with the conjectures of Hou et al. (2015), we show that book-to-market and investment are driven by the same effects—namely cash flow and discount rate shocks. Nevertheless, we reject the conclusion that a value factor is therefore necessarily redundant. In particular, we find that a value factor captures incremental pricing information beyond an investment factor if its construction considers which stocks should, based on economic rationale, contain pricing information. This incremental pricing information is hidden in the Fama-French (2015) version of the value factor because its construction methodology does not consider whether stocks' book-to-market reflects differences in expected returns or differences in expected profitability. Consequently, we advocate to include an adjusted value factor in a multifactor model, even in the presence of an investment factor. This value factor's construction methodology should be adjusted to consider whether variation in book-to-market stems from differences in expected returns.[3]

Second, this study contributes to the recent literature on improvements to the factors' construction methodology. Fama and French (2018) show that the pricing performance of their five-factor model is sensitive to the factors' construction methodology. Fama and French (2020) construct cross-section factors from Fama-MacBeth (1973) regressions and document that they perform somewhat better than the standard time-series factors. Daniel et al. (2020) propose hedged versions of the five Fama-French (2015) factors that aim to capture priced covariation more accurately. They find that the factors' hedged versions improve upon the pricing performance of their standard versions and that their hedged value factor captures marginally significant pricing information. In line with these studies, our results show that better versions of existing factors are needed.[4] As such, we complement these studies by proposing improvements to the factors' construction that are motivated by economic rationale rather than statistical arguments. In particular, we document that factors can be improved if their construction considers which stocks should, based on economic rationale, contain their pricing information. Purging factors of their unpriced parts can even restore their incremental pricing power, as is the case with the value factor. Moreover, moving beyond Daniel et al. (2020), we give an intuitive explanation, supported by empirical evidence, of why and which of the value factor's parts captures pricing information. By explicitly distinguishing the priced and unpriced parts, we obtain much more conclusive evidence than Daniel et al. (2020) that a value factor can capture incremental pricing information: our discount rate shock-driven value factor exhibits an alpha of 0.25%, being significant at the 2.5% level, whereas Daniel et al.'s (2020) hedged value factor exhibits an alpha of 0.09%, being significant only at the 7.5% level.

[3] Fama and French (2015) conclude that the value factor can be dropped when estimating risk-adjusted returns but should be retained when determining portfolios' tilts towards the factors. Our recommendation contrasts with this conclusion: an adjusted value factor that captures significant incremental pricing information should not only be included for determining portfolio tilts but also for estimating risk-adjusted returns.

[4] Constructing better versions of a few existing factors that can be theoretically motivated counteracts the issue of an ever-expanding factor zoo.

Third, our paper relates to the extensive literature on the source of book-to-market's predictive power for future returns and on the value premium.[5] Fama and French (2006) aim to isolate book-to-market's information about expected returns by canceling its information about expected profitability. Daniel and Titman (2006) split the change in book-to-market into a tangible return, capturing firms' past performance, and an intangible return, capturing news about firms' future performance. They find that only the latter predicts future returns. Fama and French (2008) decompose the change in book-to-market into the per-share book equity change, the without-dividend return, and share issues. They document that all three components have predictive power for future returns. Most closely related to our study, Gerakos and Linnainmaa (2018) differentiate between changes in total book equity and changes in total market equity. They show that only stocks whose book-to-market is driven by market equity changes earn the value premium. We extend these studies by differentiating variation in book-to-market that is informative about expected returns from variation in book-to-market that is informative about expected profitability. Our approach improves upon these studies in pinpointing the priced variation in book-to-market. In particular, the mean return on our discount rate shock-driven value factor is almost twice the mean return on Gerakos and Linnainmaa's (2018) value factor. Moreover, our discount rate shock-driven value factor captures—contrary to Gerakos and Linnainmaa's (2018) value factor—substantial and significant incremental pricing information.

Finally, we contribute to the literature on the investment effect and its relation to the value effect. Titman et al. (2004) are among the first to document a negative association between investment, as measured by capital expenditures to sales, and future returns. Cooper et al. (2008) show that this result also holds when investment is measured by asset growth, which is the measure of investment used to construct the investment factor. Xing (2008) finds that book-to-market and investment capture similar information about future returns. Thereby, the investment effect subsumes the value effect, but not vice versa. Our results add to this literature by identifying the variation in investment related to future returns. Moreover, we explicate the reasons for the close relation between book-to-market and investment. Importantly, we show that book-to-market and investment capture incremental information about expected returns when their information about expected profitability is discarded.

Our results also deliver valuable insights for the investment management industry. While the value factor is one of the most frequently targeted factors in factor investing strategies, the investment factor is, as yet, hardly targeted. One major reason may be that targeting the

[5] Recent studies (see, e.g., Arnott et al., 2021; Eisfeldt et al., Forthcoming) show that a value factor based on a book-to-market ratio adjusted for intangible assets outperforms the standard value factor. However, this approach does not rival our approach. First, our context would require adjusting investment for intangible assets as well. Given the outperformance of an intangibles-adjusted value factor, an intangibles-adjusted investment factor also is likely to outperform its standard counterpart. Since the value and investment factors' pricing information would thus increase in parallel, accounting for intangible assets is unlikely to resurrect the value factor's incremental pricing power. Second, adjusting book-to-market is complementary to our approach. Specifically, adjusting book-to-market for intangible assets addresses the question of how to measure "value". By contrast, our approach to identify stocks whose book-to-market is driven by discount rate shocks addresses the question for which stocks "value" is in fact a good indicator of expected returns. Put differently, adjusting book-to-market for intangible assets is concerned with the numerator of book-to-market, whereas our approach is concerned with the denominator of book-to-market.

investment factor in addition to the value factor is not perceived to have an added value because of their close relation. Our findings challenge this perception. In particular, they reveal that enhanced value and investment strategies that select only stocks for which book-to-market and investment are good indicators of expected returns represent largely independent sources of excess returns. Thus, it is beneficial for investors to include both—an enhanced value strategy and an enhanced investment strategy—in a multifactor investing strategy.

Moreover, our findings provide a theoretical underpinning for the infamous value trap that plagues value investing (see, e.g., Penman and Reggiani, 2018). The value trap refers to the observation that value stocks with weak profitability do, on average, not outperform. The common practice of avoiding such stocks in value investing strategies resonates with our results: stocks whose book-to-market is high due to negative cash flow shocks, and thus due to low profitability, do not earn the value premium. Only stocks whose book-to-market is high due to positive discount rate shocks earn the value premium.

2 Theoretical Framework

Fama and French (2015) derive the following relation between a firm's book-to-market, profitability, investment, and expected stock return by manipulating the dividend discount model:

$$\frac{ME_0}{BE_0} = \sum_{t=1}^{\infty} \frac{\frac{E_0(Y_t)}{BE_0} - \frac{E_0(dBE_t)}{BE_0}}{(1+r)^t} \tag{1}$$

where ME_0 (BE_0) is the firm's current market (book) equity, Y_t is total earnings in year t, dBE_t is the change in book equity in year t, and r is the long-term average expected stock return. In words, this equation states that, all else being equal, a firm's book-to-market ($\frac{BE_0}{ME_0}$) and its expected profitability ($\frac{E_0(Y_t)}{BE_0}$) are positively related to its expected stock return, while the firm's expected investment ($\frac{E_0(dBE_t)}{BE_0}$) is negatively related to its expected stock return. Thus, book-to-market, profitability, and investment are indicators of expected stock returns. Fama and French (2015) motivate their value, profitability, and investment factors based on this insight. The implicit assumption is that the three variables capture sufficiently different information about expected returns and that the factors therefore reflect at least partly independent priced covariation.

Equation (1) is an identity that has to hold at any time. Hence, if one variable changes, one or multiple of the other variables must also change. Two types of news may trigger changes: news about the firm's future cash flows (i.e., a cash flow shock) and news about investors' required return (i.e., a discount rate shock). In equation (1), a cash flow shock affects the firm's expected earnings ($E_0(Y_t)$), and a discount rate shock affects its expected return (r). For equation (1) to still hold after a cash flow or discount rate shock, the firm's market value (ME_0) or the firm's expected investment ($E_0(dBE_t)$) need to adjust, or both.

How do these two variables adjust upon cash flow and discount rate shocks; that is, how do investors, who determine the firm's market value, and firm managers, who determine the firm's investment, react to these shocks? First, consider a representative investor who values the firm's stock based on the dividend discount model:

$$P_0 = \sum_{t=1}^{\infty} \frac{E_0(D_t)}{(1+r)^t} \tag{2}$$

where P_0 is the fair price of the firm's stock, D_t is the dividend in year t, and r is the investor's required return.

Second, assume that the firm's manager evaluates projects based on the net present value rule of investment; that is, the firm invests into projects with net present values greater than zero:

$$NPV_0 = -I_0 + \sum_{t=1}^{T} \frac{E_0(CF_t)}{(1+r)^t} \tag{3}$$

where NPV_0 is a project's current net present value, I_0 is the required investment to realize the project, CF_t is the cash flow from the project in year t, and r is the project's cost of capital, which is in equilibrium equal to the investor's required return r from equation (2).[6]

Now, consider a discount rate shock. A positive discount rate shock means that the investor's required return for holding the firm's stock increases and, in turn, that the firm's cost of capital increases. Equation (2) shows that an increase in the required return (r) leads the investor to value the firm's stock at a lower price, implying a decrease in the firm's market value and an increase in its book-to-market. Simultaneously, equation (3) indicates that an increase in the firm's cost of capital (r) implies lower net present values for the firm's projects, prompting the firm's manager to decrease investment.

Next, suppose the firm experiences a cash flow shock. A negative cash flow shock implies lower expected cash flows from projects and, in turn, lower expected dividends. Equation (2) shows that lower expected dividends ($E_0(D_t)$) lead the investor to value the firm's stock at a lower price, again implying a decrease in the firm's market value and an increase in its book-to-market. Simultaneously, equation (3) indicates that lower expected cash flows ($E_0(CF_t)$) result in lower net present values for the firm's projects, prompting the firm's manager to invest less.

In both cases—a positive discount rate shock and a negative cash flow shock—the firm's book-to-market increases and its investment decreases. Based on analogous reasoning, a firm's book-to-market decreases and its investment increases upon a negative discount rate shock or a positive cash flow shock. Thus, discount rate and cash flow shocks give rise to a negative relation between book-to-market and investment. Importantly, the negative relation of book-to-market to investment is for both types of shocks associated with a change in market equity (i.e., a change in the denominator of book-to-market; hf. market-channel) rather than a change in book equity (i.e., a change in the numerator of book-to-market; hf. book-channel).

[6] For simplicity, we assume that the firm's projects are homogeneous and that the firm is all-equity-financed, meaning that the discount rate for each project is the same and equal to the investor's required return.

The value factor is long in high book-to-market stocks (hf. value stocks) and short in low book-to-market stocks (hf. growth stocks). The investment factor is long in low investment stocks (hf. conservative stocks) and short in high investment stocks (hf. aggressive stocks). Given the predicted negative relation between book-to-market and investment, value stocks should frequently also be conservative stocks. Analogously, growth stocks should frequently also be aggressive stocks. Hence, the factors are likely to select similar stocks in their long legs and their short legs. The factors' long legs as well as their short legs should therefore strongly comove, causing in turn the factors themselves to comove. Figure 1 summarizes our thesis on how discount rate and cash flow shocks give rise to the value and investment factors' comovement.

[Insert Figure 1 near here.]

Discount rate shocks and cash flow shocks both contribute to the negative relation between book-to-market and investment. However, only discount rate shocks reflect changes in investors' required returns and, thus, changes in stocks' expected returns.[7] By contrast, cash flow shocks reflect changes in firms' expected profitability. While cash flow shocks therefore affect stocks' prices immediately, they do not give rise to changes in stocks' expected returns. Differences in expected returns across stocks stem only from differences in their past discount rate shocks.

For this reason, only value and conservative stocks whose book-to-market is high, respectively, whose investment is low because of positive discount rate shocks should, all else being equal, have higher expected returns. By contrast, value and conservative stocks whose book-to-market is high, respectively, whose investment is low because of negative cash flow shocks should, all else being equal, not have higher expected returns but lower expected profitability. In both cases, the opposite applies to growth and aggressive stocks. Thus, book-to-market and investment are only good indicators of expected returns if they are driven by discount rate shocks. As a consequence, only those stocks whose variation in book-to-market and investment is due to discount rate shocks should contain the factors' pricing information for the cross-section of expected stock returns.

Although our theoretical framework is based on rationality, it can also accommodate irrationalities. In particular, the representative investor's required return in the dividend discount model in equation (2), and thus the stock's expected return, may not only be determined by the stock's exposure to systematic risk but also by the investor's behavioral biases. Like rational changes in expected returns, irrational changes in expected returns should also spill over to the firm's cost of capital in equation (3) and therefore affect the firm's investment.[8] Hence, it is not necessary to assume that changes in expected returns are rational.

[7] Note that this statement is concerned with *expected* returns. It does not say anything about whether *realized* returns are primarily driven by discount rate or cash flow shocks.

[8] The findings of, among others, Polk and Sapienza (2009) and Dessaint et al. (2019) support this conjecture. Their evidence suggests that mispricing affects firms' investment decisions.

3 Data and Methodology

3.1 Data Sample

Our sample period spans from July 1963 to December 2019. We obtain stock data from CRSP and firm fundamentals data from Compustat. We supplement the Compustat fundamentals data with Davis et al.'s (2000) hand-collected book equity data from Kenneth French's website.[9] Our sample includes all stocks traded on the NYSE, AMEX, or NASDAQ with a CRSP share code of 10 or 11. We adjust monthly holding period returns for potential delisting returns. Following Shumway (1997) and Shumway and Warther (1999), we additionally set missing delisting returns for NYSE and AMEX stocks to -30% and for NASDAQ stocks to -55% in case the delisting was performance-related. Finally, we use the one-month T-bill rate retrieved from Kenneth French's website as a proxy for the risk-free rate. The construction of our key variables is described in detail in Appendix A.

3.2 Factor Portfolios

We construct the value and investment factors as described in Fama and French (2015). In particular, for the construction of the value factor, we sort stocks at the end of each June into two groups according to their market equity at the end of June and into three groups according to their book-to-market from the last fiscal year ending in the prior year.[10] The breakpoints are the median market equity and the 30th and 70th book-to-market percentiles of all NYSE stocks. Taking the intersections of the two market equity groups and the three book-to-market groups yields six portfolios. The stocks in these portfolios are value-weighted. The return on the value factor (HML) is the average return on the two high book-to-market portfolios minus the average return on the two low book-to-market portfolios.

The investment factor is constructed in the same way, only that the second sort is with respect to investment as measured by asset growth from the last fiscal year ending in the prior year. The return on the investment factor (CMA) is the average return on the two low investment portfolios minus the average return on the two high investment portfolios. The correlation of the investment factor with the value factor is 0.66.

For both factors, we form an aggregate long (short) portfolio as the equal-weighted combination of the small and big long (short) portfolios. Thereby, each stock receives the same weight in the aggregate portfolios as it has in calculating the factors' returns. We refer to the long (short) portfolio of the value factor as the value (growth) portfolio and the long (short) port-

[9] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[10] We measure book-to-market slightly differently than Fama and French (2015): We take the market equity at the fiscal year ending rather than at the calendar year ending. We make this adjustment to align market equity changes with our cash flow and discount rate shock proxies introduced in Section 3.4.

folio of the investment factor as the conservative (aggressive) portfolio. For example, the value portfolio is the equal-weighted combination of the small and big value portfolios. The long-short combinations of the aggregate factor portfolios are denoted as HML and CMA portfolios, respectively.

3.3 Book-to-Market Decomposition

Next, we decompose firms' book-to-market following Gerakos and Linnainmaa (2018):

$$BM_{i,t} = BM_{i,t-k} + \sum_{s=0}^{k-1} dBE_{i,t-s} - \sum_{s=0}^{k-1} dME_{i,t-s} \tag{4}$$

where $BM_{i,t}$ is firm i's log book-to-market in year t and $dBE_{i,t}$ ($dME_{i,t}$) is the log change in the firm's book (market) equity from year $t-1$ to year t; t-variables are measured at the end of June of year t based on the firm's last fiscal year ending in year $t-1$. The equation states that a firm's log book-to-market is equal to its lagged log book-to-market plus the annual log changes in book equity minus the annual log changes in market equity.

[Insert Table 1 near here.]

Table 1 presents the average contributions of lagged book-to-market, book equity changes, and market equity changes to the total cross-sectional variation in book-to-market for one- to five-year decompositions of book-to-market. The results for the full sample in Panel A show that book equity changes contribute virtually nothing to book-to-market's variation in the one-year decomposition, while they contribute even negatively to the two- to five-year decompositions. By contrast, market equity changes contribute 18.3% to book-to-market's variation in the one-year decomposition, further increasing to 52.6% in the five-year decomposition. The contributions of lagged book-to-market decrease in parallel from 81.5% to 53.1%. Overall, book-to-market changes are in the full sample primarily driven by market equity changes rather than book equity changes. These results are in line with those of Gerakos and Linnainmaa (2018).

Panel B of Table 1 presents the same results for the sample of stocks that are newly entering the value and growth portfolios in the respective year. Contrary to the full sample, the contributions of lagged book-to-market to book-to-market's variation are rather small. Across all decompositions, market equity changes account for most of the variation. This result implies that the market-channel is the primary channel for stocks to become value or growth stocks. Nevertheless, book equity changes also contribute considerably to book-to-market's variation in this sample (between 24.0% and 33.1%). Thus, book equity changes also are a non-negligible driver for stocks to become value or growth stocks.

3.4 Cash Flow and Discount Rate Shock Proxies

To evaluate the predictions from our theoretical framework in Section 2, we need to determine whether stocks' book-to-market and investment are driven by cash flow or discount rate shocks. We follow Hou and van Dijk (2019) and use a firm's estimated profitability shock as proxy for its cash flow shock. To this end, we first implement Hou and van Dijk's (2019) cross-sectional profitability model, which yields estimates for firms' expected profitability. Specifically, we run the following cross-sectional regression at the end of each June from 1964 to 2019:[11]

$$\frac{OI_{i,t}}{AT_{i,t-1}} = b_{0,t} + b_{1,t}\frac{FV_{i,t-1}}{AT_{i,t-1}} + b_{2,t}DD_{i,t-1} + b_{3,t}\frac{D_{i,t-1}}{BE_{i,t-1}} + b_{4,t}\frac{OI_{i,t-1}}{AT_{i,t-2}} + \epsilon_{i,t} \tag{5}$$

where $\frac{OI_{i,t}}{AT_{i,t-1}}$ is firm i's operating income after depreciation scaled by lagged total assets, $\frac{FV_{i,t-1}}{AT_{i,t-1}}$ is the ratio of market value to book value of assets (market value of assets is calculated as book value of assets plus market equity (from Compustat) minus book equity (calculated as described in Appendix A)), $\frac{D_{i,t-1}}{BE_{i,t-1}}$ is the ratio of dividend payments to book equity, and $DD_{i,t}$ is a dummy variable that equals one if the firm does not pay dividends; t-variables are measured at the end of June of year t based on the firm's last fiscal year ending in year $t-1$.

