Replicating Anomalies

Kewei Hou*
The Ohio State University and CAFR

Chen Xue†
University of Cincinnati

Lu Zhang‡
The Ohio State University and NBER

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Abstract

Most anomalies fail to replicate. This paper replicates the anomalies literature by compiling a large data library with 452 anomalies. With microcaps controlled for via NYSE breakpoints and value-weighted returns, 294 anomalies (65%), including 102 (96%) out of 106 trading frictions variables, fail to replicate at the 5% threshold. Imposing the absolute t-cutoffs of 2.78 and 3.39 to adjust for multiple testing raises the number of failed replications further to 371 (82%) and 412 (91%), respectively. Even for the 158 replicated anomalies, their magnitudes are much lower than originally reported. In all, capital markets are more efficient than previously recognized.

*Fisher College of Business, The Ohio State University, 820 Fisher Hall, 2100 Neil Avenue, Columbus OH 43210; and China Academy of Financial Research (CAFR). Tel: (614) 292-0552. E-mail: hou.28@osu.edu.

†Lindner College of Business, University of Cincinnati, 405 Lindner Hall, Cincinnati, OH 45221. Tel: (513) 556-7078. E-mail: xuecx@ucmail.uc.edu.

‡Fisher College of Business, The Ohio State University, 760A Fisher Hall, 2100 Neil Avenue, Columbus OH 43210; and National Bureau of Economic Research (NBER). Tel: (614) 292-8644. E-mail: zhanglu@fisher.osu.edu.

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1 Introduction

This paper replicates the bulk of the published anomalies literature in finance and accounting by compiling a large data library with 452 anomaly variables. We adopt a common set of replication procedures. To ensure the reliability and robustness of the anomalies in question, we control for microcaps (stocks that are smaller than the 20th percentile of the market equity for New York Stock Exchange, or NYSE, stocks). In particular, we form testing deciles with NYSE breakpoints and value-weighted returns. We treat an anomaly as a replication success if the average return of its high-minus-low decile is significant at the traditional 5% threshold ($|t| \geq 1.96$).

Most anomalies fail to replicate. Out of 452 anomalies, 294 (65%) cannot be replicated. Imposing the absolute t-cutoffs of 2.78 and 3.39 per Harvey, Liu, and Zhu (2016) to adjust for multiple testing raises the number of failed replications further to 371 (82%) and 412 (91%), respectively.

The biggest casualty is the trading frictions literature. In the category that contains mostly liquidity, market microstructure, and other types of trading frictions variables, 102 out of 106 anomalies (96%) fail to replicate. Prominent anomalies that do not survive our replication include the Jegadeesh (1990) short-term reversal; the Datar-Naik-Radcliffe (1998) share turnover; the Chordia-Subrahmanyam-Anshuman (2001) coefficient of variation for dollar trading volume; the Amihud (2002) absolute return-to-volume; the Easley-Hvidkjaer-O'Hara (2002) probability of informed trading; the Pastor-Stambaugh (2003) liquidity beta; the Acharya-Pedersen (2005) liquidity betas; the Ang-Hodrick-Xing-Zhang (2006) idiosyncratic volatility, total volatility, and systematic volatility; the Liu (2006) number of zero daily trading volume; and the Corwin-Schultz (2012) high-low bid-ask spread. Several recently proposed frictions variables also fail to replicate, including the Bali-Cakici-Whitelaw (2011) maximum daily return, the Adrian-Etula-Muir (2014) financial intermediary leverage beta, and the Kelly-Jiang (2014) tail risk.

The distress anomaly is virtually nonexistent in our replication. The Campbell-Hilscher-Szilagyi (2008) failure probability, the O-score and Z-score studied in Dichev (1998), and the Avramov-

Chordia-Jostova-Philipov (2009) credit rating yield mostly insignificant average return spreads.

Other influential and widely cited anomalies that fail to replicate include the Bhandari (1988) debt-to-market; the Lakonishok-Shleifer-Vishny (1994) five-year sales growth; the La Porta (1996) long-term analysts' forecasts; several of the Abarbanell-Bushee (1998) fundamental signals; the Piotroski (2000) fundamental score; the Diether-Malloy-Scherbina (2002) dispersion in analysts' forecasts; the Gompers-Ishii-Metrick (2003) corporate governance index; the Francis-LaFond-Olsson-Schipper (2004) earnings attributes, including persistence, smoothness, value relevance, and conservatism; the Francis-LaFond-Olsson-Schipper (2005) accrual quality; the Richardson-Sloan-Soliman-Tuna (2005) total accruals; and the Fama-French (2015) operating profitability.

Even for replicated anomalies, their economic magnitudes are much lower than originally reported. Famous examples include the Jegadeesh-Titman (1993) price momentum; the Lakonishok-Shleifer-Vishny (1994) cash flow-to-price; the Sloan (1996) operating accruals; the Chan-Jegadeesh-Lakonishok (1996) earnings momentum formed on standardized unexpected earnings, abnormal returns around earnings announcement dates, and revisions in analysts' earnings forecasts; the Cohen-Frazzini (2008) customer momentum; and the Cooper-Gulen-Schill (2008) asset growth.

Why does our replication differ so much from original studies? The key word is microcaps. Fama and French (2008) show that microcaps represent only 3% of the aggregate market capitalization of the NYSE-Amex-NASDAQ universe, but account for 60% of the number of stocks. Microcaps not only have the highest equal-weighted returns, but also the largest cross-sectional dispersions in returns and in anomaly variables among microcaps, small stocks, and big stocks. Many studies overweight microcaps with equal-weighted returns, and often together with NYSE-Amex-NASDAQ breakpoints in portfolio sorts. Hundreds of studies use Fama-MacBeth (1973) cross-sectional regressions of returns on anomaly variables, mostly with ordinary least squares, which can assign even higher weights to microcaps than equal-weights in sorts. Regressions impose a linear functional form, making them more susceptible to outliers, which are most likely microcaps. Alas, due to high costs in trading these stocks, anomalies in microcaps are more apparent than real. More important, with only 3% of the aggregate market equity, the economic importance of microcaps is small.

Our low replication rate of only 35% is not due to our extended sample through December 2016. Repeating our tests on the shorter, original samples, we find that 295 (65%) anomalies fail to clear the hurdle of $|t| \geq 1.96$, including 97 out of 106 variables (91.5%) in the trading frictions category. Imposing the $|t|$-cutoffs of 2.78 and 3.39 raises the overall number of failed replications further to 378 (84%) and 417 (92%), respectively. These results are quantitatively close to those in the extended sample. As such, most anomalies have never existed in the original samples.

Overweighting microcaps via NYSE-Amex-NASDAQ breakpoints and equal-weighted returns in portfolio sorts or cross-sectional regressions with ordinary least squares does not cure the replication failure of the trading frictions literature, at least not completely. In their respective settings, both procedures assign microcaps a maximum amount of weight. Alas, only 42 out of 106 frictions variables (39.6%) clear the $|t| \geq 1.96$ hurdle in the sorts, and only 40 (37.7%) in cross-sectional regressions. In particular, equal-weights revive short-term reversal, share turnover, dollar trading volume, absolute return-to-volume, and the number of zero trading days, but not the probability of informed trading, the Pastor-Stambaugh (2003) liquidity beta, the Acharya-Pedersen (2005) liquidity betas, idiosyncratic volatility, the high-low bid-ask spread, or the financial intermediary leverage beta.

We follow the replication literature in economics in defining replication as "any study whose primary purpose is to establish the correctness of a previous study" (The Replication Network[1]). Hamermesh (2007) distinguishes three categories of replication. Pure replication (reproduction) is redoing a prior study in exactly the same way. Statistical replication is the same statistical model but different sample from the same underlying population. Scientific replication is different sample, different population, and similar but not identical statistical model. Hamermesh argues that scientific replication "appears much more suited in type to our methods of research and, indeed, comprises most of what economists view as replication (p. 716)." The crux is that unlike natural

[1] See https://replicationnetwork.com.

sciences, economics, finance, and accounting are mostly observational in nature. As such, it is critical to evaluate the reliability of published results against "similar but not identical" specifications. In our practice, we use the same population, different and same samples, but similar (not identical) methods. We use identical variable definitions from the original studies, but focus on sorts with NYSE breakpoints and value-weighted returns because of the economic importance. We also present results from a variety of different procedures. Notably, the 8 replication articles published in the May 2017 issue of American Economic Review all adopt the same definition of replication as we do.[2]