Panel A of Table 2 presents the average coefficients from the annual regressions. Their signs are identical and their magnitudes are similar to those reported by Hou and van Dijk (2019). In line with intuition, the coefficients indicate that expected profitability is higher for firms with higher valuations, higher dividend payments, and higher past profitability. Despite its parsimony, the model exhibits an R^2 of 61.3% and thus captures a large proportion of the variation in future profitability.

[Insert Table 2 near here.]

Like Hou and van Dijk (2019), we use the annual regression coefficients from the profitability model in (5) to calculate firms' profitability shocks. In particular, we forecast firm i's profitability for year t by multiplying the estimated coefficients from the regression in year $t-1$ with the firm's values for the predictor variables in year $t-1$. The firm's profitability shock in year t, $PS_{i,t}$, is then its realized profitability in year t minus its forecasted profitability; that is:

$$PS_{i,t} = \frac{OI_{i,t}}{AT_{i,t-1}} - E_{t-1}\left(\frac{OI_{i,t}}{AT_{i,t-1}}\right) = \frac{OI_{i,t}}{AT_{i,t-1}} - X_{i,t-1}\hat{b}'_{t-1} \tag{6}$$

where $X_{i,t-1}$ is a vector that contains firm i's values for the predictors as of year $t-1$ and $\hat{b}_{t-1}$ is the vector of coefficients estimated from regression (5) in year $t-1$. We employ $PS_{i,t}$ as proxy for firm i's cash flow shock across the fiscal year that ended in year $t-1$.

Further following Hou and van Dijk (2019), we adjust firms' realized returns by regressing them on their contemporaneous profitability shocks. Specifically, we estimate the following

[11] Following Hou and van Dijk (2019), we exclude firms with total assets of less than \$10 million and book equity of less than \$5 million for the estimation of the model.

cross-sectional regression at the end of each June from 1964 to 2019:[12]

$$\overline{R}_{i,t} = c_{1,t}\overline{PS}_{i,t} + RR_{i,t} \tag{7}$$

where $\overline{R}_{i,t}$ is firm i's cross-sectionally demeaned return across the fiscal year ending in year $t-1$, $\overline{PS}_{i,t}$ is the firm's cross-sectionally demeaned profitability shock across the fiscal year that ended in year $t-1$, and $RR_{i,t}$ is the regression's error term that captures the part of the firm's return unexplained by its profitability shock.[13]

Panel B of Table 2 presents the regression results, showing that the average coefficient on the profitability shock is positive and highly significant. Thus, a positive profitability shock is associated with a positive contemporaneous return. This finding is consistent with the notion that the estimated profitability shock captures cash flow shocks.

Campbell (1991) argues that realized returns are driven by three components: expected returns, cash flow shocks, and discount rate shocks. Hou and van Dijk's (2019) results combined with the significantly positive coefficient in Panel B of Table 2 indicate that the estimated profitability shock is a reasonable proxy for a firm's cash flow shock. The regression in (7) therefore cancels the part of the realized return due to cash flow shocks. Moreover, by demeaning the return before estimating the regression in (7), we further cancel the part of the realized return due to the expected market return as well as market-wide cash flow and discount rate shocks. Consequently, the residual return, $RR_{i,t}$, from the regression in (7) should only capture firm-specific discount rate shocks and pre-existing differences in expected returns. Pre-existing differences in expected returns are, on average, zero, are uncorrelated with subsequent discount rate shocks, and are likely to be small relative to the price effects of discount rate shocks. Therefore, we use the negative of $RR_{i,t}$ as a proxy for firm i's discount rate shock across the fiscal year that ended in year $t-1$.[14] We take the negative of $RR_{i,t}$ as discount rate shock proxy because a positive discount rate shock has a negative contemporaneous effect on the stock price. In unreported results, we find that a strategy that goes long stocks in the bottom decile and short stocks in the top decile of residual returns earns a highly significant mean return of 0.31% per month. This result corroborates the notion that the negative of the residual return captures discount rate shocks (i.e., changes in expected returns).

Despite these considerations, one may worry about the adequacy of the residual return as a proxy for discount rate shocks. Specifically, the R^2 of 7.9% in Panel B of Table 2 means that our cash flow shock proxy explains, on average, only 7.9% of the cross-sectional variation in realized returns whereas our discount rate shock proxy explains 92.1% of the variation. At first sight,

[12]We slightly deviate from Hou and van Dijk's (2019) approach: we adjust stocks' realized returns across their fiscal years rather than their monthly realized returns. We do this to align the return measurement period with the period across which the profitability shocks are measured.

[13]Note that this regression as well as the estimation of the profitability shocks require only data that are publicly available by the end of June of year t; that is, there is no look-ahead bias.

[14]In this context, discount rate shock refers to an expected return change emanating either from a change in risk or from mispricing.

these proportions may seem unreasonable.[15] We nevertheless stick to this approach for three reasons. First, for the way we use the residual return as a proxy for discount rate shocks, it is not critical that the regression in (7) cancels the entire cash flow news. As described in detail in the next subsection, we rank stocks cross-sectionally according to their residual returns and profitability shocks. If a stock's residual return, and thus its residual return rank, is relatively high compared to the stock's profitability shock, and thus its profitability shock rank, the stock's associated market equity increase should be more likely to stem from a negative discount rate shock than a positive cash flow shock, and vice versa. This conjecture holds no matter whether the regression in (7) cancels the entire cash flow news or not. Second, as shown in Section 5, the interplay of the profitability shocks' and residual returns' cross-sectional rankings is empirically successful in identifying the factors' parts containing pricing information. Third, alternative approaches to estimate the shocks are not feasible in our setting: a VAR as used by Vuolteenaho (2002) is subject to a look-ahead bias and has been shown to suffer from limitations such as small predictive power and model misspecification (see, e.g., Chen and Zhao, 2009); analyst forecasts as used by Chen et al. (2013) cover only a small sample of firms and have been shown to be biased (see, e.g., Lin and McNichols, 1998; McNichols and O'Brien, 1997).

Our attempt to separate the effects of cash flow and discount rate shocks extends the approaches of Gerakos and Linnainmaa (2018), Daniel and Titman (2006), and Fama and French (2008). These studies argue that market equity changes, intangible returns, and without-dividend returns are the source of book-to-market's predictive power for future returns because they reflect discount rate news. However, they neglect that these variables also reflect cash flows news. Based on our cash flow and discount rate shock proxies, we aim to identify the variation in book-to-market that is informative about expected returns more precisely than these studies.

3.5 Subsets of the Factor Portfolios

We dissect the factors' portfolios based on the book-to-market decomposition and the cash flow and discount rate shock proxies into several subsets. First, we split the value and growth portfolios into market- and book-channel subsets. Specifically, we classify value (growth) stocks in the year they enter the value (growth) portfolio as market-channel stocks if the negative of the cross-sectionally demeaned log change in their market equity is greater (lower) than the cross-sectionally demeaned log change in their book equity, and as book-channel stocks in the opposite case.[16] Market-channel stocks are thus stocks whose book-to-market change causing them to become value respectively growth stocks is, relative to other stocks' book-to-

[15] Vuolteenaho (2002) finds, based on a VAR approach, that the majority of the variation in realized returns is due to cash flow shocks. Chen et al. (2013) find, based on cash flow and discount rate shocks backed out from analyst forecasts, that cash flow shocks explain around half of the variation in realized returns. However, Vuolteenaho's (2002) and Chen et al.'s (2013) findings relate to the time-series variation in realized returns. The proportions explained by the two types of shocks may be different for the cross-sectional variation.

[16] We classify only stocks that could have been but have not been in the previous year's portfolios. This filter excludes stocks that were not yet in the sample or did not have valid data in the previous year.

market change, more strongly driven by market than book equity changes. Given that lagged book-to-market hardly contributes to the variation of incoming value and growth stocks' book-to-market (see Panel B of Table 1), considering the one-year decomposition is sufficient to determine whether stocks become value or growth stocks primarily because of book equity or market equity changes. Stocks keep their classification as long as they remain uninterrupted in the value or growth portfolio. On average, 81.4% (18.6%) of incoming value and growth stocks are classified as market-channel (book-channel) stocks. In line with the results from Panel B of Table 1, these numbers imply that stocks become value or growth stocks primarily because of market equity changes.

Next, we use the profitability shocks and residual returns to determine whether market-channel value and growth stocks as well as conservative and aggressive stocks are cash flow shock- or discount rate shock-driven. Since the profitability shocks and residual returns have different scales and cross-sectional dispersions, simply comparing them would be inappropriate. Therefore, we rank stocks cross-sectionally according to their profitability shocks and residual returns before comparing them. Comparing a stock's profitability shock rank with its residual return rank indicates whether the stock is, relative to other stocks, more strongly affected by cash flow shocks or discount rate shocks.

In detail, we rank all market-channel value stocks in the year they enter the value portfolio according to their profitability shocks and residual returns from low to high. We do the same for market-channel growth stocks. Market-channel value (growth) stocks are then classified as discount rate shock-driven if their residual return ranks are lower (higher) than their profitability shock ranks, and as cash flow shock-driven in the opposite case. Thus, discount rate shock-driven value (growth) stocks are stocks whose positive (negative) discount rate shocks are likely to be more pronounced than their negative (positive) cash flow shocks. Stocks keep their classification as long as they remain uninterrupted in the value or growth portfolio. On average, 40.9% (59.1%) of market-channel incoming value and growth stocks that can be classified are classified as discount rate (cash flow) shock-driven.

Conservative and aggressive stocks are classified analogously as cash flow and discount rate shock-driven stocks. That is, we rank all conservative stocks in the year they enter the conservative portfolio according to their profitability shocks and residual returns from low to high. We do the same for aggressive stocks. Conservative (aggressive) stocks are classified as discount rate shock-driven if their residual return ranks are lower (higher) than their profitability shock ranks, and as cash flow shock-driven in the opposite case. Stocks keep their classification as long as they remain uninterrupted in the conservative or aggressive portfolio. On average, 48.0% (52.0%) of incoming conservative and aggressive stocks that can be classified are classified as discount rate (cash flow) shock-driven.

In each of these subsets, stocks are weighted proportionally the same as in the respective aggregate factor portfolio.

4 Book-to-Market's Relation to Investment and its Implication for the Value and Investment Factors' Comovement

4.1 Correlation between Book-to-Market and Investment

This section evaluates the predictions from our theoretical framework in Section 2 on why the value and investment factors are so closely related. To begin, we characterize the relation between book-to-market and investment. Panel A of Figure 2 presents cross-sectional rank correlations of book-to-market and investment changes with up to five-year ago and up to ten-year ahead investment changes. Book-to-market changes negatively correlate with contemporaneous investment changes (-0.094) and even more so with one-year ahead investment changes (-0.142). Panel B shows that the negative correlation between their changes carries over to book-to-market and investment in general. Specifically, book-to-market's correlation with investment is negative across all five lags and ten leads but peaks again for contemporaneous and one-year ahead investment (around -0.27). Book-to-market's stronger relation to one-year ahead than contemporaneous investment is intuitive: being a market-based variable, book-to-market is likely to reflect cash flow and discount rate shocks timelier than investment, which is accounting-based.[17]

[Insert Figure 2 near here.]

Figure 3 examines whether book-to-market's negative relation to investment is in fact due to cash flow and discount rate shocks. For this purpose, we orthogonalize book-to-market and investment to up to ten-year lagged profitability shocks and residual returns and calculate the cross-sectional rank correlations between the orthogonalized variables. For comparison, we also orthogonalize the variables to profitability shocks and residual returns individually as well as to simple fiscal-year returns.

[Insert Figure 3 near here.]

The results support our thesis that the relation between book-to-market and investment stems from cash flow and discount rate shocks. Panel A of Figure 3 shows that the contemporaneous correlation between book-to-market and investment quickly attenuates when the variables are orthogonalized to an increasing number of lagged profitability shocks and residual returns. Panel B shows that the same holds for the correlation of book-to-market with one-year ahead

[17] Investment is likely to reflect firms' actual investment decisions and thus the effects of cash flow and discount rate shocks with a lag for two reasons. First, depending on the timing of the shocks during the fiscal year, firms' decisions to adjust their investment may be only reflected in the financial statements of the following fiscal year. Second, investment plans may be sticky, meaning firms cannot immediately adjust their investment upon a shock. By contrast, investors can immediately react to cash flow and discount rate shocks, wherefore stock prices, and thus book-to-market, are likely to reflect the shocks timely.

investment, although the decline is less pronounced. The figure further indicates that the correlation between book-to-market and investment is driven by both—discount rate shocks and cash flow shocks: orthogonalizing to simple returns, profitability shocks, or residual returns attenuates the correlation much less.

4.2 Overlaps of Value and Growth Stocks with CMA Portfolios

The negative relation between book-to-market and investment should lead the value and investment factors' portfolios to select to a considerable degree the same stocks. To evaluate this conjecture, we compute the average overlaps of incoming value and growth stocks with CMA portfolios from up to five years ago and up to ten years ahead. The overlap of incoming value (growth) stocks with a given CMA portfolio is calculated as the weighted percentage of incoming value (growth) stocks that are in the respective conservative portfolio minus the weighted percentage of incoming value (growth) stocks that are in the respective aggressive portfolio. If the factors' portfolios were independent, we would expect value and growth stocks to exhibit similar overlaps with the CMA portfolios.

[Insert Figure 4 near here.]

Panel A of Figure 4 shows this is not the case. Incoming value stocks exhibit positive overlaps with contemporaneous and future CMA portfolios, whereas incoming growth stocks exhibit negative overlaps. Thus, incoming value stocks are more likely to be, or to become, conservative stocks than aggressive stocks, and vice versa for incoming growth stocks. This pattern is entirely driven by market-channel stocks: only market-channel incoming value stocks exhibit a more positive overlap with the CMA portfolios than market-channel incoming growth stocks. By contrast, book-channel incoming value stocks exhibit a more negative overlap with the contemporaneous CMA portfolio than book-channel incoming growth stocks. Thus, the variation in book-to-market stemming from market equity changes, and thus ultimately from discount rate and cash flow shocks, is responsible for the positive association between the value and investment factors' portfolios.

Panel B shows that the results are similar for discount rate shock- and cash flow shock-driven stocks.[18] The only salient difference is that the spread between the cash flow shock-driven value and growth stocks' overlaps peaks for the contemporaneous CMA portfolio while the spread between the discount rate shock-driven value and growth stocks' overlaps peaks for the one-year ahead CMA portfolio. This observation suggests that the intertemporal pattern between book-to-market and investment is primarily due to discount rate shock-driven stocks. The reason may be that cash flow shocks originate from the firm side, whereas discount rate shocks

[18] In the Internet Appendix, we further document that, as can be expected, discount rate shock-driven value and growth stocks are more strongly associated with the discount rate shock-driven subset of the CMA portfolio than cash flow shock-driven value and growth stocks, and vice versa.

originate from the investor side. Therefore, firm managers become earlier aware of cash flow shocks than discount rate shocks, thus adjusting their investment timelier to the former than the latter. This explanation is in line with our theoretical framework.

4.3 Drivers of the Factors' Comovement

The finding that value stocks are frequently also conservative stocks while growth stocks are frequently also aggressive stocks should naturally lead to a positive comovement between the factors. Given that the strong comovement is critical for the investment factor to subsume the value factor, this subsection analyzes to which extent the association of the factors' portfolios drives their comovement. To this end, we examine the comovement of the HML portfolio's various subsets with the investment factor.[19] We further split the subsets according to whether the value (growth) stocks are contemporaneously also conservative (aggressive) stocks (hf. overlapping part) or not (hf. non-overlapping part). For comparison, we also consider an adjusted HML portfolio that combines the book- and market-channel subsets.[20]

[Insert Table 3 near here.]

Table 3 presents the subsets' size as a percentage of the adjusted HML portfolio, their overlaps with the contemporaneous CMA portfolio, their correlations with the investment factor, and their betas on the investment factor obtained by regressing their monthly returns on the market, size, profitability, and investment factors.[21] First, the table documents that the adjusted HML portfolio strongly comoves with the investment factor, exhibiting a correlation of 0.599 with the investment factor and an investment beta of 0.92. As expected, the market-channel subset is the predominant driver of this comovement. It exhibits a considerably higher correlation with the investment factor (0.648 vs. 0.189) and a considerably higher investment beta (1.06 vs. 0.44) than the book-channel subset.

The market-channel subset's correlation of 0.648 with the investment factor seems large compared to its overlap of 28.7% with the contemporaneous CMA portfolio. This discrepancy suggests that the market-channel subset's comovement with the investment factor does not stem from its overlap with the CMA portfolio only. Comparing the results for the overlapping and non-overlapping parts of the market-channel subset in fact reveals that not only the former strongly comoves with the investment factor but also the latter. Although the correlation of the non-overlapping part with the investment factor is naturally lower (0.399 vs. 0.772), it is still considerable, especially given its negative overlap with the CMA portfolio of -27.4%.

[19]In the Internet Appendix, we implement cross-sectional Fama-MacBeth (1973) regressions that predict stocks' correlations with the investment factor. The results support the same conclusions as those based on the factor portfolios discussed in this section.

[20]Note that the two subsets taken together do not equal the complete HML portfolio because stocks that are new in the sample or that lack data on relevant variables cannot be classified. The two subsets together capture, on average, 62.5% of the complete HML portfolio and exhibit similar properties as the complete HML portfolio.

[21]See Appendix B for the construction of the market, size, and profitability factors.

Thus, market-channel value (growth) stocks behave like conservative (aggressive) stocks even if they are not, or not yet, conservative (aggressive) stocks. This finding indicates that stocks whose discount rate and cash flow shocks are reflected in book-to-market but not, or not yet, in investment nevertheless behave like stocks whose discount rate and cash flow shocks are (already) reflected in investment. Because the non-overlapping part of the market-channel subset is larger than the overlapping part, accounting, on average, for 46.2% of the adjusted HML portfolio compared to 33.3%, its positive comovement with the investment factor is a major reason for the value factor's comovement with the investment factor.

Table 3 further documents that the cash flow shock- and discount rate shock-driven subsets exhibit, in general, similar investment factor correlations and investment betas. Hence, they contribute to similar degrees to the value factor's comovement with the investment factor.

Overall, the results in this section are in line with our theoretical predictions. First, they confirm the negative relation between book-to-market and investment and corroborate that the relation is driven by cash flow and discount rate shocks. The negative relation leads to a positive association between the factors' portfolios. This association as well as the factors' comovement is almost entirely due to market-channel value and growth stocks, and thus due to stocks whose book-to-market is driven by discount rate or cash flow shocks. Nevertheless, the factors' comovement is not only mechanical, reinforcing that it is due to fundamental reasons such as discount rate and cash flow shocks.