Our contribution is to provide a direct, large-scale replication in finance. Using a multiple testing framework, Harvey, Liu, and Zhu (2016) cast doubt on the credibility of the anomalies literature, and conclude that "most claimed research findings in financial economics are likely false (p. 5)." Harvey et al. do not attempt replication. Failing to replicate most of the published anomalies, our results lend support to Harvey et al.'s conclusion. Also complementary to our study, Chordia, Goyal, and Saretto (2018) construct a large laboratory of over two million simulated strategies, and quantify the proportion of false discoveries to be more than 90% due to multiple testing.

The rest of the paper is organized as follows. Section 2 motivates our massive effort. Section 3 describes the 452 anomalies and our replication procedures. Section 4 details the replication results. Finally, Section 5 concludes. A separate Internet Appendix furnishes supplementary results.

2 Motivating Replication

In a pioneering meta-study in finance, Harvey, Liu, and Zhu (2016) present a multiple testing framework to derive threshold levels to account for data mining. The threshold cutoff increases over

[2]For example, Berry, Coffman, Hanley, Gihleb, and Wilson (2017) define replication as "any project that reports results that speak directly to the veracity of the original paper's main hypothesis (p. 27)." Hamermesh (2017) writes: "Applied microeconomics is not a laboratory science—at its best it consists of the generation of new ideas describing economic behavior, independent of time or space. The empirical validity of these ideas, after their relevance is first demonstrated for a particular time and place, can only be usefully replicated at other times and places: If they are general descriptions of behavior, they should hold up beyond their original testing ground (p. 38)." Duvendack, Palmer-Jones, and Reed (2017) operationalize replication as "any study whose main purpose is to determine the validity of one or more empirical results from a previously published study (p. 47)." "By redoing the original data analysis, by adjusting model specifications, exploring the influence of unusual observations, using different estimation methods, and alternative datasets, replication can identify spurious or fragile results (p. 46)."

time as more anomalies are data-mined. Reevaluating 296 significant anomalies in past published studies, Harvey et al. report that 80–158 (27%–53%) are false discoveries, depending on the specific adjusting method for multiple testing.[3] Two publication biases are likely responsible for the high percentage of false discoveries. First, it is difficult to publish a non-result in top academic journals. Second, it is difficult to publish replication studies in finance and economics, while replications routinely appear in top journals in many other scientific fields. As a result, finance academics tend to focus on publishing new results, rather than rigorously verifying the reliability of published results.

Harvey (2017) elaborates a complex agency problem behind the publication biases. Editors compete for citation-based impact factors, and prefer to publish papers with the most significant results. In response, authors often file away papers with weak or non-results, instead of submitting them for publication. More disconcertingly, authors sometimes engage in specification search, i.e., selecting sample criteria and test procedures until insignificant results become significant. The likely outcome is an embarrassingly large number of false positives that cannot be replicated in the future.

Finance is only the latest field that starts to take replication seriously. In economics, Leamer (1983) exposes the fragility of empirical results to small specification changes, and proposes to "take the con out of econometrics" by reporting extensive sensitivity analyses to show how key results vary with perturbations in regression specification and functional form. Dewald, Thursby, and Anderson (1986) attempt to replicate results published in Journal of Money, Credit, and Banking, and find that inadvertent errors are so commonplace that the original results often cannot be reproduced.[4]

Initiating the replication movement, Ioannidis (2005) argues that most research findings are false for most designs and in most fields. Results are more likely to be false when the studies in a field use smaller samples, when the effect magnitudes are smaller, when there exist many but

[3]Finance academics have long warned against data mining. Lo and MacKinlay (1990) show that few studies are free of data mining, which becomes more severe as the number of studies on a single dataset increases. Fama (1998) shows that many anomalies weaken and even disappear with value-weighted returns. Conrad, Cooper, and Kaul (2003) argue that data mining can account for up to one half of the relations between characteristics and average returns. Schwert (2003) shows that after anomalies are documented, the patterns often seem to disappear, reverse, or weaken. McLean and Pontiff (2016) find that the average return spreads of 97 anomalies decline out of sample and post publication.