5 The Sources of the Value and Investment Premia

5.1 Value and Investment Premia

Our findings so far support the theses that cash flow and discount rate shocks cause the relation between book-to-market and investment as well as the value and investment factors' comovement. Yet, only discount rate shocks give rise to differences in expected returns. Hence, only stocks whose book-to-market and investment are driven by discount rate shocks should contain the factors' pricing information.

To examine this prediction, we conduct portfolio sorts.[22] First, we sort stocks at the end of each June into quintiles with respect to their market equity using NYSE breakpoints. Second, we take the intersections of the size quintiles with the value, growth, conservative, and aggressive portfolios as well as their market-channel, book-channel, cash flow shock-driven, and discount rate shock-driven subsets. The stocks in the resulting portfolios are value-weighted. Panel A

[22]In the Internet Appendix, we implement cross-sectional Fama-MacBeth (1973) regressions that predict stocks' one-month and one-year ahead returns based on book-to-market, market equity changes, book equity changes, investment, and investment changes while controlling for size, operating profitability, momentum, and short-term reversal. The results support largely the same conclusions as discussed in this section.

of Table 4 displays the average long-short returns and five-factor alphas of the different types of value and conservative stocks over the corresponding growth and aggressive stocks. These are essentially market-channel, book-channel, discount rate shock-driven, and cash flow shock-driven value and investment premia within each size quintile. The table further presents results for strategies that go long the market-channel and short the book-channel value premia and that go long the discount rate shock-driven and short the cash flow shock-driven value and investment premia. These strategies are close to book-to-market-neutral, respectively, investment-neutral as value and growth stocks, respectively, conservative and aggressive stocks exhibit similar book-to-market and investment, irrespective of whether they are market equity-, book equity-, discount rate shock-, or cash flow shock-driven. The standard value and investment effects would thus suggest that these strategies' returns should, on average, be zero.

[Insert Table 4 near here.]

Panel A of Table 4 documents a strong value premium of, on average, 0.32% per month across the size quintiles. The value premium is, however, only observable for market-channel stocks. In particular, the average market-channel value premium across the size quintiles is 0.32% per month, whereas the average book-channel value premium is only -0.01% per month. The difference between the average market- and book-channel value premia is a highly significant 0.33% per month.[23] The Fama-French (2015) five-factor model fails to explain this difference, leaving a significant alpha of 0.22%.

When further separating market-channel stocks into discount rate shock- and cash flow shock-driven stocks, we find that the former contain almost the entire pricing information of the value factor. Specifically, discount rate shock-driven value stocks earn a strong and highly significant value premium of, on average, 0.49% per month over discount rate shock-driven growth stocks. The five-factor model fails to completely capture this value premium, producing a significant alpha of 0.16%. In contrast, the cash flow shock-driven value premium of 0.13% per month is small and insignificant. The difference of 0.36% per month between the discount rate shock- and cash flow shock-driven value premia is highly significant.[24] It cannot be explained by the five-factor model, exhibiting a highly significant alpha of 0.24%.

Panel A also documents a significant investment premium of, on average, 0.19% per month. As for the value factor, the discount rate shock-driven stocks contain the entire pricing information of the investment factor, generating a significant investment premium of 0.30% per month. The five-factor model produces a non-negligible but insignificant alpha of 0.07%. Contrary to

[23] The results for the differences between the market- and book-channel value premia do not add up perfectly with those for the individual market- and book-channel value premia because a few of the book-channel size quintiles are empty in the first two years of the sample period (in total, five portfolio-year observations are missing).

[24] The results for the differences between the discount rate shock- and cash flow shock-driven value premia do not add up perfectly with those for the individual discount rate shock- and cash flow shock-driven value premia because a few of the discount rate shock-driven size quintiles as well as of the cash flow shock-driven size quintiles are empty in the early years of the sample period (in total, five respectively nine portfolio-year observations are missing).

the discount rate shock-driven investment premium, the cash flow shock-driven investment premium exhibits an insignificant average return of only 0.04% per month. The difference of 0.26% per month between the discount rate shock- and cash flow shock-driven investment premia is significant, and the five-factor model leaves a significant alpha of 0.14%.

Taken together, these results give rise to two conclusions. First, our discount rate shock proxy is able to identify the variation in book-to-market and investment that is informative about future returns, respectively, to identify those stocks that contain the factors' pricing information. Specifically, only stocks whose book-to-market and investment are more likely to be driven by discount rate shocks than cash flow shocks earn the value and investment premia. These stocks' value and investment premia are roughly 50% higher than the standard value and investment premia. Second, the standard Fama-French (2015) five-factor model cannot sufficiently differentiate between stocks that contain pricing information and those that do not. It produces expected return estimates that are too similar for market-channel versus book-channel value and growth stocks as well as for discount rate shock-driven versus cash flow shock-driven value, growth, conservative, and aggressive stocks—although they have, predictably, very different expected returns.

Beyond these findings, the table further reveals an interesting pattern across the size quintiles. For the standard value and investment premia, we can observe the familiar pattern of declining average returns when moving from small to big stocks. However, for the discount rate shock-driven value and investment premia, the pattern is much weaker and far from monotonous. This observation corroborates the notion that the variation in book-to-market respectively in investment of those stocks we classify as discount rate shock-driven is in fact due to differences in discount rates because differences in discount rates should give rise to differences in expected returns irrespective of firm size.

5.2 Complementarity of Value and Investment Premia

Having identified the stocks that generate the factor premia, we examine whether they represent independent sources of excess returns. To begin, Panel B of Table 4 displays the results for the value premia when we control for investment rather than size. The value premia are somewhat attenuated compared to those in Panel A, indicating that the investment effect subsumes the value effect to some extent. Nevertheless, the standard, market-channel, and discount rate shock-driven value premia remain all significantly positive. Moreover, the general pattern is intact: the average market-channel and discount rate shock-driven value premia (0.28% and 0.35% per month, respectively) are significantly higher than the average book-channel and cash flow shock-driven value premia (0.06% and 0.15% per month, respectively).

Panel C displays the results for the investment premia when we control for book-to-market rather than size. Like the value premia in Panel B, the investment premia notably attenuate, meaning that the value effect also partially subsumes the investment effect. Specifically, the standard investment premium is now marginally insignificant, whereas the discount rate shock-driven investment premium remains significantly positive. Importantly, the general patterns are again preserved: the average discount rate shock-driven investment premium of 0.19% per month is much higher than the average cash flow shock-driven investment premium of only 0.03% per month. Although the difference of 0.16% is no longer significant, it is sizable.

Finally, Panel D examines whether the discount rate shock-driven value and investment premia subsume each other. For this purpose, we exclude all discount rate shock-driven conservative (aggressive) stocks from the discount rate shock-driven subset of the value (growth) portfolio, and vice versa. These portfolios are then intersected with the size quintiles. The results show that the discount rate shock-driven value and investment premia cannot subsume each other: the average discount rate shock-driven value (investment) premium amounts to a highly significant 0.44% (0.23%) per month when excluding the discount rate shock-driven stocks of the CMA (HML) portfolio. The average premia decline only by 0.05%-points (0.07%-points) per month compared to Panel A. Thus, the discount rate shock-driven value and investment premia represent largely complementary sources of excess returns. Put differently, the variation in book-to-market that is informative about future returns is incremental to the variation in investment that is informative about future returns, and vice versa. This conjecture contrasts with the finding that the standard value and investment effects subsume each other to large extents, suggesting that this finding arises because book-to-market and investment also reflect information about future profitability. Their information about future profitability overshadows their complementary information about future returns.

In sum, the findings from this section are in line with our prediction that only stocks whose book-to-market and investment are driven by discount rate shocks contain the factors' pricing information.[25] We find that the Fama-French (2015) five-factor model can hardly differentiate whether stocks' variation in book-to-market and investment is driven by differences in expected returns or expected profitability. Moreover, we show that the actual sources of the value and investment premia are largely complementary.

6 Discount Rate Shock-Driven Value and Investment Factors

6.1 Factor Construction and Summary Statistics

Amid the findings from the previous section, we construct value and investment factors that use only discount rate shock-driven stocks. These factors should reflect more priced covariation than the standard factors because they use only stocks for which book-to-market and investment

[25] In the Internet Appendix, we show that the conclusions from this section also hold for equal-weighted portfolios as well as within each of the two subperiods from 1964 to 1992 and from 1993 to 2019.

are good indicators of expected returns. We construct the discount rate shock-driven value (investment) factor in the same way as the standard value (investment) factor but keep only discount rate shock-driven value (conservative) and growth (aggressive) stocks in the portfolios used for the construction of the standard factor. For comparison, we analogously construct cash flow shock-driven value and investment factors that keep only cash flow shock-driven stocks as well as market- and book-channel value factors that keep only market- respectively book-channel stocks. Panel A of Table 5 presents summary statistics on the factors. The discount rate shock-driven value and investment factors exhibit highly significant mean returns of 0.54% and 0.34% per month, respectively. These mean returns considerably exceed those of the standard factors (0.30% and 0.21% per month, respectively). As expected given their less diversified portfolios, the discount rate shock-driven factors' volatilities are somewhat higher than the standard factors' volatilities, but the increase is rather moderate. Consequently, the discount rate shock-driven factors' t-statistics and Sharpe ratios are around 50% higher than those of the standard factors.

[Insert Table 5 near here.]

Figure 5 compares the performance of our discount rate shock-driven value and investment factors to the performance of the standard factors. Panels A and C show that the discount rate shock-driven factors strongly outperform their standard counterparts over the entire sample period. Panels B and D present the factors' rolling ten-year performances. They reveal that the discount rate shock-driven factors quite consistently outperform their standard counterparts.

[Insert Figure 5 near here.]

Panel B of Table 5 displays the factors' correlations. First, the discount rate shock- and cash flow shock-driven factors' correlations with their standard counterparts are quite similar, implying that the standard factors reflect both effects to similar degrees. Second, the correlations between the discount rate shock- and cash flow shock-driven value factors as well as between the discount rate shock- and cash flow shock-driven investment factors are rather moderate (0.63 and 0.40, respectively). This result is consistent with the conjecture that they reflect different effects. Third, the correlation between the discount rate shock-driven value and investment factors is lower than the correlation between their standard counterparts (0.59 vs. 0.66), suggesting that the discount rate shock-driven factors reflect more independent covariation.

6.2 Spanning Regressions

Panel D of Table 4 shows that the value and investment factors' discount rate shock-driven stocks represent largely independent sources of returns. Therefore, our discount rate shock-driven value factor may, contrary to the standard value factor, no longer be redundant. To investigate this conjecture, we conduct spanning regressions in which we regress different versions of the value factor on different versions of the investment factor as well as the market, size, and profitability factors, and vice versa. Table 6 presents the results. They reveal that the discount rate shock-driven value and investment factors always exhibit significant alphas, no matter whether we employ the standard, market-channel, cash flow shock-driven, or discount rate shock-driven version of the respective other factor as an explanatory factor. In particular, when we use both discount rate shock-driven factors (specification (12)), the value factor's alpha is 0.25% and the investment factor's alpha is 0.20%, both of which are highly significant. By contrast, the cash flow shock-driven value and investment factors exhibit, in general, small and insignificant alphas. Similarly, the market-channel value factor's alpha is, except when using the cash flow shock-driven investment factor, insignificant as well.

[Insert Table 6 near here.]

Barillas and Shanken (2017) argue that a factor improves the pricing performance of a given factor model if it exhibits a significant alpha with respect to the model. Given this argument, the significant alphas of our discount rate shock-driven value factor mean it would improve the pricing power if it were added to a four-factor model consisting of the market, size, profitability, and investment factors, irrespective of which version of the investment factor is employed. Thus, a value factor built only from discount rate shock-driven stocks would no longer be redundant. The significant alphas of our discount rate shock-driven investment factor imply it is not redundant as well. Hence, the discount rate shock-driven value and investment factors no longer subsume each other and have incremental pricing power with respect to each other. The factors' incremental pricing information is only discernible when purging them of their cash flow shock-driven stocks. These stocks contain hardly any pricing information but contribute to the factors' comovement. Consequently, the value factor can be resurrected from its redundancy if its construction is adjusted to consider which stocks' variation in book-to-market is informative about expected returns and, thus, which stocks contain pricing information.

Importantly, the market-channel value factor remains redundant in the presence of either the standard or the discount rate shock-driven investment factor; that is, it is not sufficient to consider market-channel stocks to recover the value factor's significant incremental pricing power. Thus, determining whether stocks' market equity-driven book-to-market changes stem from discount rate or cash flow shocks is critical. Our approach differs in this regard from the approach of Gerakos and Linnainmaa (2018). Just like us, they argue that book-to-market's information about future returns is in its market equity-driven part because changes in expected returns are reflected in market equity changes. Gerakos and Linnainmaa (2018) conduct cross-sectional regressions of firms' book-to-market on their lagged market equity changes to extract book-to-market's pricing information. Contrary to our approach, this approach neglects that market equity changes may not only emanate from discount rate shocks but also from cash flow shocks and that cash flow shocks do not convey information about expected returns.[26]

Gerakos and Linnainmaa (2018) construct a new value factor based on the fitted values from their cross-sectional regression. They denote this value factor as size value factor. In unreported results, we reconstruct their size value factor and find that it earns a mean return of 0.28% per month. It underperforms our discount rate shock-driven value factor by a highly significant 0.26% per month. Like the standard value factor as well as our market-channel value factor, the size value factor is redundant. It exhibits insignificant alphas of -0.01% in spanning regression like in Table 6, no matter whether the standard or discount rate shock-driven investment factor is used. Gerakos and Linnainmaa's (2018) size value factor is therefore, contrary to our discount rate shock-driven value factor, unable to restore the value factor's significant incremental pricing power. Differentiating between discount rate shock- and cash flow shock-driven market equity changes is therefore critical to identify the value factor's incremental pricing information.

Our evidence that a value factor can capture incremental pricing information is also much stronger than the evidence of Daniel et al. (2020). Specifically, our discount rate shock-driven value factor's alpha of 0.25% exhibits a t-statistic of 2.28, corresponding to a significance level of 2.5%, whereas Daniel et al.'s (2020) hedged value factor's alpha of 0.09% exhibits a t-statistic of 1.78 (see their Table 7), corresponding to a significance level of only 7.5%. Daniel et al.'s (2020) approach to isolate factors' pricing information by hedging unpriced sources of risk is motivated by statistical arguments. By contrast, our approach to purge factors' of the parts containing no pricing information is motivated by an economic rationale. Given that our evidence is much stronger, precisely identifying the unpriced components based on an economic rationale is important to recover the value factor's incremental pricing power conclusively.

6.3 Pricing Factors

Next, we verify whether our discount rate shock-driven value and investment factors should replace their standard counterparts in the Fama-French (2015) five-factor model. To this end, we regress our discount rate shock-driven factors on the standard five-factor model and the standard factors on an adjusted five-factor model using our discount rate shock-driven factors.

[Insert Table 7 near here.]

Table 7 presents the results. Panel A shows that the standard five-factor model cannot price our discount rate shock-driven factors. The discount rate shock-driven value factor exhibits an alpha of 0.25% and the discount rate shock-driven investment factor an alpha of 0.10%, both of which are significant. By contrast, Panel B reveals that the adjusted five-factor model using our discount rate shock-driven factors can price the standard value and investment factors as they

[26]Differentiating between discount rate shocks and cash flow shocks is particularly relevant amid findings that the cross-sectional variation in book-to-market is more strongly driven by profitability than expected returns (see, e.g., Cohen et al., 2003).

exhibit insignificant alphas. These results imply that our discount rate shock-driven factors capture the pricing information of the standard factors, but not vice versa. Consequently, replacing the standard factors with our discount rate shock-driven factors would improve the five-factor model's pricing performance.

6.4 Pricing Performance

To illustrate the improved pricing performance of the adjusted five-factor model, we price the double-sorted portfolios from Panel A of Table 4 with the adjusted and standard five-factor models. We start with the average value and investment premia across the size quintiles. Panel A of Table 8 presents the results. As already observed in Table 4, the standard five-factor model fails to explain the differences between the market- and book-channel value premia as well as between the discount rate shock- and cash flow shock-driven value and investment premia, leaving significant alphas of 0.22%, 0.24%, and 0.14%. Thus, the standard five-factor model cannot explain why market-channel and discount rate shock-driven stocks generate value and investment premia while book-channel and cash flow shock-driven stocks do not. The adjusted five-factor model performs better in this regard. It produces a significant alpha only for the difference between the market- and book-channel value premia but not for the differences between the discount rate shock- and cash flow shock-driven value and investment premia. Thus, the adjusted model explains why discount rate shock-driven stocks earn value and investment premia while cash flow shock-driven stocks do not.

[Insert Table 8 near here.]

In Panel B of Table 8, we conduct asset pricing tests using the portfolios constructed as the intersections of the size quintiles with the value, growth, conservative, and aggressive portfolios as well as with their cash flow shock- and discount rate shock-driven subsets as test assets. We also use the long-short portfolios that go long the discount rate shock-driven size quintiles of the value, growth, conservative, and aggressive portfolios and short the corresponding cash flow shock-driven size quintiles. We compare the standard and adjusted five-factor models' pricing performance based on several metrics. First, the GRS statistic of Gibbons et al. (1989) and its p-value, testing whether the test assets' alphas are jointly zero. Second, the test assets' average absolute alpha and the fraction of significant alphas. Third, the ratio of the average absolute alpha to the average absolute deviation of the test assets' mean returns from their mean, reflecting the unexplained proportion of the mean returns' dispersion. Fourth, the cross-sectional R^2, measuring the explained proportion of the variance of the test assets' mean returns.[27] Finally, the test assets' average time-series R^2.

[27] The cross-sectional R^2 is calculated as one minus the ratio of the variance of the test assets' alphas to the variance of the test assets' mean returns.

The standard and adjusted five-factor models perform similarly in pricing the size quintiles of the standard value, growth, conservative, and aggressive portfolios. Both models are rejected by the GRS test and leave average absolute alphas of 0.091% and 0.090%, respectively. Thus, using the discount rate shock-driven versions of the value and investment factors does not harm the explanation of the standard value and investment effects.

The adjusted model outperforms the standard model in pricing the discount rate shock-driven test assets; for instance, it is not rejected by the GRS test at any conventional significance level and produces a lower average alpha (0.090% vs. 0.102%). This result is expected since the discount rate shock-driven factors are designed to explain the discount rate shock-driven value and investment premia. Although its performance worsens, the adjusted model also outperforms the standard model in pricing the cash flow shock-driven test assets. It produces a lower average alpha (0.102% vs. 0.114%) and a much higher cross-sectional R^2 (21.4% vs. 2.1%). On the one hand, the deterioration in the models' pricing performance suggests that they have more of a problem explaining why cash flow shock-driven stocks do not earn value and investment premia than explaining why discount rate shock-driven stocks do. On the other hand, the adjusted model's outperformance relative to the standard model in pricing the cash flow shock-driven test assets is a strong testimony to its improved performance as it is not designed to explain the cash flow shock-driven value and investment premia.

Importantly, the adjusted model also improves upon the standard model in pricing the strategies that go long the discount rate shock-driven and short the corresponding cash flow shock-driven test assets. In particular, the adjusted model generates a much lower average absolute alpha (0.126% vs. 0.154%) and a much higher cross-sectional R^2 (22.6% vs. 8.3%). Moreover, it also performs better than the standard model in pricing the long-short strategies jointly with the size quintiles of the value, growth, conservative, and aggressive portfolios. Hence, it captures the two stylized facts that value and investment premia exist and that the discount rate shock- and cash flow shock-driven value and investment premia are very different better than the standard model.

Overall, the findings from this section indicate that value and investment factors that use only stocks for which book-to-market and investment are good indicators of expected returns improve upon the standard factors. These adjusted factors capture incremental pricing information with respect to each other, meaning the adjusted value factor is no longer redundant. Moreover, we show that the adjusted factors subsume the pricing information of the standard factors, but not vice versa. Replacing the standard factors in the five-factor model with our adjusted factors would therefore improve the model's pricing performance.

7 Why is the Value Factor the Redundant Factor?

Our empirical evidence supports our thesis that Fama and French's (2015) value and investment factors are closely related because book-to-market and investment are both driven by cash flow and discount rate shocks. Since both factors therefore reflect largely the same effects, it is not surprising that one of the factors is redundant. However, it raises the question of why the value factor rather than the investment factor is the redundant factor. We address this question by conducting spanning regressions with manipulated versions of the value and investment factors. Table 9 presents the results. In specification (1), we regress the standard value and investment factors on the market, size, and profitability factors. Both factors exhibit significantly positive alphas, meaning neither of the two is redundant with respect to the market, size, and profitability factors. Specification (2) adds the investment factor as an explanatory factor to explain the value factor, and vice versa. The usual result unfolds: the value factor is subsumed by the market, size, profitability, and investment factors, exhibiting an insignificant alpha of 0.00%. By contrast, the investment factor is not subsumed, exhibiting a significant alpha of 0.20%.

[Insert Table 9 near here.]

Evidence from the previous sections indicates that the value factor's book-channel part is a "noise" component reflecting other effects than the value factor's market-channel part and the investment factor. Thus, the book-channel part may be the reason why the investment factor trumps the value factor. The results from specification (3) confirm that the book-channel part is to a considerable extent responsible for the value factor's redundancy. Specifically, the value factor's alpha increases from 0.00% to 0.09% when its market-channel rather than its standard version is employed. Nevertheless, given its insignificant alpha, the market-channel value factor is still redundant.

Comparing the results for the value factor to those for the investment factor reveals three further potential reasons why the former is redundant. First, the value factor's beta on the investment factor is much higher than vice versa (1.05 vs. 0.41). Second, the value factor exhibits a higher volatility than the investment factor (2.75% vs. 1.82%). Third, the value factor's betas on the market, size, and profitability factors are higher than those of the investment factor.

The first and second difference are related: a higher standard deviation of the dependent variable implies, all else being equal, a lower regression coefficient. In specification (4), we rescale the value factor to have the same volatility as the investment factor while keeping its mean constant. The results show that the factors' betas on each other are much more similar in this case (0.69 vs. 0.62). Moreover, the value factor would exhibit a significant alpha of 0.10% and would therefore no longer be redundant. Its higher volatility compared to the investment factor is thus a major reason for its redundancy.

These results raise the question of why the value factor captures the effects with higher volatility than the investment factor. In general, a factor's volatility is determined by its long and short legs' volatilities and the correlation between them.[28] Figure 6 displays three-year moving volatilities of the value and investment factors as well as their legs and three-year moving correlations between the factors' legs. Panels C and D show that the short legs' volatilities as well as the long legs' volatilities are very similar. Panel B reveals, however, that the correlations between the factors' legs behave differently. The correlation between the investment factor's legs is quite stable and never drops below 0.85. It amounts to 0.944 across the entire sample period. By contrast, the correlation between the value factor's legs fluctuates strongly and amounts only to 0.864. It drops especially during times of market-wide turbulences, such as the oil crises in the early 1970s and 1980s, the biotech and dotcom bubbles in the early 1990s and 2000s, and the global financial crisis in 2007/08. Panel A shows that the low correlation between the value factor's legs during such periods is associated with surges in its volatility and, importantly, with strong divergences from the investment factor's volatility. The reason for the value factor's distortions during such periods is arguably that book-to-market is much more sensitive to market turbulences than investment because it relies on a market variable.

[Insert Figure 6 near here.]

A third reason for the value factor's redundancy is its less favorable exposures to the market, size, and profitability factors compared to the investment factor. Specifically, the value factor's mean return is partly explained by its slightly positive betas on these factors, deflating its alpha. By contrast, the investment factor's slightly negative betas on these factors inflate its alpha. To examine the importance of the factors' differential exposures to the other factors, we first orthogonalize both factors to the market, size, and profitability factors and then rescale them to their original means and volatilities. Specification (5) shows that the orthogonalized factors exhibit insignificant alphas, meaning that both factors are redundant now. However, the value factor's alpha increases by 0.09% relative to its original alpha, whereas the investment factor's alpha decreases by 0.12%. Thus, the factors' differential exposures are also a reason why the value factor is redundant.

We evaluate whether the value factor's elevated volatility and worse hedge ability compared to the investment factor are typical features or just bad outcomes. For this purpose, we obtain out-of-sample data on the value factor for the period from 1926 to 1963 from Kenneth French's website and on the investment factor for the period from 1940 to 1963 from Sunil Wahal's website.[29] In unreported results, we find that the correlation between the value factor's legs was 0.930 from 1926 to 1963, suggesting that the correlation of 0.864 was exceptionally low during our sample period. Based on a correlation of 0.930, the value factor's volatility during our sample period would be 2.00% per month and thus close to the investment factor's volatility. Moreover, we document that the value factor's profitability beta was much lower than the investment factor's profitability beta during the period from 1940 to 1963 (-0.72 vs. -0.34). Yet, the investment factor was again a somewhat better hedge against the market and size

[28] A factor's variance can be expressed as follows: $\sigma^2_{Factor} = \sigma^2_{Long} + \sigma^2_{Short} - 2 \cdot \rho_{Long,Short} \cdot \sigma_{Long} \cdot \sigma_{Short}$.

[29] `https://cie.wpcarey.asu.edu/`

factors. Nevertheless, these findings suggest that the value factor's elevated volatility and worse hedge ability were bad outcomes rather than typical features. Thus, the value factor may not necessarily continue to be the redundant factor going forward.

In summary, the value factor is the redundant factor for three reasons. First, it comprises the noisy book-channel part that reflects other effects than its market-channel part and the investment factor. Second, it captures the effects less precisely than the investment factor because of distortions during times of market turbulences. Third, it is a slightly worse hedge for the other factors than the investment factor. Since the second and third reasons may be specific to our sample period, the value factor may be non-redundant going forward. This conjecture supports Fama and French's (2015) decision to keep the value factor in their five-factor model.

8 Factors' Exposures to Cash Flow, Discount Rate, and Variance News

The literature has offered numerous explanations that aim to rationalize the value effect.[30] Our finding that only discount rate shock-driven stocks earn a value premium provides a fresh laboratory for testing these explanations. In particular, any explanation that aims to rationalize the value effect also needs to explain why only discount rate shock-driven stocks generate the value premium. While an evaluation of all explanations is beyond the scope of this paper, we examine whether one particularly promising explanation passes this test: the three-beta ICAPM of Campbell et al. (2018). In this model, exposure to market cash flow news is positively priced, while exposures to market discount rate news and market volatility news are negatively priced. Campbell et al. (2018) show that value stocks have a higher exposure to cash flow news and a lower exposure to volatility news than growth stocks. Building on this finding, Gerakos and Linnainmaa (2018) investigate the exposures of their size factor as well as an orthogonal value factor to these types of news.[31] As previously outlined, their size value factor is similar to our market-channel value factor and earns a value premium. By contrast, their orthogonal value factor is similar to our book-channel value factor and does not earn a value premium. While the factors have similar exposures to market cash flow and discount rate news, the size value factor has a significantly lower exposure to volatility news than the orthogonal value factor. Amid the findings of Campbell et al. (2018) and Gerakos and Linnainmaa (2018), compensation for exposure to market volatility news represents a potential explanation for the value effect.

If exposure to market volatility news does in fact rationalize the value effect, our discount rate shock-driven value factor should have a lower volatility news beta than our cash flow shock-driven value factor given that only the former earns a value premium. To investigate this

[30]See Golubov and Konstantinidi (2019) for a comprehensive overview and evaluations of these explanations.

[31]Gerakos and Linnainmaa (2018) construct the orthogonal value factor based on the residuals from their cross-sectional regression. See Section 6.2 for more details.

conjecture, we obtain data on the quarterly estimated news terms for the period from July 1964 to December 2011 from Christopher Polk's website.[32] Table 10 presents the factors' betas on the news terms. In line with Gerakos and Linnainmaa's (2018) results, our market- and book-channel value factors' cash flow and discount rate news betas are not significantly different, whereas the former's volatility news beta is significantly lower than the latter's. However, the discount rate shock- and cash flow shock-driven value factors have similar betas to all types of news, and the differences between their betas are insignificant. This result holds in particular for their volatility news betas. Since exposure to volatility news therefore cannot explain the return difference between the discount rate shock- and cash flow shock-driven value factors, it cannot rationalize the value effect.

[Insert Table 10 near here.]

We further examine whether exposure to any of the news types may explain the investment effect. The results for the standard investment factor reveal an insignificant beta on market cash flow news and significantly negative betas on market discount rate and volatility news. Thus, exposure to market discount rate and volatility news may potentially rationalize the investment effect. Yet, none of the differences between the cash flow shock- and discount rate shock-driven investment factors' betas is significant. Thus, exposure to market discount rate or volatility news cannot explain the factors' return differential and therefore the investment effect.

Contrary to the conclusions of Campbell et al. (2018) and Gerakos and Linnainmaa (2018), this section's results suggest that the value effect cannot be rationalized as compensation for exposure to market volatility news. The same holds for the investment effect. Explanations aiming to rationalize the value and investment effects should also be able to explain the disconnect between our cash flow shock- and discount rate shock-driven value and investment factors.

9 Alternative Explanations for the Relation between Book-to-Market and Investment

9.1 Mispricing

In Section 2, we argue that the negative relation between book-to-market and investment arises because both are driven by cash flow and discount rate shocks. Our results are consistent with this thesis. However, variation in firms' market equity, and thus in their book-to-market, may also stem from mispricing. Moreover, the literature put forward several mechanisms for how mispricing may affect firms' investment.[33] Thus, the negative relation between book-to-

[32] https://personal.lse.ac.uk/polk/research/work.htm

[33] See, e.g., Polk and Sapienza (2009) and Dessaint et al. (2019).

market and investment may also be due to mispricing rather than cash flow and discount rate shocks. To gauge the importance of mispricing for our results, we split our sample based on several mispricing proxies. If mispricing rather than cash flow and discount rate shocks drive the relation between market equity-driven book-to-market and investment, it should be much stronger for stocks more likely to be mispriced.

We split our sample based on three mispricing proxies. First, following Baker and Wurgler (2002), overvalued (undervalued) firms are more likely to issue (repurchase) equity. Second, following Baker et al. (2003), stocks with very high (low) returns across the subsequent three years are more likely to be undervalued (overvalued). Third, following Edmans et al. (2012), stocks subject to high selling pressure by mutual funds are likely to be undervalued. Therefore, at the end of each June and using NYSE breakpoints, we classify firms whose net share issues across the next fiscal year are below the 25th or above the 75th percentile (between the 25th and the 75th percentile), firms whose cumulative three-year ahead returns are below the 25th or above the 75th percentile (between the 25th and the 75th percentile),[34] and firms with above-median (below-median) mutual fund hypothetical sales across the previous fiscal year as mispriced (fairly priced).[35]

For each subsample, we conduct annual Fama-MacBeth (1973) regressions that regress investment on up to four-year lagged book and market equity changes as well as five-year lagged book-to-market. The book equity changes, the market equity changes, and lagged book-to-market sum up to current book-to-market. This decomposition allows us to assess which components of book-to-market drive its relation with investment. We use weighted least squares with stocks' market capitalizations as weights to estimate the regressions and winsorize all variables at the 0.5% and 99.5% levels. For comparison, we implement the regressions also for our complete sample of stocks. Column (1) of Table 11 presents the average coefficients for the complete sample. The coefficient on lagged book-to-market is significantly negative, the coefficients on the book equity changes are mostly significantly positive, and the coefficients on the market equity changes are uniformly and highly significantly positive. In line with our earlier findings, these results imply that only market equity changes drive book-to-market's negative relation with investment. By contrast, book equity changes would rather imply a positive relation.[36]

Columns (2) to (7) of Table 11 present the average coefficients for the subsamples based on the mispricing proxies. The coefficients on the market equity changes are mostly higher for mispriced than fairly priced firms based on net share issues and three-year ahead returns. However, the differences are rather small compared to the coefficients' absolute magnitudes. Moreover, the coefficients on the market equity changes are even lower for mispriced than fairly priced firms based on mutual fund hypothetical sales. Consequently, mispricing drives, if anything, the relation between market equity-driven book-to-market and investment only to a

[34]We measure a firm's three-year ahead return across the 36 months beginning at the end of the month of its last fiscal year ending.

[35]See Appendix A for the construction of net share issues and mutual fund hypothetical sales.

[36]This result is intuitive: since book equity plus debt equals total assets in the balance sheet, investment, as measured by asset growth, should be positively related to book equity changes.

very limited extent.

[Insert Table 11 near here.]

9.2 Financial Constraints

A second alternative explanation for the negative relation between market equity-driven book-to-market and investment is that changes in firms' market equity may affect their ability to raise external capital. Specifically, negative returns may make investors and lenders more pessimistic about firms' prospects, making it difficult for the firms to obtain external financing. In case they are financially constrained, firms consequently need to reduce their investment in projects, even if these projects had positive net present values.[37] We again conduct subsample analyses to examine how financial constraints affect our results. If financial constraints rather than cash flow and discount rate shocks drive the relation between market equity-driven book-to-market and investment, it should be much stronger for financially constrained firms.

We split our sample based on three proxies for financial constraints. First, following Fazzari et al. (1988), financially constrained firms should pay out less capital. Second, following Whited (1992), firms without an S&P long-term debt rating or whose debt is in default should be more financially constrained. Third, we use the Kaplan-Zingales index proposed by Lamont et al. (2001) as a composite score of financial constraints. Therefore, at the end of each June and using NYSE breakpoints, we classify firms whose total payout-to-book ratios are below-median (above-median), firms with outstanding debt but no S&P long-term debt rating or whose debt is in default (firms with no outstanding debt or an S&P long-term debt rating and whose debt is not in default), and firms whose Kaplan-Zingales index is above-median (below-median) as financially constrained (unconstrained).[38]

For each subsample, we again conduct annual Fama-MacBeth (1973) regressions that regress investment on up to four-year lagged book and market equity changes as well as five-year lagged book-to-market. Columns (8) to (13) of Table 11 present the average coefficients. The coefficients on contemporaneous market equity changes are lower for constrained than unconstrained firms based on payout-to-book and the Kaplan-Zingales index, which is the opposite of what we would expect if financial constraints drive the relation. However, the coefficients on lagged market equity changes are, in general, higher for constrained than unconstrained firms. Thus, financial constraints may to some extent be responsible for the positive relation between lagged market equity changes and investment. Nevertheless, the coefficients on lagged market equity changes are not substantially different between unconstrained and constrained firms. On balance, financial constraints do not seem to play a major role in driving the relation between market equity-driven book-to-market and investment.

[37]The same reasoning holds analogously for positive returns and increased investment.

[38]See Appendix A for the construction of the total payout-to-book ratio and the Kaplan-Zingales index.

Overall, the results from this section support the notion that cash flow and discount rate shocks drive the relation between book-to-market and investment.[39] While financial constraints and mispricing may contribute to the relation, their effects are not unanimous and rather muted.

10 Conclusion

The finding of Fama and French (2015) that the value factor does not possess incremental pricing power for the cross-section of stock returns in their five-factor model has sparked controversy about the value factor. In this work, we resolve this controversy.

The value factor's pricing power is primarily subsumed by the investment factor. We argue that the factors' close relation arises because their sorting variables—book-to-market and investment—are both driven by cash flow and discount rate shocks. In line with this thesis, we document a negative relation between the two variables that is exclusively due to book-to-market's market equity-driven part. The negative relation causes a positive overlap between the value and investment factors' portfolios. This overlap is, in turn, the primary driver of the factors' comovement.

Variation in book-to-market and investment is informative about expected returns only if it stems from discount rate shocks. We identify those stocks whose book-to-market and investment are likely to be driven by discount rate shocks and find that they in fact contain the entire pricing information of the value and investment factors. To capture the pricing information more accurately, we construct adjusted versions of the value and investment factors that use only such discount rate shock-driven stocks. These adjusted value and investment factors have higher mean returns and Sharpe ratios than their standard counterparts. Importantly, our discount rate shock-driven value factor is no longer redundant; that is, a value factor built only from stocks whose book-to-market is a good indicator of expected returns captures incremental pricing information, even beyond the investment factor. A value factor has therefore still a place in a multifactor model, but its construction methodology should be adjusted to reflect its pricing information more accurately.

We further show that our discount rate shock-driven factors capture the entire pricing information of the standard factors, but not vice versa. As a consequence, the pricing performance of the Fama-French (2015) five-factor model improves when our discount rate shock-driven factors replace the standard factors.

As they reflect the same effects, it is not surprising that one of the two factors is redundant in the original Fama-French (2015) five-factor model. We uncover three reasons why the value factor rather than the investment factor is the redundant factor. First, it comprises the noisy

[39] In the Internet Appendix, we conduct the same analyses with investment factor correlation rather than investment as the dependent variable. The results show that mispricing and financial constraints can hardly explain the association between market equity-driven book-to-market and comovement with the investment factor. This finding confirms that the comovement of the value factor with the investment factor is due to discount rate and cash flow shocks.

book equity-driven part. Second, it is much more distorted in times of market-wide turbulences. Third, it is a worse hedge for the market, size, and profitability factors. We provide evidence that the latter two reasons may be specific to our sample period. Therefore, the value factor may not necessarily continue to be the redundant factor going forward.

Furthermore, we use the documented disconnect between the discount rate shock- and cash flow shock-driven value and investment premia to reevaluate the three-beta ICAPM of Campbell et al. (2018) as an explanation for the value and investment effects. We find that the model fails to explain this disconnect, implying that it also cannot explain the value and investment effects in general. Future research may want to use our discount rate shock- and cash flow shock-driven value and investment factors to evaluate potential explanations for these effects.

Finally, our results have implications for the implementation of factor investing strategies. First, value and investment factor investing strategies can be considerably enhanced if they take into account whether firms' book-to-market is high, respectively, whether firms' investment is low because of high expected returns or low expected profitability. Second, such enhanced value and investment strategies are largely independent sources of excess returns, meaning it is beneficial for investors to engage in both strategies simultaneously.