[4]Other influential replication studies in economics include McCullough and Vinod (2003), Chang and Li (2015), Brodeur, Lé, Sangnier, and Zylberberg (2016), and Camerer et al. (2016).

fewer theoretically predicted relations, when researchers have more degrees of freedom in designs, variable definitions, and analytical methods, when there exist greater financial and other interest and bias, and when more independent teams are involved in a field. Since Ioannidis, replication failures have been widely documented across diverse scientific disciplines.[5]

Most, if not all, of the conditions, against which Ioannidis (2005) warns, seem to apply to the anomalies literature. First, Ioannidis, Stanley, and Doucouliagos (2017) report that the median statistical power is only 18% or less from 64,076 estimates in more than 6,700 empirical studies in economics and finance. Second, for decades, the anomalies literature is largely statistical in nature. Fama and French (1992) reject the classic CAPM. The consumption CAPM often performs even worse, and is rarely used in practice. As a result, empiricists are free to explore hundreds of variables, often with little a priori hypothesizing as for why a given variable should predict returns. Third, publication biases are well documented in economics (De Long and Lang 1992; Card and Krueger 1995). Fourth, empiricists have many degrees of freedom in exploiting ambiguities in sample criteria, variable definitions, and empirical specifications, all of which are tools of chasing statistical significance. Fifth, with trillions of dollars invested in factors-based, exchange-traded funds and quantitative hedge funds worldwide, the financial interest is overwhelming. Finally, armies of academics and practitioners actively engage in searching for significant anomalies, each eager to beat competitors. As such, the anomalies literature is one of the biggest areas in finance.

3 Replication Procedures

Our replication target consists of 452 anomalies. Table 1 shows the list, which includes 57, 69, 38, 79, 103, and 106 anomalies from the momentum, value-versus-growth, investment, profitability,

[5]For example, in oncology, Prinz, Schlange, and Asadullah (2011) report that scientists at Bayer fail to reproduce two thirds of 67 published studies. Begley and Ellis (2012) report that scientists at Amgen attempt to replicate 53 landmark studies, but reproduce the original results in only 6. In psychology, Open Science Collaboration (2015), which consists of about 270 researchers, conducts replications of 100 studies published in top 3 academic journals, and reports a success rate of only 36%. Baker (2016) reports that 90% of the respondents in a survey of 1,576 scientists believe that there exists a reproducibility crisis in the published scientific literature. More than 70% of researchers have tried and failed to reproduce other scientists' experiments, and more than 50% have failed to reproduce their own experiments. Selective reporting, pressure to publish, and poor use of statistics are the three leading causes.

intangibles, and trading frictions categories, respectively. The list encompasses the bulk of the published anomalies literature. Appendix A details variable definitions and portfolio construction.

Although we vary the methods in forming portfolios and in performing cross-sectional regressions (Section 3.1), we closely follow the variable definitions in the original studies. In addition, when necessary, we perform small perturbations to the original variable definitions, such as changing the scalar of a ratio variable, to evaluate the reliability of its predictive power for returns. For monthly sorted anomalies, we include three different predictive horizons (1-, 6-, and 12-month). Chan, Jegadeesh, and Lakonishok (1996), for example, emphasize the short-lived nature of momentum, by examining how momentum profits vary with the holding period. As such, it is economically interesting to study how monthly sorted anomalies vary over different horizons.

Our sample criterion is standard. Monthly returns are from the Center for Research in Security Prices (CRSP) and accounting information from the Compustat Annual and Quarterly Fundamental Files. The sample is from January 1967 to December 2016. Financial firms and firms with negative book equity are excluded. Some studies exclude stocks with prices per share lower than $1 or $5. We do not impose such a screen because doing so has little impact on our robust procedures.

To test whether an anomaly variable predicts returns, we adopt a variety of approaches described in Section 3.1. In Section 3.2, we explain why we emphasize the reliability of sorts with NYSE breakpoints and value-weighted returns as well as cross-sectional regressions with weighted least squares. Finally, in Section 3.3, we report new evidence on why one should control for microcaps.

3.1 A Common Set of Replicating Procedures

We adopt a variety of approaches to evaluate the reliability of the predictive power of an anomaly variable. For portfolio sorts (into deciles), we vary breakpoints and return weights, including NYSE breakpoints and value-weighted returns (NYSE-VW), NYSE breakpoints and equal-weighted returns (NYSE-EW), NYSE-Amex-NASDAQ breakpoints and value-weighted returns (All-VW), as well as NYSE-Amex-NASDAQ breakpoints and equal-weighted returns (All-EW).[6] For Fama-MacBeth (1973) cross-sectional regressions, we use both ordinary least squares (FM-OLS) and weighted least squares with the market equity as the weights (FM-WLS).

For annually sorted testing deciles, we split stocks at the end of June of each year t into deciles on an anomaly variable measured at the fiscal year ending in year $t-1$, and calculate decile returns from July of year t to June of $t+1$. For monthly sorted portfolios involving the latest earnings data, we use quarterly earnings data in the months immediately after quarterly earnings announcement dates (Compustat quarterly item RDQ). For monthly sorted portfolios involving quarterly accounting data other than earnings, we impose a four-month lag between the fiscal quarter end and subsequent returns. Unlike earnings, other quarterly items are typically not available upon earnings announcement dates. Many firms announce their earnings for a given quarter through a press release, and then file SEC reports several weeks later. Easton and Zmijewski (1993) document a median reporting lag of 46 days for NYSE-Amex firms and 52 days for NASDAQ firms. Chen, DeFond, and Park (2002) report that only 37% of quarterly earnings announcements include balance sheet information.

Following Beaver, McNichols, and Price (2007), we adjust monthly returns for delisting by compounding returns in the month before delisting with delisting returns from CRSP. When a delisting return is missing, we replace it with the mean of available delisting returns of the same delisting type and stock exchange in the prior 60 months. Appendix B details our delisting adjustment procedure.

When performing monthly cross-sectional regressions, we winsorize the regressors at the 1–99% level each month to alleviate the impact of outliers. Also, different anomaly variables often have vastly different units. To make their slopes comparable, we standardize a given winsorized regressor by subtracting its cross-sectional mean, and then dividing by its cross-sectional standard deviation.

[6] In the Internet Appendix, we have also furnished supplementary results from all-but-micro breakpoints and value-weighted returns (ABM-VW), all-but-micro breakpoints and equal-weighted returns (ABM-EW), micro breakpoints and value-weighted returns (Micro-VW), as well as micro breakpoints and equal-weighted returns (Micro-EW). At each portfolio formation date, we form all-but-micro breakpoints using the sample that excludes microcaps, and form micro breakpoints using the sample that includes only microcaps. Also, when calculating decile returns, we exclude microcaps in ABM-VW and ABM-EW, and include only microcaps in Micro-VW and Micro-EW.

A slope then estimates the change in the average return when the regressor varies by 1 cross-sectional standard deviation. The slope is also the return to a zero-investment long-short portfolio (Fama 1976).[7] However, in general, the long and short sides of the slope portfolio do not have total weights that sum up to 1. As such, the magnitude of the slopes is not directly comparable to the magnitude of the average returns of the high-minus-low deciles from portfolio sorts.

For anomalies with a multi-month holding period, such as standardized unexpected earnings with the 6-month horizon, denoted Sue6, at the beginning of month t, we regress the return in month t on Sue6 known at the beginning of month $t-s$, for $s=0,1,\ldots,5$. We then take the average of the slopes from the 6 sub-regressions as the slope for Sue6 in month t, and calculate its Fama-MacBeth t-value from the time series of the average. This procedure is analogous to our portfolio construction of the Sue6 deciles, in which we take the simple average across the 6-subdeciles formed at the beginning of month $t-s$, for $s=0,1,\ldots,5$, as the return for a given decile.

In addition to their economic importance, we evaluate the statistical significance of the high-minus-low average returns from portfolio sorts and the slopes from cross-sectional regressions. We focus on the traditional, single-test absolute t-value ($|t|$) cutoff of 1.96. To adjust for multiple testing, we also adopt two additional $|t|$-cutoffs of 2.78 and 3.39. Harvey, Liu, and Zhu (2016) propose these two cutoffs based on the Benjamini-Hochberg-Yekutieli adjustment method at the 5% and 1% threshold levels of the false discovery rate (Benjamini and Hochberg 1995; Benjamini