A Variable Definitions

Market Equity (ME):
A stock's market equity for the end of month t is calculated as the stock's price at the end of month t times the stock's shares outstanding at the end of month t. To reduce the skewness in ME, we transform it by the natural logarithm. The ME data is considered missing if ME is non-positive.

Book-to-Market Ratio (BM):
A stock's book-to-market ratio for the end of June of year y is calculated as the firm's book equity from the last fiscal year ending in year $y-1$, divided by the firm's ME at the end of the month of this fiscal year ending.[40] Following Davis et al. (2000), book equity (BE) is the book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock (depending on availability, the redemption, liquidation, or par value of preferred stock is used, in that order); if the book value of stockholders' equity is not directly available, it is measured as the book value of common equity plus the par value of preferred stock or as the difference between total assets and total liabilities (in that order). To reduce the skewness in BM, we transform it by the natural logarithm. The BM data is considered missing if either ME or BE is non-positive.

Investment (INV):
A stock's investment for the end of June of year y is calculated as the firm's total assets from the last fiscal year ending in year $y-1$ divided by the firm's total assets from the last fiscal year ending in year $y-2$, minus 1. To reduce the skewness in INV, we transform it by the natural logarithm. The INV data is considered missing if total assets are non-positive.

Operating Profitability (OP):
A stock's operating profitability for the end of June of year y is calculated as the firm's annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses, divided by the firm's BE, all from the last fiscal year ending in year $y-1$. The OP data is considered missing if annual revenues data is missing, if data for each of cost of goods sold, interest expense, and selling, general, and administrative expenses is missing, or if BE is non-positive.

Net Share Issues (NSI):
A firm's net share issues for the end of June of year y is calculated as the natural logarithm of the firm's split-adjusted shares outstanding from the last fiscal year ending in year $y-1$ minus the natural logarithm of the firm's split-adjusted shares outstanding from the last fiscal

[40] This construction of BM slightly differs from Fama and French (2015), who divide the book equity by the firm's ME from the end of December of year $y-1$.

year ending in year $y-2$. Split-adjusted shares outstanding are shares outstanding times the adjustment factor, both from Compustat.

Total Payout-to-Book Ratio (TPB):

A firm's total payout-to-book ratio for the end of June of year y is calculated as total payout from the last fiscal year ending in year $y-1$ divided by the firm's BE from the last fiscal year ending in year $y-2$. Total payout is dividends on common stocks plus total expenditure for the purchase of common and preferred stocks (zero if missing) plus reductions in the redemption value of preferred stocks (i.e., increases are set to zero). The TPB data is considered missing if data on dividends, preferred stocks' redemption value, or BE is missing.

Kaplan-Zingales Index (KZ Index):

Following Lamont et al. (2001), we calculate firm i's Kaplan-Zingales index for the end of June of year y as follows:

$$KZ_{i,y} = -1.002\frac{CF_{i,y}}{K_{i,y-1}} + 0.283Q_{i,y} + 3.139\frac{Debt_{i,y}}{Debt_{i,y} + SEQ_{i,y}} - 39.368\frac{D_{i,y}}{K_{i,y-1}} - 1.315\frac{Cash_{i,y}}{K_{i,y-1}}$$

CF is cash flow measured as income before extraordinary items plus depreciation and amortization. K is net property, plant, and equipment. Q is Tobin's Q measured as total assets plus market equity (from CRSP, measured at the end of December) minus book value of common equity and deferred taxes, divided by total assets. $Debt$ is the sum of short-term debt and long-term debt. SEQ is stockholders' equity. D is total dividends. $Cash$ is cash and short-term investments. y-variables are from the last fiscal year ending in year $y-1$.

Mutual Fund Hypothetical Sales (MFHS):

We determine stocks' mutual fund hypothetical sales across a given fiscal year following the approaches of Edmans et al. (2012) and Dessaint et al. (2019). For this purpose, we obtain monthly mutual fund data from CRSP and quarterly mutual fund holdings data from Thomson Reuters, which are available from 1980 onwards. We use all US mutual funds that are not specialized in a certain industry.

CRSP reports mutual funds' monthly returns and total net asset values by share class. We calculate fund f's average return across all share classes in month m by averaging its share classes' returns in month m as follows:

$$Return_{f,m} = \frac{\sum_{s=1}^{S_f}(TNA_{f,m,s} \times Return_{f,m,s})}{\sum_{s=1}^{S_f} TNA_{f,m,s}}$$

where $Return_{f,m,s}$ is the return of share class s of fund f in month m, $TNA_{f,m,s}$ is the total net asset value of share class s of fund f at the end of month m, and S_f is the number of share classes of fund f. We compound funds' average monthly returns on a quarterly basis. Moreover, we calculate funds' total net asset values at the end of each quarter by aggregating the total net asset values of their share classes.

Next, we estimate the net inflow of fund f across quarter q as a percentage of its beginning-of-quarter total net asset value as follows:

$$Flow_{f,q} = \frac{TNA_{f,q} - TNA_{f,q-1} \times (1 + Return_{f,q})}{TNA_{f,q-1}}$$

where $TNA_{f,q}$ is fund f's total net asset value at the end of quarter q and $Return_{f,q}$ is fund f's compounded return across quarter q.

Using the mutual fund holdings data from Thomson Reuters, we estimate stock i's hypothetical sales in quarter q caused by mutual fund outflows as follows:

$$MFHS_{i,q} = \frac{\sum_f Flow_{f,q} \times Shares_{i,f,q-1} \times Price_{i,q-1}}{Volume_{i,q}}$$

where $Shares_{i,f,q}$ is the number of shares in stock i held by fund f at the end of quarter q, $Price_{i,q}$ is stock i's price at the end of quarter q, and $Volume_{i,q}$ is stock i's dollar trading volume in quarter q. We use only funds with extreme outflows, defined as funds with $Flow_{f,q} \leq -0.05$.

Finally, we calculate stocks' average mutual fund hypothetical sales across their fiscal years. For this purpose, we first assign $MFHS_{i,q}$ to each month m in quarter q. Then, we calculate stock i's average hypothetical sales across fiscal year y as follows:

$$MFHS_{i,y} = \frac{\sum_{m \in y} MFHS_{i,m}}{N_{i,y}}$$

where $N_{i,y}$ is the number of months in stock i's fiscal year y (i.e., usually 12).

B Market, Size, and Profitability Factors

We construct the market, size, and profitability factors as described in Fama and French (2015). First, the market portfolio in a given month contains all stocks traded on the NYSE, AMEX, or NASDAQ with a CRSP share code of 10 or 11 as well as good market equity data at the beginning of the month. The market portfolio is newly formed at the beginning of each month, and the stocks in the market portfolio are value-weighted. The return on the market factor (MP) is the return on the market portfolio in excess of the one-month T-bill rate.

The profitability factor is constructed in the same way as the value factor (see Section 3.2), only that the second sort is with respect to operating profitability from the last fiscal year ending in the prior year. The return on the profitability factor (RMW) is the average return on the two high profitability portfolios minus the average return on the two low profitability portfolios.

Finally, the return on the size factor (SMB) is the average return on the nine low market equity portfolios resulting from the bivariate sorts with respect to market equity and any of book-to-market, operating profitability, and investment, minus the average return on the nine high market equity portfolios.

References

Arnott, Robert D., Campbell R. Harvey, Vitali Kalesnik, and Juhani T. Linnainmaa, 2021, Reports of value's death may be greatly exaggerated, *Financial Analysts Journal* 77, 44–67.

Baker, Malcolm, Jeremy C. Stein, and Jeffrey Wurgler, 2003, When does the market matter? Stock prices and the investment of equity-dependent firms, *Quarterly Journal of Economics* 118, 969–1005.

Baker, Malcolm, and Jeffrey Wurgler, 2002, Market timing and capital structure, *Journal of Finance* 57, 1–32.

Barillas, Francisco, and Jay Shanken, 2017, Which alpha?, *Review of Financial Studies* 30, 1316–1338.

Barillas, Francisco, and Jay Shanken, 2018, Comparing asset pricing models, *Journal of Finance* 73, 715–754.

Campbell, John Y., 1991, A variance decomposition for stock returns, *Economic Journal* 101, 157–179.

Campbell, John Y., Stefano Giglio, Christopher Polk, and Robert Turley, 2018, An intertemporal CAPM with stochastic volatility, *Journal of Financial Economics* 128, 207–233.

Chen, Long, Zhi Da, and Xinlei Zhao, 2013, What drives stock price movements?, *Review of Financial Studies* 26, 841–876.

Chen, Long, and Xinlei Zhao, 2009, Return decomposition, *Review of Financial Studies* 22, 5213–5249.

Cochrane, John H., 2011, Presidential address: Discount rates, *Journal of Finance* 66, 1047–1108.

Cohen, Randolph B., Christopher Polk, and Tuomo Vuolteenaho, 2003, The value spread, *Journal of Finance* 58, 609–641.

Cooper, Michael J., Huseyin Gulen, and Michael J. Schill, 2008, Asset growth and the cross-section of stock returns, *Journal of Finance* 63, 1609–1651.

Daniel, Kent, Lira Mota, Simon Rottke, and Tano Santos, 2020, The cross-section of risk and returns, *Review of Financial Studies* 33, 1927–1979.

Daniel, Kent, and Sheridan Titman, 2006, Market reactions to tangible and intangible information, *Journal of Finance* 61, 1605–1643.

Davis, James L., Eugene F. Fama, and Kenneth R. French, 2000, Characteristics, covariances, and average returns: 1929 to 1997, *Journal of Finance* 55, 389–406.

Dessaint, Olivier, Thierry Foucault, Laurent Frésard, and Adrien Matray, 2019, Noisy stock prices and corporate investment, *Review of Financial Studies* 32, 2625–2672.

Edmans, Alex, Itay Goldstein, and Wei Jiang, 2012, The real effects of financial markets: The impact of prices on takeovers, *Journal of Finance* 67, 933–971.

Eisfeldt, Andrea L., Edward T. Kim, and Dimitris Papanikolaou, Forthcoming, Intangible value, *Critical Finance Review* .

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanations of asset pricing anomalies, *Journal of Finance* 51, 55–84.

Fama, Eugene F., and Kenneth R. French, 2006, Profitability, investment and average returns, *Journal of Financial Economics* 82, 491–518.

Fama, Eugene F., and Kenneth R. French, 2008, Average returns, B/M, and share issues, *Journal of Finance* 63, 2971–2995.

Fama, Eugene F., and Kenneth R. French, 2015, A five-factor asset pricing model, *Journal of Financial Economics* 116, 1–22.

Fama, Eugene F., and Kenneth R. French, 2018, Choosing factors, *Journal of Financial Economics* 128, 234–252.

Fama, Eugene F., and Kenneth R. French, 2020, Comparing cross-section and time-series factor models, *Review of Financial Studies* 33, 1891–1926.

Fama, Eugene F., and James D. MacBeth, 1973, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 81, 607–636.

Fazzari, Steven, R. Glenn Hubbard, and Bruce C. Petersen, 1988, Financing constraints and corporate investment, *Brooking Papers on Economic Activity* 1, 141–195.

Gerakos, Joseph, and Juhani T. Linnainmaa, 2018, Decomposing value, *Review of Financial Studies* 31, 1825–1854.

Gibbons, Michael R., Stephen A. Ross, and Jay Shanken, 1989, A test of the efficiency of a given portfolio, *Econometrica* 57, 1121–1152.

Golubov, Andrey, and Theodosia Konstantinidi, 2019, Where is the risk in value? Evidence from a market-to-book decomposition, *Journal of Finance* 74, 3135–3186.

Harvey, Campbell R., Yan Liu, and Heqing Zhu, 2016, ... and the cross-section of expected returns, *Review of Financial Studies* 29, 5–68.

Hou, Kewei, and Mathijs A. van Dijk, 2019, Resurrecting the size effect: Firm size, profitability shocks, and expected stock returns, *Review of Financial Studies* 32, 2850–2889.

Hou, Kewei, Chen Xue, and Lu Zhang, 2015, Digesting anomalies: An investment approach, *Review of Financial Studies* 28, 650–705.

Lamont, Owen, Christopher Polk, and Jesús Saaá-Requejo, 2001, Financial constraints and stock returns, *Review of Financial Studies* 14, 529–554.

Lin, Hsiou-wei, and Maureen F. McNichols, 1998, Underwriting relationships, analysts' earnings forecasts and investment recommendations, *Journal of Accounting and Economics* 25, 101–127.

McNichols, Maureen F., and Patricia C. O'Brien, 1997, Self-selection and analyst coverage, *Journal of Accounting Research* 35, 167–199.

Newey, Whitney K., and Kenneth D. West, 1987, A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix, *Econometrica* 55, 703–708.

Penman, Stephen, and Francesco Reggiani, 2018, Fundamentals of value versus growth investing and an explanation for the value trap, *Financial Analysts Journal* 74, 103–119.

Polk, Christopher, and Paola Sapienza, 2009, The stock market and corporate investment: A test of catering theory, *Review of Financial Studies* 22, 187–217.

Shanken, Jay, 1992, On the estimation of beta-pricing models, *Review of Financial Studies* 5, 1–33.

Shumway, Tyler, 1997, The delisting bias in CRSP data, *Journal of Finance* 52, 327–340.

Shumway, Tyler, and Vincent A. Warther, 1999, The delisting bias in CRSP's Nasdaq data and its implications for the size effect, *Journal of Finance* 54, 2361–2379.

Titman, Sheridan, K.C. John Wei, and Feixue Xie, 2004, Capital investments and stock returns, *Journal of Financial and Quantitative Analysis* 39, 677–700.

Vuolteenaho, Tuomo, 2002, What drives firm-level stock returns?, *Journal of Finance* 57, 233–264.

Whited, Toni M., 1992, Debt, liquidity constraints, and corporate investment: Evidence from panel data, *Journal of Finance* 47, 1425–1460.

Xing, Yuhang, 2008, Interpreting the value effect through the q-theory: An empirical investigation, *Review of Financial Studies* 21, 1767–1795.

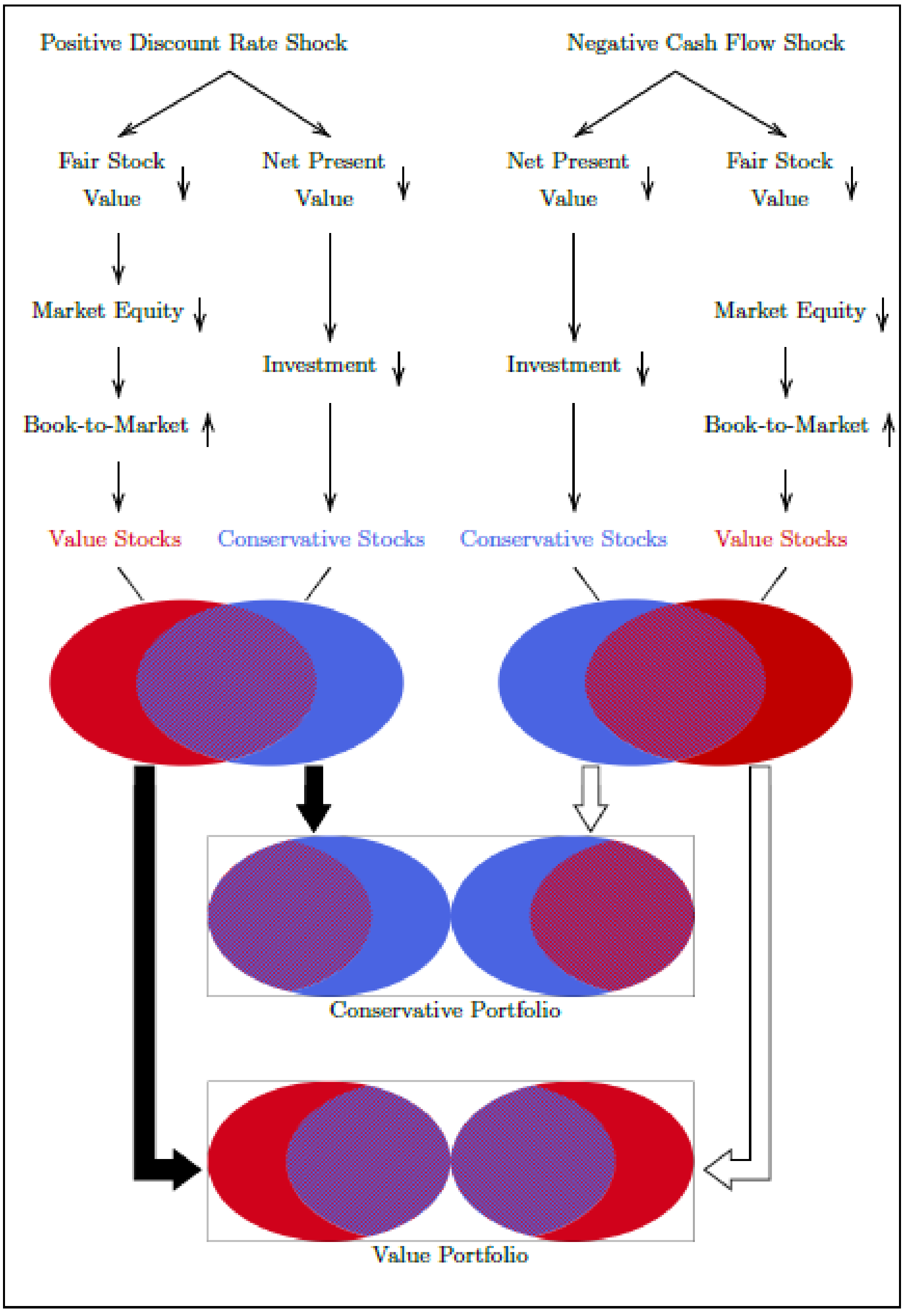

Figure 1
Cash Flow and Discount Rate Shocks as Drivers of the Relation between the Value and Investment Factors

This figure illustrates our thesis on how negative cash flow shocks and positive discount rate shocks drive the association between value stocks (red) and conservative stocks (blue). The case of how positive cash flow shocks and negative discount rate shocks drive the association between growth stocks and aggressive stocks is analogous. The black arrows indicate that these stocks contain cross-sectional pricing information; the white arrows indicate that these stocks do not contain cross-sectional pricing information.

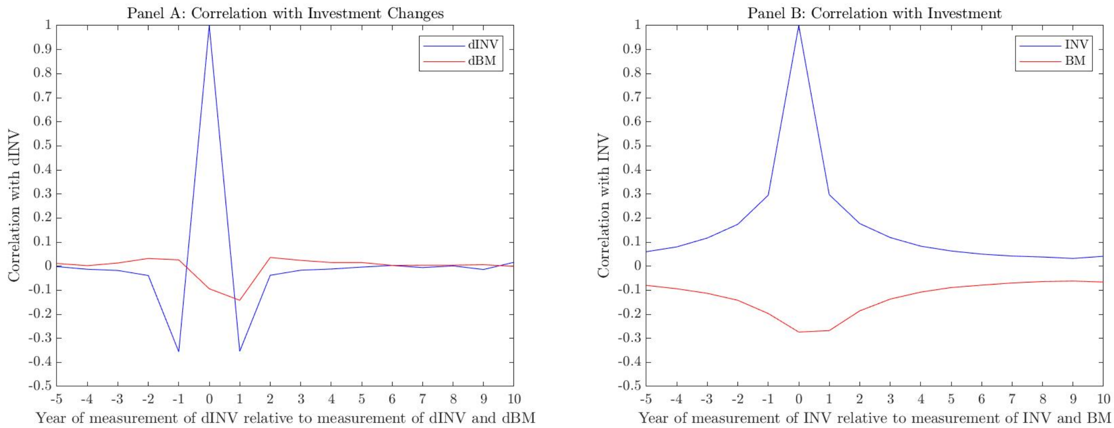

Figure 2
Correlation between Book-to-Market and Investment

Panel A of this figure displays time-series averages of annual cross-sectional rank correlations of the change in investment (dINV) and the change in book-to-market (dBM) with past (up to five years), contemporaneous, and future (up to ten years) changes in investment. Panel B displays time-series averages of annual cross-sectional rank correlations of investment (INV) and book-to-market (BM) with past (up to five years), contemporaneous, and future (up to ten years) investment. Variables are measured at the end of each June from 1963 to 2019. INV and BM are calculated as described in Appendix A and are both in log terms. dINV and dBM are the annual log changes in INV and BM, respectively.

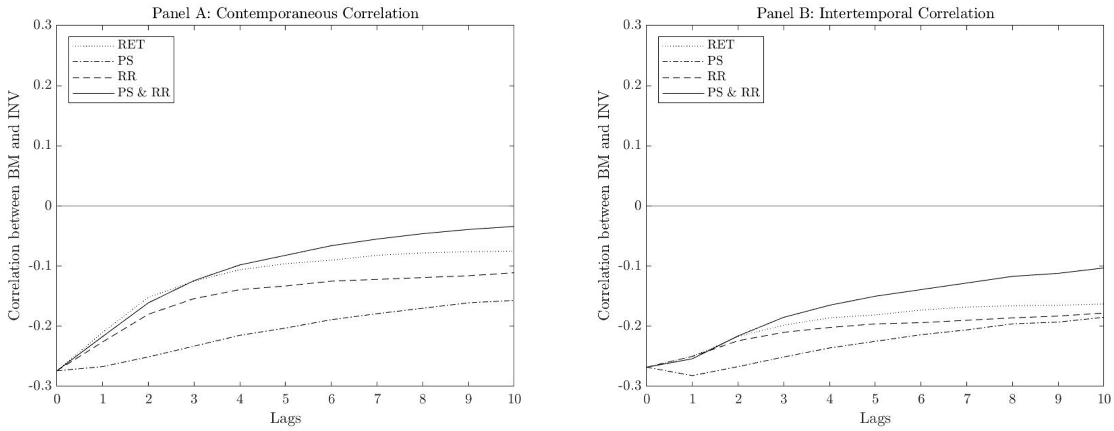

Figure 3

Correlation between Orthogonalized Book-to-Market and Investment

Panel A of this figure displays time-series averages of annual cross-sectional rank correlations between book-to-market (BM) and contemporaneous investment (INV) when both are orthogonalized to past (1 to 10 years) fiscal-year returns (RET), profitability shocks (PS), residual returns (RR), or profitability shocks and residual returns simultaneously (PS & RR). Panel B displays the correlations between orthogonalized book-to-market and one-year ahead orthogonalized investment. The orthogonalizations are conducted based on annual cross-sectional regressions of BM and INV on the respective explanatory variables. Variables are measured at the end of each June from 1963 to 2019. INV and BM are calculated as described in Appendix A and are both in log terms. PS and RR are estimated as described in Section 3.4.

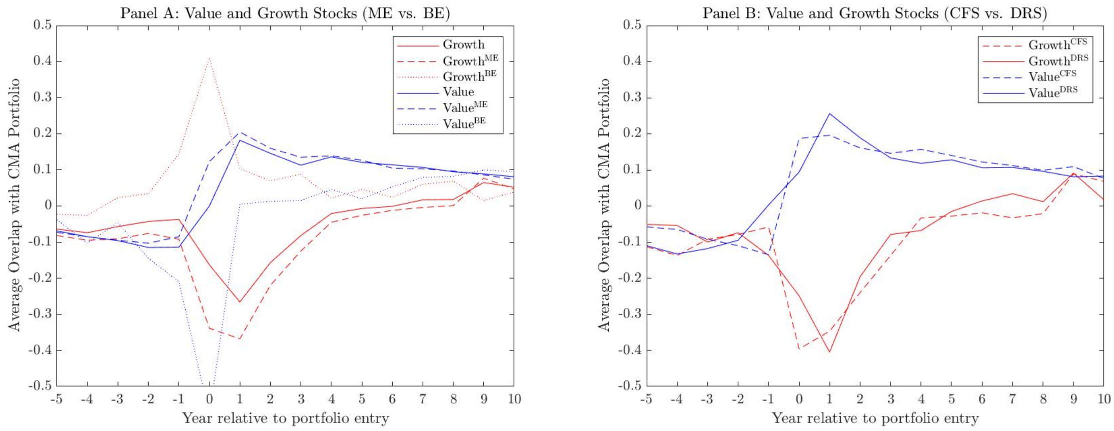

Figure 4
Average Overlaps of Value and Growth Stocks with CMA Portfolios

This figure displays time-series averages of portfolios' overlaps with past (up to five years), contemporaneous, and future (up to ten years) CMA portfolios. The overlap of a portfolio with a CMA portfolio is the weighted fraction of the portfolios' stocks in the respective conservative portfolio minus the weighted fraction of the portfolios' stocks in the respective aggressive portfolio. Panel A displays the results for incoming value and growth stocks as well as their market-channel (Value$^{\mathrm{ME}}$ and Growth$^{\mathrm{ME}}$) and book-channel (Value$^{\mathrm{BE}}$ and Growth$^{\mathrm{BE}}$) subsets. Panel B displays the results for incoming discount rate shock-driven value (Value$^{\mathrm{DRS}}$) and growth (Growth$^{\mathrm{DRS}}$) stocks and incoming cash flow shock-driven value (Value$^{\mathrm{CFS}}$) and growth (Growth$^{\mathrm{CFS}}$) stocks. The construction of the portfolios and the classification of value and growth stocks are described in Sections 3.2 and 3.5. Stocks are weighted proportionally the same as in the aggregate value and growth portfolios, respectively.

Figure 5
Factor Performance

Panel A (C) of this figure displays the cumulative performance of the standard and discount rate shock-driven value (investment) factors. Panel B (D) displays the rolling ten-year cumulative performance of the standard and discount rate shock-driven value (investment) factors. The y-axes have a log scale. The sample period is from July 1964 to December 2019.

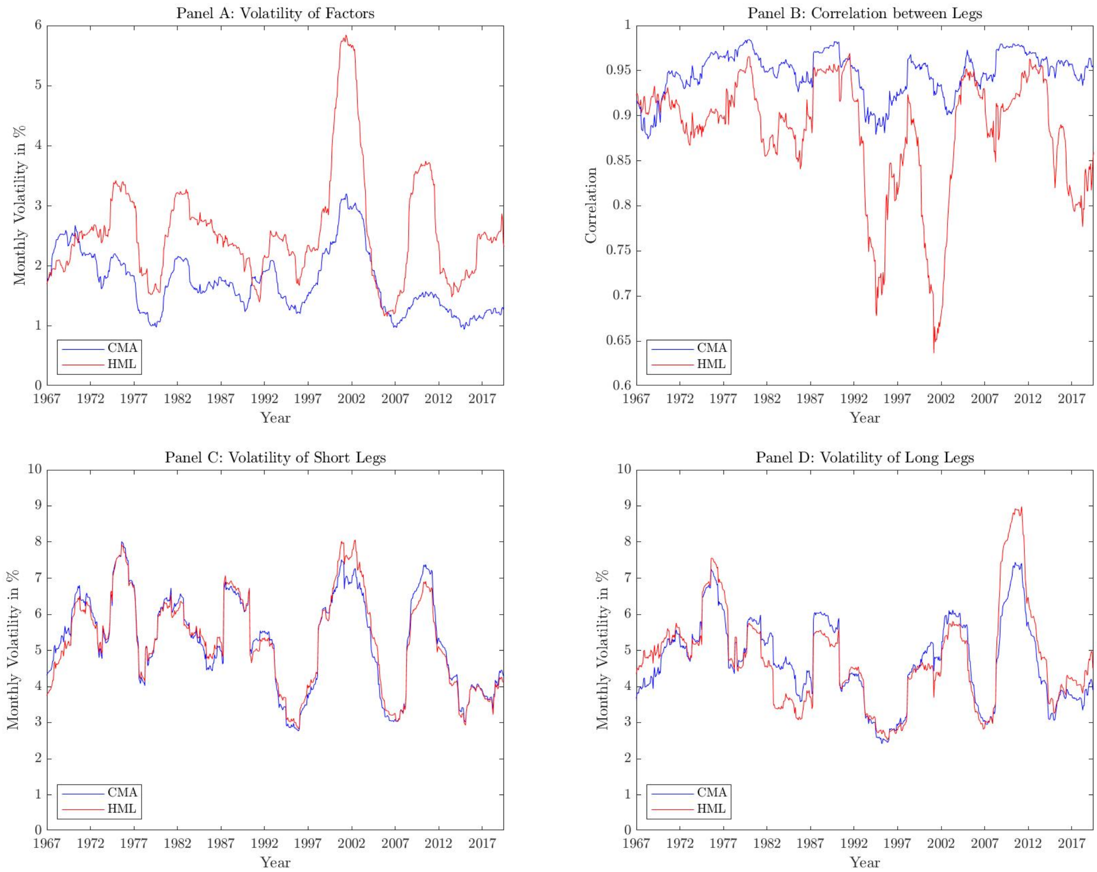

Figure 6
Factor Volatilities

Panel A of this figure displays the three-year rolling volatilities of the value and investment factors (HML and CMA, respectively). Panel B displays the three-year rolling correlations between the factors' long and short legs. Panel C (D) displays the three-year rolling volatilities of the factors' short (long) legs. The sample period is from July 1964 to December 2019.

Table 1
Decomposition of the Cross-Sectional Variation in Book-to-Market

This table displays the time-series averages of the percentage contributions of lagged book-to-market (BM), book equity changes (dBE), and market equity changes (dME) to the total variation in book-to-market. Book-to-market is measured at the end of each June, is calculated as described in Appendix A, and is in log terms. At the end of June of year t, we decompose the cross-sectional variance in book-to-market for $k = 1, ..., 5$ as follows:

$$var(BM_{i,t}) = cov(BM_{i,t}, BM_{i,t-k}) + \sum_{s=0}^{k-1} cov(BM_{i,t}, dBE_{i,t-s}) + \sum_{s=0}^{k-1} cov(BM_{i,t}, -dME_{i,t-s})$$

The percentage contributions are calculated by dividing the three terms on the right side of the equation by $var(BM_{i,t})$. The annual percentage contributions are averaged across the sample period from 1963 to 2019. Panel A displays the results when in each year all common US stocks traded on the NYSE, AMEX, or NASDAQ are used. Panel B displays the results when in each year only stocks newly entering the value and growth portfolios are used.

	Panel A: Full Sample			Panel B: Incoming Value and Growth Stocks		
k	$BM_{i,t-k}$	$\sum dBE_{i,t-s}$	$-\sum dME_{i,t-s}$	$BM_{i,t-k}$	$\sum dBE_{i,t-s}$	$-\sum dME_{i,t-s}$
1	81.5	0.2	18.3	1.5	24.0	74.6
2	71.0	−1.5	30.5	7.6	29.4	63.1
3	63.9	−3.1	39.2	12.0	31.0	57.0
4	58.2	−4.7	46.4	14.1	30.8	55.1
5	53.1	−5.7	52.6	13.2	33.1	53.7

Table 2
Cross-Sectional Estimation of Profitability Shocks and Residual Returns

Panel A of this table displays time-series averages of coefficients from the cross-sectional profitability model of Hou and van Dijk (2019). The regressions are estimated at the end of each June from 1964 to 2019 using common US stocks traded on the NYSE, AMEX, or NASDAQ with total assets above $10 million and book equity above $5 million. The dependent variable is operating income-to-total assets as measured at the end of June. The independent variables are the market-to-book value of assets (FV/AT), a dummy variable that equals one if the firm does not pay dividends (DD), the dividend-to-book ratio (D/BE), and operating income-to-total assets (OI/AT). The independent variables are lagged by one year relative to the dependent variable. The variables are measured at the end of June. Multiplying the estimated coefficients from an annual regression with the contemporaneous independent variables yields predictions for firms' profitability across the next fiscal year. Panel B displays the time-series average of the coefficient from annual cross-sectional regressions of stocks' returns on their estimated profitability shocks. The regressions are estimated at the end of each June from 1964 to 2019 using all common US stocks traded on the NYSE, AMEX, or NASDAQ. The dependent variable is the cross-sectionally demeaned compounded return across the previous fiscal year. The independent variable is the cross-sectionally demeaned profitability shock across the previous fiscal year. Firms' profitability shocks are calculated by subtracting their predicted profitability from their realized profitability. R^2 is the average adjusted R-squared across all annual regressions. t-statistics are reported in parentheses. In Panel A, t-statistics are based on Newey-West (1987) heteroskedasticity-robust standard errors with five lags. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Panel A: Profitability Shock Estimation						Panel B: Residual Return Estimation	
	Intercept	FV/AT	DD	D/BE	OI/AT	R^2	PS	R^2
Coefficient	0.0155***	0.0064**	−0.0128***	0.0675***	0.7187***	0.613	1.3341***	0.079
	(7.37)	(2.14)	(−4.50)	(3.65)	(40.55)		(7.72)	

Table 3
Comovement of Subsets of the Value Factor Portfolio with the Investment Factor

This table displays characteristics for subsets of the HML portfolio over the period from July 1964 to December 2019. The HML portfolio is reformed annually at the end of each June and is constructed as described in Section 3.2. The following subsets of the HML portfolio are considered: (1) market- and book-channel stocks (HML^{Adj}), (2) market-channel stocks (HML^{ME}), (3) discount rate shock-driven stocks (HML^{DRS}), (4) cash flow shock-driven stocks (HML^{CFS}), and (5) book-channel stocks (HML^{BE}). The subsets are constructed as described in Section 3.5. The subsets are further split according to whether the stocks are contemporaneously in the corresponding leg of the CMA portfolio (i.e., in the conservative (aggressive) portfolio in the case of value (growth) stocks), denoted as "CMA-Overlap", or not, denoted as "Non-CMA-Overlap." "%" is the subsets' average size as a percentage of the size of the subset consisting of all market- and book-channel stocks. "Overlap" is the average overlap with the contemporaneous CMA portfolio, calculated as the weighted fraction of stocks that are in the conservative portfolio minus the weighted fraction of stocks that are in the aggressive portfolio, divided by two. ρ^{CMA} is the correlation with the investment factor. β^{CMA} is the loading on the investment factor from a multivariate regression on a four-factor model consisting of the market, size, profitability, and investment factors. t-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	All				CMA-Overlap				Non-CMA-Overlap			
	%	Overlap	ρ^{CMA}	β^{CMA}	%	Overlap	ρ^{CMA}	β^{CMA}	%	Overlap	ρ^{CMA}	β^{CMA}
HML^{Adj}	100.0	0.207	0.599	0.92***	38.2	1.000	0.783	1.40***	61.8	−0.319	0.341	0.54***
				(17.96)				(29.88)				(9.02)
HML^{ME}	79.5	0.287	0.648	1.06***	33.3	1.000	0.772	1.45***	46.2	−0.274	0.399	0.65***
				(20.22)				(28.90)				(10.46)
HML^{DRS}	29.9	0.294	0.576	1.11***	13.1	1.000	0.611	1.41***	16.8	−0.320	0.334	0.72***
				(17.25)				(19.20)				(8.40)
HML^{CFS}	43.8	0.304	0.590	1.02***	17.8	1.000	0.686	1.48***	26.1	−0.245	0.328	0.58***
				(17.34)				(22.24)				(8.44)
HML^{BE}	20.5	−0.076	0.189	0.44***	5.0	1.000	0.424	1.23***	15.5	−0.467	0.031	0.15
				(5.43)				(11.26)				(1.57)

Table 4

Average Returns and Alphas on Subsets of the Value and Investment Factor Portfolios

This table displays average monthly returns and monthly alphas (in percent) on long-short portfolios. The sample period is from July 1964 to December 2019. In Panel A, all common US stocks are first sorted into quintiles with respect to their market equity at the end of each June. The breakpoints for the sorts are based only on NYSE stocks. Second, the size quintiles are intersected with the aggregate value, growth, conservative, and aggressive portfolios, with the market-channel (ME) and book-channel (BE) subsets of the value and growth portfolios, and with the cash flow shock-driven (CFS) and discount rate shock-driven (DRS) subsets of the value, growth, conservative, and aggressive portfolios. The construction of the aggregate value, growth, conservative, and aggressive portfolios is described in Section 3.2; the construction of their subsets is described in Section 3.5. The stocks in the resulting portfolios are value-weighted. The table displays the mean returns and alphas of strategies that go, within each size quintile, long in value stocks and short in growth stocks (HML), respectively, long in conservative stocks and short in aggressive stocks (CMA). The column "Avg" displays the averages across the size quintiles. Panel B (C) displays the same results when the first sort is with respect to investment (book-to-market) rather than market equity. In Panel D, the first sort is again with respect to market equity, but discount rate shock-driven conservative (aggressive) stocks are excluded from the value (growth) portfolios, and discount rate shock-driven value (growth) stocks are excluded from the conservative (aggressive) portfolios. The alphas are from regressions of the portfolios' returns on the factors of the Fama-French (2015) five-factor model. t-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Controlling for Size