[7] Let $R_{it+1}=b_{0t}+b_{1t}C_{it}+\epsilon_{it+1}$ be the cross-sectional regression at the beginning of month t, in which R_{it+1} is stock i's return over month t, and C_{it} is the latest known value of a given characteristic as of month t. Stack the individual returns into an $N_t\times 1$ vector, $\mathbf{R}_{t+1}$, and the individual characteristics into a vector, $\mathbf{C}_t$, in which N_t is the number of stocks in month t. Let $\mathbf{1}_t$ be an $N_t\times 1$ vector of ones, $\mathbf{X}_t\equiv[\mathbf{1}_t\ \mathbf{C}_t]$, and $\mathbf{B}_t\equiv[b_{0t}\ b_{1t}]'$. Then ordinary least squares yield $\mathbf{B}_t=\left(\mathbf{X}_t'\mathbf{X}_t\right)^{-1}\mathbf{X}_t'\mathbf{R}_{t+1}$. Rewrite $\mathbf{B}_t=\mathbf{W}_t'\mathbf{R}_{t+1}$, in which $\mathbf{W}_t\equiv[W_{0t}\ W_{1t}]=\mathbf{X}_t\left(\mathbf{X}_t'\mathbf{X}_t\right)^{-1}$ is an $N_t\times 2$ matrix of portfolio weights, with W_{0t} the weights for the intercept portfolio, and W_{1t} the weights for the slope portfolio. Also,

$$\mathbf{W}_t'\mathbf{X}_t=[W_{0t}\ W_{1t}]'[\mathbf{1}_t\ \mathbf{C}_t]=\left[\begin{array}{cc} W_{0t}'\mathbf{1}_t & W_{0t}'\mathbf{C}_t \\ W_{1t}'\mathbf{1}_t & W_{1t}'\mathbf{C}_t \end{array}\right]=\left[\begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array}\right].$$

It follows that the intercept portfolio is a unit long portfolio ($W_{0t}'\mathbf{1}_t=1$), with a spread of zero in the characteristic ($W_{0t}'\mathbf{C}_t=0$), and the slope portfolio is a zero-investment long-short portfolio ($W_{1t}'\mathbf{1}_t=0$), with a unit spread in the characteristic ($W_{1t}'\mathbf{C}_t=1$). For weighted least squares, let $\mathbf{M}_t$ be the $N_t\times N_t$ weighting matrix, in which the diagonal element for stock i is given by its value weight, and the off-diagonal elements are all zero. The regression coefficients are then given by $\mathbf{B}_t=\left(\mathbf{X}_t'\mathbf{M}_t\mathbf{X}_t\right)^{-1}\mathbf{X}_t'\mathbf{M}_t\mathbf{R}_{t+1}$, and the intercept and slope portfolio weights are given by $\mathbf{W}_t=[W_{0t}\ W_{1t}]=\mathbf{M}_t'\mathbf{X}_t\left(\mathbf{X}_t'\mathbf{M}_t\mathbf{X}_t\right)^{-1}$.

and Yekutieli 2001). Harvey et al. show that these two cutoffs are relatively stable over time.[8]

3.2 Reliable, Robust Procedures That Control for Microcaps

While reporting results from different procedures, we emphasize the reliability of sorts with NYSE breakpoints and value-weights as well as cross-sectional regressions with weighted least squares.

When forming portfolios, many studies equal-weight portfolio returns. We instead focus on value-weighting. First, value-weighting accurately reflects the wealth effect experienced by investors (Fama 1998). Second, microcaps are influential in equal-weighted returns. Microcaps are on average only 3% of the aggregate market capitalization of the NYSE-Amex-NASDAQ universe, but account for about 60% of the total number of stocks (Fama and French 2008). Due to high transaction costs, anomalies in microcaps are difficult to exploit in practice (Novy-Marx and Velikov 2016). Also, with only 3% of the aggregate market equity, microcaps are relatively unimportant on economic grounds.

Many studies also use NYSE-Amex-NASDAQ breakpoints, as opposed to NYSE breakpoints. We advocate NYSE breakpoints because the cross-sectional dispersion of anomaly variables is the largest among microcaps. Fama and French (2008) show that microcaps have the highest cross-sectional standard deviations of returns and many anomaly variables among micro, small, and big stocks. With NYSE-Amex-NASDAQ breakpoints, microcaps typically account for more than 60% of the stocks in extreme deciles. These microcaps can inflate the magnitude of anomalies, especially when combined with equal-weighted returns. In contrast, NYSE breakpoints assign a fair number of small and big stocks into extreme deciles, alleviating the impact of microcaps.