	Mean Returns						Five-Factor Alphas					
	Q1	Q2	Q3	Q4	Q5	Avg	Q1	Q2	Q3	Q4	Q5	Avg
HML	0.63***	0.35***	0.31**	0.18	0.12	0.32***	0.32***	0.07	−0.03	−0.14**	−0.16**	0.01
	(4.52)	(2.66)	(2.38)	(1.44)	(0.90)	(2.84)	(4.22)	(0.99)	(−0.50)	(−2.03)	(−2.42)	(0.50)
HML^{ME}	0.44***	0.42***	0.26**	0.24*	0.24	0.32***	0.15	0.18*	0.00	−0.03	−0.03	0.06
	(3.32)	(3.13)	(1.96)	(1.82)	(1.55)	(2.96)	(1.52)	(1.88)	(−0.03)	(−0.28)	(−0.29)	(1.24)
HML^{BE}	0.38*	−0.42*	0.25	−0.24	0.00	−0.01	0.13	−0.71***	0.04	−0.19	−0.07	−0.16*
	(1.65)	(−1.71)	(1.14)	(−1.25)	(0.02)	(−0.06)	(0.62)	(−3.09)	(0.17)	(−1.00)	(−0.38)	(−1.73)
$\text{HML}^{\text{ME-BE}}$	0.06	0.84***	0.00	0.50**	0.22	0.33***	0.02	0.89***	−0.05	0.18	0.00	0.22**
	(0.25)	(3.40)	(0.01)	(2.44)	(1.06)	(3.02)	(0.10)	(3.58)	(−0.23)	(0.89)	(0.02)	(2.15)
HML^{DRS}	0.70***	0.66***	0.53***	0.22	0.41**	0.49***	0.40**	0.28	0.22	−0.17	0.15	0.16**
	(3.63)	(3.31)	(2.94)	(1.27)	(2.26)	(3.85)	(2.27)	(1.58)	(1.45)	(−1.13)	(0.96)	(2.05)
HML^{CFS}	0.10	0.18	0.08	0.26*	0.08	0.13	−0.24	−0.01	−0.10	0.15	−0.20	−0.08
	(0.53)	(1.14)	(0.51)	(1.84)	(0.46)	(1.16)	(−1.44)	(−0.08)	(−0.83)	(1.39)	(−1.63)	(−1.18)
$\text{HML}^{\text{DRS-CFS}}$	0.68***	0.27	0.46**	−0.01	0.33*	0.36***	0.71***	0.06	0.32*	−0.31*	0.34*	0.24**
	(3.68)	(1.40)	(2.45)	(−0.07)	(1.77)	(3.72)	(3.65)	(0.28)	(1.66)	(−1.74)	(1.81)	(2.45)
CMA	0.42***	0.20**	0.13	0.05	0.17	0.19***	0.42***	0.08	−0.03	−0.23***	−0.18***	0.01
	(5.36)	(2.46)	(1.43)	(0.50)	(1.55)	(2.92)	(6.28)	(1.34)	(−0.43)	(−3.16)	(−3.12)	(0.70)
CMA^{DRS}	0.41***	0.39***	0.20	0.15	0.37***	0.30***	0.24*	0.18*	0.00	−0.15	0.07	0.07
	(3.32)	(3.39)	(1.64)	(1.22)	(2.88)	(4.02)	(1.96)	(1.65)	(0.02)	(−1.43)	(0.70)	(1.33)
CMA^{CFS}	0.22**	0.04	−0.10	0.03	0.01	0.04	0.22**	0.00	−0.17*	−0.08	−0.33***	−0.07
	(1.99)	(0.38)	(−0.95)	(0.32)	(0.07)	(0.61)	(2.04)	(0.01)	(−1.79)	(−0.87)	(−3.09)	(−1.60)
$\text{CMA}^{\text{DRS-CFS}}$	0.18	0.35**	0.30**	0.12	0.36**	0.26***	0.01	0.18	0.18	−0.07	0.41**	0.14*
	(1.20)	(2.41)	(2.09)	(0.83)	(2.23)	(3.43)	(0.08)	(1.18)	(1.20)	(−0.48)	(2.48)	(1.84)

Panel B: Controlling for Investment

	Mean Returns						Five-Factor Alphas					
	Q1	Q2	Q3	Q4	Q5	Avg	Q1	Q2	Q3	Q4	Q5	Avg
HML	0.25*	0.21	0.20	0.28*	0.16	0.22**	0.13	−0.02	0.01	−0.01	−0.32***	−0.04
	(1.88)	(1.58)	(1.53)	(1.85)	(0.96)	(2.06)	(1.13)	(−0.23)	(0.06)	(−0.08)	(−2.92)	(−1.13)
HML^{ME}	0.25	0.17	0.24	0.27	0.46**	0.28**	0.10	−0.05	0.03	0.05	0.05	0.04
	(1.49)	(1.04)	(1.52)	(1.48)	(2.44)	(2.32)	(0.66)	(−0.36)	(0.27)	(0.37)	(0.33)	(0.55)
HML^{BE}	−0.08	0.18	0.07	0.13	−0.02	0.06	−0.01	0.05	−0.07	−0.08	−0.21	−0.08
	(−0.30)	(0.73)	(0.29)	(0.51)	(−0.08)	(0.43)	(−0.05)	(0.21)	(−0.27)	(−0.30)	(−0.84)	(−0.71)
$\text{HML}^{\text{ME-BE}}$	0.30	−0.06	0.13	0.14	0.48*	0.22*	0.11	−0.14	0.08	0.15	0.26	0.12
	(1.07)	(−0.23)	(0.50)	(0.52)	(1.65)	(1.68)	(0.39)	(−0.50)	(0.28)	(0.52)	(0.88)	(0.91)
HML^{DRS}	0.43**	0.35*	0.11	0.27	0.63***	0.35**	0.31	0.14	−0.04	−0.01	0.14	0.09
	(1.98)	(1.66)	(0.55)	(1.29)	(2.70)	(2.55)	(1.41)	(0.72)	(−0.25)	(−0.04)	(0.69)	(0.91)
HML^{CFS}	0.04	−0.03	0.20	0.19	0.39*	0.15	−0.19	−0.30	0.02	0.02	0.04	−0.09
	(0.19)	(−0.16)	(1.11)	(0.91)	(1.70)	(1.20)	(−1.00)	(−1.63)	(0.11)	(0.13)	(0.17)	(−1.06)
$\text{HML}^{\text{DRS-CFS}}$	0.47*	0.30	−0.10	0.08	0.24	0.19*	0.55*	0.37	−0.06	−0.03	0.13	0.18
	(1.71)	(1.17)	(−0.46)	(0.33)	(0.91)	(1.67)	(1.95)	(1.41)	(−0.29)	(−0.13)	(0.46)	(1.50)

- Continued on next page -

Panel C: Controlling for Book-to-Market

	Mean Returns						Five-Factor Alphas					
	Q1	Q2	Q3	Q4	Q5	Avg	Q1	Q2	Q3	Q4	Q5	Avg
CMA	−0.02	0.09	0.25**	0.07	0.14	0.11	−0.41***	−0.04	0.11	−0.04	0.12	−0.05
	(−0.13)	(0.86)	(2.27)	(0.67)	(1.08)	(1.61)	(−4.54)	(−0.42)	(1.19)	(−0.38)	(0.94)	(−1.31)
CMA^{DRS}	0.18	0.15	0.44***	0.18	0.02	0.19**	−0.17	−0.04	0.36**	0.02	0.04	0.04
	(1.08)	(1.08)	(2.88)	(1.27)	(0.13)	(2.37)	(−1.13)	(−0.32)	(2.40)	(0.14)	(0.24)	(0.63)
CMA^{CFS}	0.02	−0.01	0.05	−0.10	0.20	0.03	−0.38***	−0.17	−0.05	−0.14	0.16	−0.12
	(0.10)	(−0.03)	(0.36)	(−0.65)	(1.21)	(0.37)	(−2.63)	(−1.20)	(−0.38)	(−0.91)	(0.97)	(−1.58)
$\text{CMA}^{\text{DRS-CFS}}$	0.16	0.15	0.39*	0.28	−0.17	0.16	0.22	0.13	0.42*	0.16	−0.12	0.16
	(0.77)	(0.77)	(1.84)	(1.35)	(−0.70)	(1.38)	(1.04)	(0.65)	(1.88)	(0.74)	(−0.46)	(1.36)

Panel D: Excluding each other's Discount Rate Shock-Driven Stocks

	Mean Returns						Five-Factor Alphas					
	Q1	Q2	Q3	Q4	Q5	Avg	Q1	Q2	Q3	Q4	Q5	Avg
HML^{DRS}	0.77***	0.53***	0.48***	0.10	0.39*	0.44***	0.45***	0.29	0.20	−0.22	0.09	0.15*
	(4.50)	(2.67)	(2.58)	(0.52)	(1.93)	(3.54)	(2.99)	(1.58)	(1.19)	(−1.38)	(0.54)	(1.83)
CMA^{DRS}	0.36***	0.27**	0.10	0.04	0.36***	0.23***	0.21*	0.14	−0.07	−0.20*	0.08	0.03
	(2.99)	(2.56)	(0.83)	(0.31)	(2.77)	(3.32)	(1.73)	(1.36)	(−0.59)	(−1.86)	(0.70)	(0.65)

Table 5
Factor Statistics

Panel A of this table displays the monthly mean returns (in percent), monthly standard deviations (in percent), and annualized Sharpe ratios of the market (MP), size (SMB), profitability (RMW), value (HML), market-channel value (HML^{ME}), book-channel value (HML^{BE}), discount rate shock-driven value (HML^{DRS}), cash flow shock-driven value (HML^{CFS}), investment (CMA), discount rate shock-driven investment (CMA^{DRS}), and cash flow shock-driven investment (CMA^{CFS}) factors. Panel B displays the correlations between the factors' monthly returns. The sample period is from July 1964 to December 2019. t-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary Statistics

	MP	SMB	RMW	HML	HML^{ME}	HML^{BE}	HML^{CFS}	HML^{DRS}	CMA	CMA^{CFS}	CMA^{DRS}
Mean	0.53***	0.24**	0.25***	0.30***	0.35***	−0.03	0.17	0.54***	0.21***	0.07	0.34***
	(3.11)	(2.11)	(2.89)	(2.79)	(3.17)	(−0.21)	(1.45)	(4.14)	(2.93)	(0.90)	(4.28)
Std	4.41	2.98	2.23	2.75	2.87	3.35	3.05	3.38	1.82	1.94	2.07
SR	0.42	0.28	0.39	0.37	0.43	−0.03	0.19	0.56	0.39	0.12	0.57

Panel B: Correlations

	MP	SMB	RMW	HML	HML^{ME}	HML^{BE}	HML^{CFS}	HML^{DRS}	CMA	CMA^{CFS}	CMA^{DRS}
MP	1.00	0.27	−0.24	−0.26	−0.23	−0.07	−0.20	−0.22	−0.38	−0.18	−0.28
SMB		1.00	−0.35	−0.08	0.00	−0.14	0.01	0.01	−0.09	−0.08	0.03
RMW			1.00	0.12	−0.01	0.15	−0.08	0.01	−0.07	−0.18	0.01
HML				1.00	0.89	0.62	0.81	0.75	0.66	0.52	0.49
HML^{ME}					1.00	0.49	0.89	0.85	0.65	0.48	0.55
HML^{BE}						1.00	0.44	0.38	0.21	0.23	0.11
HML^{CFS}							1.00	0.63	0.60	0.46	0.48
HML^{DRS}								1.00	0.59	0.39	0.59
CMA									1.00	0.78	0.78
CMA^{CFS}										1.00	0.40
CMA^{DRS}											1.00

Table 6
Spanning Regressions

This table displays results from spanning regressions that regress different versions of the value factor (VAL) on different versions of the investment factor (INV) as well as the market (MP), size (SMB), and profitability (RMW) factors, and vice versa. The sample period is from July 1964 to December 2019. The first two columns of each row depict which versions of the investment and value factors are used in the respective spanning regressions. "standard" refers to the standard factors. "ME" refers to the market-channel value factor. "CFS" refers to the cash flow shock-driven factors. "DRS" refers to the discount rate shock-driven factors. α is in percent. t-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

			Dependent Factor: Investment						Dependent Factor: Value					
	INV	VAL	α	β^{MP}	β^{SMB}	β^{RMW}	β^{VAL}	R^2	α	β^{MP}	β^{SMB}	β^{RMW}	β^{INV}	R^2
(1)	standard	standard	0.20***	−0.11***	−0.03*	−0.18***	0.41***	0.525	0.00	0.03	0.04	0.24***	1.05***	0.465
			(3.92)	(−9.11)	(−1.79)	(−7.76)	(22.25)		(−0.04)	(1.32)	(1.34)	(6.22)	(22.25)	
(2)	standard	ME	0.17***	−0.11***	−0.05**	−0.12***	0.37***	0.495	0.09	0.01	0.08**	0.08*	1.05***	0.427
			(3.34)	(−8.69)	(−2.49)	(−4.94)	(20.65)		(1.05)	(0.42)	(2.47)	(1.90)	(20.65)	
(3)	standard	CFS	0.25***	−0.12***	−0.04*	−0.10***	0.32***	0.442	−0.06	0.01	0.06*	−0.02	1.02***	0.362
			(4.58)	(−9.21)	(−1.95)	(−3.69)	(17.94)		(−0.57)	(0.50)	(1.67)	(−0.38)	(17.94)	
(4)	standard	DRS	0.16***	−0.12***	−0.05***	−0.14***	0.29***	0.442	0.25**	0.01	0.11***	0.13**	1.14***	0.360
			(2.90)	(−9.05)	(−2.60)	(−5.39)	(17.93)		(2.24)	(0.27)	(2.81)	(2.49)	(17.93)	
(5)	CFS	standard	0.07	−0.04***	−0.08***	−0.27***	0.37***	0.346	0.21**	−0.08***	0.07**	0.26***	0.76***	0.326
			(1.05)	(−2.70)	(−3.56)	(−9.01)	(15.98)		(2.29)	(−3.71)	(2.06)	(5.96)	(15.98)	
(6)	CFS	ME	0.06	−0.04***	−0.09***	−0.21***	0.30***	0.285	0.32***	−0.10***	0.10***	0.09*	0.69***	0.256
			(0.89)	(−2.83)	(−3.88)	(−6.86)	(13.32)		(3.20)	(−4.43)	(2.81)	(1.77)	(13.32)	
(7)	CFS	CFS	0.12*	−0.05***	−0.08***	−0.19***	0.27***	0.263	0.16	−0.10***	0.08**	−0.01	0.70***	0.229
			(1.77)	(−3.31)	(−3.55)	(−6.02)	(12.37)		(1.47)	(−3.78)	(2.14)	(−0.13)	(12.37)	
(8)	CFS	DRS	0.06	−0.06***	−0.09***	−0.23***	0.21***	0.222	0.50***	−0.12***	0.13***	0.12**	0.67***	0.184
			(0.90)	(−3.49)	(−3.79)	(−7.06)	(10.47)		(4.12)	(−4.23)	(2.91)	(1.98)	(10.47)	
(9)	DRS	standard	0.29***	−0.10***	0.07***	−0.06*	0.34***	0.280	0.10	−0.06***	−0.04	0.10**	0.62***	0.263
			(4.12)	(−5.75)	(2.84)	(−1.70)	(13.34)		(1.06)	(−2.65)	(−1.10)	(2.24)	(13.34)	
(10)	DRS	ME	0.24***	−0.09***	0.06**	0.00	0.37***	0.333	0.15	−0.06***	−0.01	−0.06	0.73***	0.311
			(3.61)	(−5.29)	(2.35)	(0.03)	(15.64)		(1.56)	(−2.68)	(−0.22)	(−1.30)	(15.64)	
(11)	DRS	CFS	0.32***	−0.10***	0.07***	0.02	0.30***	0.267	0.02	−0.06**	−0.02	−0.15***	0.67***	0.239
			(4.59)	(−5.95)	(2.59)	(0.68)	(12.78)		(0.18)	(−2.47)	(−0.54)	(−3.05)	(12.78)	
(12)	DRS	DRS	0.20***	−0.09***	0.05**	−0.01	0.33***	0.368	0.25**	−0.05*	0.01	−0.02	0.93***	0.342
			(3.01)	(−5.50)	(2.07)	(−0.46)	(17.17)		(2.28)	(−1.87)	(0.19)	(−0.30)	(17.17)	

Table 7
Pricing Factors

This table displays results from factor model regressions. In Panel A, the standard Fama-French (2015) five-factor model is used to explain the discount rate shock-driven value and investment factors (HML^{DRS} and CMA^{DRS}, respectively). In Panel B, the adjusted five-factor model with the discount rate shock-driven value and investment factors is used to explain the standard value and investment factors (HML and CMA, respectively). The sample period is from July 1964 to December 2019. α is in percent. t-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Fama-French (2015) Five-Factor Model

	α	β^{MP}	β^{SMB}	β^{RMW}	β^{CMA}	β^{HML}	R^2
HML^{DRS}	0.25***	−0.01	0.05*	−0.05	0.31***	0.78***	0.589
	(2.83)	(−0.61)	(1.77)	(−1.19)	(4.65)	(19.21)	
CMA^{DRS}	0.10*	0.01	0.10***	0.12***	0.95***	−0.03	0.622
	(1.93)	(0.66)	(5.61)	(4.66)	(24.22)	(−1.39)	

Panel B: Adjusted Five-Factor Model

	α	β^{MP}	β^{SMB}	β^{RMW}	$\beta^{CMA^{DRS}}$	$\beta^{HML^{DRS}}$	R^2
HML	−0.04	−0.03*	−0.04	0.11***	0.10**	0.56***	0.575
	(−0.56)	(−1.88)	(−1.61)	(3.21)	(2.35)	(22.07)	
CMA	0.05	−0.07***	−0.08***	−0.13***	0.54***	0.11***	0.681
	(1.22)	(−7.05)	(−5.22)	(−6.73)	(22.32)	(7.34)	

Table 8
Pricing Performance

Panel A of this table displays results from factor model regressions using the Fama-French (2015) five-factor model consisting of the market (MP), size (SMB), profitability (RMW), investment (CMA), and value (HML) factors as well as the adjusted five-factor model that replaces the standard value and investment factors with their discount rate shock-driven versions (HML^{DRS} and CMA^{DRS}, respectively). The dependent returns are the average HML and CMA returns across the size quintiles from Panel A of Table 4. The sample period is from July 1964 to December 2019. Monthly mean returns (μ) and alphas are in percent. Panel B displays metrics on the models' performance in pricing different sets of test assets. "Val" ("Inv") denotes the set of size quintiles of the value and growth (conservative and aggressive) portfolios. "DRS" ("CFS") denotes the set of size quintiles of the discount rate shock-driven (cash flow shock-driven) subsets of the value, growth, conservative, and aggressive portfolios. "LS" denotes the long-short strategies that go long the size quintiles of the discount rate shock-driven subsets of the value, growth, conservative, and aggressive portfolios and short the size quintiles of the corresponding cash flow shock-driven subsets. "N" is the number of test assets. The performance metrics are the GRS statistic of Gibbons et al. (1989) and its associated p-value; the test assets' average absolute alpha (in percent) and the fraction of alphas significant at the 5% level; the test assets' average absolute alpha over the average absolute deviation of the test assets' mean returns from their mean; the test assets' cross-sectional R^2; and the test assets' average time-series R^2. t-statistics are reported in parentheses. Boldface indicates significance at the 10% level.

Panel A: Pricing of Average Value and Investment Premia

		Fama-French (2015) Five-Factor Model							Adjusted Five-Factor Model						
	μ	α	β^{MP}	β^{SMB}	β^{RMW}	β^{CMA}	β^{HML}	R^2	α	β^{MP}	β^{SMB}	β^{RMW}	$\beta^{CMA^{DRS}}$	$\beta^{HML^{DRS}}$	R^2
HML	**0.32**	0.01	−0.01	**−0.12**	**0.16**	**0.10**	**0.91**	0.953	−0.03	**−0.05**	**−0.14**	**0.23**	**0.11**	**0.56**	0.615
	(2.84)	(0.50)	(−1.62)	(−13.14)	(12.72)	(5.46)	(78.17)		(−0.36)	(−2.74)	(−5.31)	(6.85)	(2.63)	(22.13)	
HML^{ME}	**0.32**	0.06	−0.01	**−0.06**	−0.01	**0.20**	**0.81**	0.843	−0.04	**−0.04**	**−0.09**	**0.05**	**0.14**	**0.62**	0.718
	(2.96)	(1.24)	(−1.24)	(−3.71)	(−0.28)	(5.97)	(39.04)		(−0.63)	(−2.53)	(−4.29)	(1.81)	(3.93)	(29.68)	
HML^{BE}	−0.01	**−0.16**	0.00	**−0.18**	**0.09**	**−0.55**	**0.96**	0.492	**−0.24**	0.01	**−0.15**	**0.25**	**−0.20**	**0.49**	0.261
	(−0.06)	(−1.73)	(0.12)	(−5.39)	(1.89)	(−7.73)	(21.91)		(−2.08)	(0.41)	(−3.72)	(4.76)	(−3.04)	(12.34)	
$HML^{ME\text{-}BE}$	**0.33**	**0.22**	−0.02	**0.12**	**−0.09**	**0.76**	**−0.15**	0.200	**0.20**	**−0.05**	0.06	**−0.20**	**0.34**	**0.13**	0.185
	(3.02)	(2.15)	(−0.66)	(3.38)	(−1.88)	(9.82)	(−3.22)		(1.95)	(−1.94)	(1.63)	(−4.23)	(5.68)	(3.63)	
HML^{DRS}	**0.49**	**0.16**	0.01	−0.02	**0.09**	**0.29**	**0.81**	0.646	−0.04	0.01	**−0.07**	**0.14**	**0.06**	**0.89**	0.882
	(3.85)	(2.05)	(0.61)	(−0.64)	(2.29)	(4.73)	(21.91)		(−0.80)	(1.18)	(−4.13)	(6.61)	(2.21)	(55.19)	
HML^{CFS}	0.13	−0.08	−0.03	**−0.08**	**−0.10**	**0.22**	**0.74**	0.675	−0.12	**−0.06**	**−0.11**	−0.06	**0.22**	**0.46**	0.446
	(1.16)	(−1.18)	(−1.60)	(−3.32)	(−3.07)	(4.28)	(23.60)		(−1.33)	(−2.88)	(−3.47)	(−1.37)	(4.31)	(14.65)	
$HML^{DRS\text{-}CFS}$	**0.36**	**0.24**	0.04	**0.06**	**0.19**	0.06	0.06	0.035	0.08	**0.07**	0.04	**0.20**	**−0.16**	**0.43**	0.284
	(3.72)	(2.45)	(1.58)	(1.76)	(3.93)	(0.86)	(1.40)		(0.95)	(3.62)	(1.38)	(4.97)	(−3.28)	(14.40)	
CMA	**0.19**	0.01	0.00	**−0.05**	0.00	**0.83**	**0.05**	0.920	0.05	**−0.05**	**−0.12**	**−0.10**	**0.45**	**0.13**	0.654
	(2.92)	(0.70)	(0.99)	(−7.48)	(0.18)	(55.94)	(5.98)		(1.19)	(−5.55)	(−8.12)	(−5.34)	(19.01)	(9.22)	
CMA^{DRS}	**0.30**	0.07	**0.03**	**0.05**	**0.12**	**0.80**	**0.04**	0.582	−0.02	**0.01**	**−0.03**	**0.03**	**0.77**	**0.09**	0.833
	(4.02)	(1.33)	(2.06)	(2.96)	(4.98)	(20.66)	(1.68)		(−0.56)	(1.84)	(−2.77)	(2.09)	(40.82)	(7.93)	
CMA^{CFS}	0.04	−0.07	**0.03**	**−0.08**	**−0.12**	**0.69**	0.01	0.576	0.02	**−0.04**	**−0.12**	**−0.21**	**0.23**	**0.09**	0.267
	(0.61)	(−1.60)	(2.33)	(−4.69)	(−5.20)	(19.93)	(0.63)		(0.28)	(−2.98)	(−5.59)	(−7.44)	(6.48)	(4.33)	
$CMA^{DRS\text{-}CFS}$	**0.26**	**0.14**	0.00	**0.13**	**0.24**	**0.11**	0.03	0.085	−0.03	**0.06**	**0.09**	**0.24**	**0.54**	0.00	0.364
	(3.43)	(1.84)	(−0.02)	(4.78)	(6.43)	(1.84)	(0.75)		(−0.54)	(3.74)	(3.87)	(8.08)	(14.54)	(−0.08)	

Panel B: Pricing Performance for Different Test Asset Sets

		Fama-French (2015) Five-Factor Model							Adjusted Five-Factor Model						
	N	GRS	p(GRS)	Avg($\lvert\alpha\rvert$)	% Sig	$\frac{\text{Avg}(\lvert\alpha\rvert)}{\text{Avg}(\lvert\mu\rvert)}$	CS-R^2	Avg(R^2)	GRS	p(GRS)	Avg($\lvert\alpha\rvert$)	% Sig	$\frac{\text{Avg}(\lvert\alpha\rvert)}{\text{Avg}(\lvert\mu\rvert)}$	CS-R^2	Avg(R^2)
Val & Inv	20	3.611	0.000	0.091	0.400	0.640	0.622	0.948	3.661	0.000	0.090	0.300	0.633	0.616	0.928
DRS	20	1.565	0.055	0.102	0.150	0.465	0.788	0.853	1.146	0.298	0.090	0.100	0.409	0.818	0.865
CFS	20	2.290	0.001	0.114	0.300	1.088	0.021	0.885	2.053	0.005	0.102	0.200	0.980	0.214	0.866
LS	20	2.602	0.000	0.154	0.250	0.927	0.083	0.071	2.267	0.001	0.126	0.200	0.756	0.226	0.104
Val & Inv & LS	40	2.956	0.000	0.127	0.350	0.373	0.811	0.510	2.869	0.000	0.113	0.275	0.332	0.831	0.518

Table 9
Spanning Regressions: Sensitivity Analysis

This table displays results from spanning regressions that regress different versions of the value factor (VAL) on different versions of the investment factor (INV) as well as the market (MP), size (SMB), and profitability (RMW) factors, and vice versa. The sample period is from July 1964 to December 2019. The first two columns of each row depict which versions of the investment and value factors are used in the respective spanning regressions. "standard" refers to the standard factors. "ME" refers to the market-channel value factor. "sc,M" indicates that the respective factor is scaled such that it has the same volatility as the other factor and that its mean is adjusted to equal its original mean. "t,orth" indicates that the factor is first orthogonalized to the market, size, and profitability factors and then rescaled to have the same mean and standard deviation as originally. μ and σ are the factors' monthly mean returns and volatilities. μ, σ, and α are in percent. t-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

			Dependent Factor: Investment								Dependent Factor: Value							
	INV	VAL	μ	σ	α	β^{MP}	β^{SMB}	β^{RMW}	β^{VAL}	R^2	μ	σ	α	β^{MP}	β^{SMB}	β^{RMW}	β^{INV}	R^2
(1)	standard	standard	0.21***	1.82	0.34***	−0.17***	−0.03	−0.15***		0.171	0.30***	2.75	0.36***	−0.15***	0.01	0.08*		0.066
			(2.93)		(5.20)	(−11.15)	(−1.21)	(−4.81)			(2.79)		(3.38)	(−6.20)	(0.22)	(1.65)		
(2)	standard	standard	0.21***	1.82	0.20***	−0.11***	−0.03*	−0.18***	0.41***	0.525	0.30***	2.75	0.00	0.03	0.04	0.24***	1.05***	0.465
			(2.93)		(3.92)	(−9.11)	(−1.79)	(−7.76)	(22.25)		(2.79)		(−0.04)	(1.32)	(1.34)	(6.22)	(22.25)	
(3)	standard	ME	0.21***	1.82	0.17***	−0.11***	−0.05**	−0.12***	0.37***	0.495	0.35***	2.87	0.09	0.01	0.08**	0.08*	1.05***	0.427
			(2.93)		(3.34)	(−8.69)	(−2.49)	(−4.94)	(20.65)		(3.17)		(1.05)	(0.42)	(2.47)	(1.90)	(20.65)	
(4)	standard	standard	0.21***	1.82	0.14***	−0.11***	−0.03*	−0.18***	0.62***	0.525	0.30***	1.82	0.10*	0.02	0.03	0.16***	0.69***	0.465
		(sc,M)	(2.93)		(2.67)	(−9.11)	(−1.79)	(−7.76)	(22.25)		(4.21)		(1.82)	(1.32)	(1.34)	(6.22)	(22.25)	
(5)	standard	standard	0.21***	1.82	0.08				0.43***	0.425	0.30***	2.75	0.09				0.99***	0.425
	(t,orth)	(t,orth)	(2.93)		(1.41)				(22.25)		(2.79)		(1.12)				(22.25)	

Table 10
Cash Flow, Discount Rate, and Volatility News Betas of Factors

This table displays market cash flow, discount rate, and volatility news betas of the standard (HML), market-channel (HML^{ME}), book-channel (HML^{BE}), discount rate shock-driven (HML^{DRS}), and cash flow shock-driven (HML^{CFS}) value factors as well as the standard (CMA), discount rate shock-driven (CMA^{DRS}), and cash flow shock-driven (CMA^{CFS}) investment factors. The betas are estimated from multivariate regressions that regress the factors' quarterly returns on the quarterly news terms estimated by Campbell et al. (2018). The sample period is from July 1964 to December 2011. t-statistics are reported in parentheses and are calculated based on the approach of Shanken (1992). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Constant	β^{CF}	β^{DR}	β^{V}	R^2
HML	1.14***	0.27***	−0.24***	−0.78***	0.351
	(3.38)	(3.18)	(−5.30)	(−5.79)	
HML^{ME}	1.31***	0.29***	−0.17***	−0.87***	0.288
	(3.52)	(3.15)	(−3.38)	(−5.86)	
HML^{BE}	−0.07	0.44***	−0.15***	−0.41**	0.178
	(−0.17)	(4.43)	(−2.76)	(−2.53)	
$HML^{ME\text{-}BE}$	1.37***	−0.15	−0.02	−0.46***	0.068
	(3.60)	(−1.60)	(−0.38)	(−3.03)	
HML^{DRS}	2.04***	0.22*	−0.21***	−0.76***	0.196
	(4.45)	(1.89)	(−3.36)	(−4.14)	
HML^{CFS}	0.61	0.32***	−0.18***	−0.83***	0.282
	(1.61)	(3.46)	(−3.46)	(−5.49)	
$HML^{DRS\text{-}CFS}$	1.44***	−0.11	−0.03	0.07	0.010
	(3.81)	(−1.15)	(−0.64)	(0.45)	
CMA	0.83***	0.06	−0.21***	−0.29***	0.280
	(3.49)	(1.07)	(−6.47)	(−3.09)	
CMA^{DRS}	1.25***	0.07	−0.18***	−0.33***	0.199
	(4.57)	(1.06)	(−4.72)	(−3.04)	
CMA^{CFS}	0.28	0.12*	−0.12***	−0.21*	0.108
	(1.00)	(1.78)	(−3.17)	(−1.90)	
$CMA^{DRS\text{-}CFS}$	0.97***	−0.05	−0.06	−0.12	0.023
	(3.17)	(−0.67)	(−1.33)	(−0.98)	

Table 11
Market Equity Changes, Book Equity Changes, and Investment in Different Subsamples

This table displays time-series averages of regression coefficients from annual Fama-MacBeth (1973) regressions. The regressions are estimated at the end of each June from 1968 to 2019 using common US stocks traded on the NYSE, AMEX, or NASDAQ. The dependent variable is investment. The independent variables are five-year lagged book-to-market (Lagged BM), the change in book equity (dBE), and the change in market equity (dME). The variables are constructed as described in Appendix A, are measured at the end of June, and are winsorized at the 0.5% and 99.5% levels. dBE and dME are the annual log changes in the book equity and the market equity used in the calculation of BM. A subscript $t-l$ indicates that the respective variable is lagged by l years. The regressions are estimated with weighted least squares with the stocks' market capitalizations as weights. R^2 is the average adjusted R-squared across all annual regressions. T is the number of annual Fama-MacBeth (1973) regressions. Column "All" uses in each annual regression all common US stocks traded on the NYSE, AMEX, or NASDAQ. Column "NSI (MV)" ("NSI (FV)") uses only firms whose net share issues across the next fiscal year are below the 25th or above the 75th percentile (between the 25th and 75th percentile) of NYSE stocks' net share issues. Column "Ret3Y (MV)" ("Ret3Y (FV)") uses only firms whose three-year ahead returns beginning from the last fiscal year ending are below the 25th or above the 75th percentile (between the 25th and 75th percentile) of NYSE stocks' three-year ahead returns. Column "MFHS (low)" ("MFHS (high)") uses only firms whose mutual fund hypothetical sales across the previous fiscal year are, in absolute terms, below (above) the median of NYSE stocks' mutual fund hypothetical sales. Column "Payout (Con)" ("Payout (Uncon)") uses only firms whose payout-to-book ratios are below (above) the median of NYSE stocks' payout-to-book ratios. Column "Rating (Con)" ("Rating (Uncon)") uses only firms with debt outstanding but no S&P long-term debt rating and firms whose debt is in default (firms without debt outstanding and firms with an S&P long-term debt rating and whose debt is not in default). Column "KZ Index (Con)" ("KZ Index (Uncon)") uses only firms whose Kaplan-Zingales index values are above (below) the median of NYSE stocks' Kaplan-Zingales index values. t-statistics are reported in parentheses and are computed using Newey-West (1987) heteroskedasticity-robust standard errors with five lags. Boldface indicates significance at the 10% level.

	All	NSI (FV)	NSI (MV)	Ret3Y (FV)	Ret3Y (MV)	MFHS (low)	MFHS (high)	Payout (Uncon)	Payout (Con)	Rating (Uncon)	Rating (Con)	KZ Index (Uncon)	KZ Index (Con)
Intercept	**0.026**	**0.029**	**0.025**	**0.028**	**0.029**	**0.018**	**0.015**	**0.029**	**0.024**	**0.028**	**0.025**	**0.022**	**0.032**
	(3.50)	(4.16)	(2.84)	(3.64)	(4.03)	(2.58)	(3.16)	(3.48)	(3.56)	(3.83)	(3.36)	(2.58)	(4.44)
Lagged BM	**−0.017**	**−0.017**	**−0.017**	**−0.015**	**−0.016**	**−0.024**	**−0.021**	**−0.016**	**−0.024**	**−0.015**	**−0.019**	**−0.013**	**−0.023**
	(−4.34)	(−2.64)	(−4.25)	(−4.05)	(−3.48)	(−5.10)	(−5.97)	(−3.45)	(−7.82)	(−4.18)	(−4.41)	(−2.74)	(−6.68)
dBE	**0.397**	**0.441**	**0.374**	**0.428**	**0.383**	**0.422**	**0.404**	**0.398**	**0.437**	**0.428**	**0.370**	**0.481**	**0.329**
	(15.75)	(15.07)	(11.74)	(14.53)	(16.36)	(14.16)	(14.78)	(11.73)	(16.84)	(13.53)	(18.61)	(11.69)	(15.03)
dBE_{t-1}	**0.029**	**0.020**	**0.035**	**0.021**	**0.041**	**0.027**	**0.030**	**0.028**	**0.019**	**0.022**	**0.033**	0.013	**0.037**
	(3.40)	(2.91)	(3.14)	(1.90)	(4.33)	(2.11)	(2.52)	(2.27)	(1.88)	(1.92)	(3.72)	(0.68)	(3.97)
dBE_{t-2}	**0.029**	**0.026**	**0.024**	**0.029**	**0.034**	0.013	0.024	**0.021**	0.014	**0.020**	**0.034**	**0.036**	**0.015**
	(2.98)	(1.86)	(1.77)	(2.07)	(3.20)	(1.51)	(1.49)	(1.84)	(1.10)	(1.85)	(4.17)	(2.44)	(2.08)
dBE_{t-3}	**0.018**	0.018	0.019	0.013	**0.019**	**0.033**	0.008	**0.026**	−0.008	0.010	**0.015**	**0.025**	0.011
	(2.31)	(1.40)	(1.39)	(1.42)	(1.65)	(2.61)	(1.33)	(1.89)	(−1.07)	(1.04)	(2.25)	(1.96)	(1.39)
dBE_{t-4}	−0.001	−0.019	0.012	−0.008	0.007	−0.012	−0.003	−0.012	0.000	0.009	−0.002	0.005	**−0.010**
	(−0.11)	(−1.26)	(1.61)	(−0.82)	(0.71)	(−0.73)	(−0.44)	(−0.78)	(−0.05)	(0.69)	(−0.35)	(0.33)	(−2.04)
dME	**0.075**	**0.069**	**0.079**	**0.067**	**0.072**	**0.079**	**0.073**	**0.072**	**0.063**	**0.062**	**0.087**	**0.078**	**0.066**
	(7.50)	(5.12)	(8.72)	(7.35)	(7.22)	(7.33)	(6.09)	(6.10)	(9.07)	(5.03)	(9.10)	(5.78)	(8.42)
dME_{t-1}	**0.049**	**0.035**	**0.064**	**0.039**	**0.059**	**0.046**	**0.042**	**0.036**	**0.061**	**0.035**	**0.070**	**0.042**	**0.059**
	(7.05)	(5.75)	(6.86)	(4.72)	(6.48)	(6.36)	(6.63)	(3.76)	(14.68)	(3.71)	(8.98)	(4.08)	(12.72)
dME_{t-2}	**0.042**	**0.037**	**0.047**	**0.037**	**0.041**	**0.046**	**0.039**	**0.036**	**0.052**	**0.041**	**0.042**	**0.030**	**0.055**
	(6.73)	(4.26)	(5.79)	(5.52)	(6.19)	(5.14)	(5.47)	(4.75)	(8.60)	(4.85)	(13.12)	(3.42)	(10.24)
dME_{t-3}	**0.029**	**0.027**	**0.031**	**0.028**	**0.027**	**0.028**	**0.037**	**0.025**	**0.038**	**0.034**	**0.023**	**0.018**	**0.034**
	(4.39)	(3.72)	(4.91)	(4.08)	(3.95)	(3.37)	(5.69)	(2.38)	(8.47)	(4.04)	(2.52)	(1.86)	(6.18)
dME_{t-4}	**0.028**	**0.030**	**0.024**	**0.026**	**0.027**	**0.032**	**0.028**	**0.028**	**0.032**	**0.027**	**0.030**	**0.024**	**0.029**
	(5.50)	(5.02)	(4.01)	(4.13)	(7.50)	(4.92)	(4.53)	(4.74)	(5.23)	(4.05)	(5.63)	(3.39)	(4.08)
R^2	0.504	0.510	0.532	0.501	0.531	0.557	0.482	0.452	0.604	0.504	0.517	0.519	0.561
T	52	51	51	50	50	39	39	52	52	52	52	52	52