Hundreds of studies use cross-sectional regressions with ordinary least squares. We advocate univariate regressions with weighted least squares with the market equity as weights. First, ordinary least squares can be dominated by microcaps because of their plentifulness. To the extent that the slopes are returns to zero-investment portfolios, cross-sectional regressions are somewhat analogous

[8] These $|t|$-cutoffs are conservative from our perspective. Applying the Benjamini-Hochberg-Yekutieli method on our dataset of 452 anomalies yields $|t|$-cutoffs of 3.47 and 4.27 at the 5% and 1% threshold levels, respectively. Adopting these higher cutoffs clearly strengthens our conclusion that most anomalies fail to replicate.

to sorts with NYSE-Amex-NASDAQ breakpoints and equal-weights. In fact, ordinary least squares can assign even higher weights to microcaps than equal-weights in sorts. Because these regressions minimize the sum of squared errors, while imposing a linear functional form between average returns and anomaly variables, they tend to put more weights on outliers with volatile returns and extreme anomaly variables, which most likely are microcaps. Using weighted least squares alleviates the concern on overweighting microcaps. Harvey and Liu (2018) also argue that value-weighting estimates from cross-sectional regressions better capture their economic importance.

Finally, cross-sectional regressions with many variables provide an excess amount of flexibility. Leamer and Leonard (1983) show that inferences based on slopes from linear regressions are sensitive to the underlying specification.[9] For example, two individually insignificant variables that are highly correlated can appear significant when used together. Because the set of regressors included in a regression specification is ambiguous, it is common and perhaps even acceptable to explore various specifications, to search for, and then report a combination that yields "statistical significance" (Simmons, Nelson, and Simonsohn 2011). We avoid this trap by using univariate regressions.

3.3 The Economic (Un)importance of Microcaps

To further justify why microcaps must be controlled for, we provide new evidence on microcaps.

The Extreme Nature of Microcaps

Table 2 updates Fama and French's (2008) Table I in our 1967–2016 sample. Panel A shows that on average, there are 2,365 microcaps, which account for 60.7% of the total number of firms, 3,896. However, microcaps represent only 3.21% of the total market capitalization, small stocks 6.71%, and big stocks 90.09%. With equal-weights, microcaps earn on average 1.27% per month relative to 1.01% for big stocks. In contrast, the value-weighted market return of 0.91% is close to 0.9%

[9] Leamer and Leonard (1983) write: "Empirical results reported in economics journals are selected from a large set of estimated models. Journals, through their editorial policies, engage in some selection, which in turn stimulates extensive model searching and prescreening by prospective authors. Since this process is well known to professional readers, the reported results are widely regarded to overstate the precision of the estimates, and probably to distort them as well. As a consequence, statistical analyses are either greatly discounted or completely ignored (p. 306)."

for big stocks. More important, microcaps have the highest cross-sectional standard deviations of monthly returns, 19.26%, followed by small stocks, 11.85%, and then by big stocks, 8.84%. Panel B shows that for the most part, the cross-sectional dispersions in anomaly variables are also the largest for microcaps, followed by small stocks, and then big stocks.

Figure 1 documents that the economic importance of microcaps has declined in recent decades. Panel A shows that microcaps account for 47.6% of firms at the beginning of the sample. This fraction jumps to 66.6% in 1973 with the addition of NASDAQ, reaches to its maximum of 71.6% in 1987, and displays a downward trend afterward. At the end of 2016, microcaps account for 50.1% of firms. In contrast, the numbers of small and big stocks show a upward trend since the mid-1980s, and account for 22.8% and 27.2% of firms, respectively, at the end of our sample.

Panel B shows that microcaps represent 2.5% of the total market cap in 1967. This fraction increases to 4.6% with the addition of NASDAQ, reaches its maximum of 6.2% in 1984, and exhibits a downward trend afterward. At the end of 2016, microcaps represent only 1.6% of the aggregate market cap, in contrast to 5.1% for small stocks and 93.3% for big stocks. Panel C shows that the breakpoints of microcaps and small stocks have increased over the years. At the end of 2016, the 20th percentile of NYSE market equity is 724 million dollars, and the median 2.6 billion dollars.[10]

Portfolio Weights and Investment Capacity

Table 3 shows why anomalies in microcaps are more apparent than real. Panel A reports average portfolio weights on microcaps for the extreme portfolios of anomalies. The sorts with NYSE breakpoints and value-weights assign a modest amount of weights on microcaps, while the sorts with NYSE-Amex-NASDAQ breakpoints and equal-weights invest a disproportionately large amount. For example, in the momentum category, the low decile assigns on average 8% on microcaps under the former procedure, but 63.9% under the latter. In the value-versus-growth category, the high

[10]Our evidence that the economic weight of microcaps has declined in recent decades is consistent with Kahle and Stulz (2017). Kahle and Stulz document that the percentage of public firms having market equity less than $100 million in 2015 dollars has dropped dramatically, from 61.5% in 1975 to 43.9% in 1995 and to 22.6% in 2015.

decile assigns on average 7.4% on microcaps under the former procedure, but 64.2% under the latter.

Similarly, cross-sectional regressions with weighted least squares assign a modest amount of weights to microcaps, while ordinary least squares invest a disproportionately large amount. We separate each zero-investment slope portfolio into two. The short portfolio consists of individual stocks with all the negative weights, and the long portfolio all the positive weights.[11] In the investment category, for example, the short portfolio assigns on average only 3.6% to microcaps with weighted least squares, but 62.1% with ordinary least squares. In the profitability category, the long portfolio assigns 3.5% to microcaps under the former procedure, but 53.5% under the latter.

From Panel B, the investment capacity on microcaps is extremely limited. We measure a portfolio's investment capacity as $\min_i\{\mathrm{Me}_i/|w_i|\}$, in which i is the index of the stocks in the portfolio, Me_i the market equity of stock i, and w_i its portfolio weight. If $w_i > 0$, $\mathrm{Me}_i/|w_i|$ is the maximum amount from buying up all the shares of stock i, without considering the availability of shares of other stocks in the portfolio. If $w_i < 0$, $\mathrm{Me}_i/|w_i|$ is the maximum amount from short-selling all its shares. We must take the minimum $\mathrm{Me}_i/|w_i|$ across the index i, because buying or selling all the shares of any stock would exhaust the investment capacity of the portfolio.

For an equal-weighted portfolio, $w_i = \pm 1/n$, in which n is the number of stocks in the portfolio. As such, the investment capacity equals $\min_i\{\mathrm{Me}_i/|w_i|\} = n \times \min_i\{\mathrm{Me}_i\}$. Intuitively, if an equal amount of dollars is invested in each stock in the portfolio, its investment capacity is restricted by the stock with the smallest market equity. For a value-weighted portfolio, $w_i = \pm \mathrm{Me}_i/\sum_i \mathrm{Me}_i$. The investment capacity becomes $\min_i\{\mathrm{Me}_i/|w_i|\} = \min_i\{\sum_i \mathrm{Me}_i\} = \sum_i \mathrm{Me}_i$, the total market equity of all stocks in the portfolio, which is much higher than the investment capacity under equal-weights. Finally, the investment capacity for the long and short portfolios from cross-sectional regressions is also calculated as $\min_i\{\mathrm{Me}_i/|w_i|\}$, except that w_i is defined over all individual stocks (footnote 7).

Panel B of Table 3 shows that the investment capacity with NYSE breakpoints and value-weights

[11] As noted, the long and short portfolios do not have total weights that sum up to 1. To ease comparison with sorts, we scale the long and short portfolios from regressions to make their total weights equal 1 and −1, respectively.

is about several orders of magnitude larger than that with NYSE-Amex-NASDAQ breakpoints and equal-weights. For example, in the momentum category, the investment capacity of the low decile is on average 5.95% of the aggregate market capitalization with the former procedure, but only 0.02% with the latter. In the value-versus-growth category, the investment capacity of the high decile is on average 5.64% of the aggregate market equity under the former procedure, but only 0.02% with the latter. Similarly, for cross-sectional regressions, in the investment category, the investment capacity of the short portfolio with weighted least squares is on average 9.03% of the aggregate market cap, but only 0.02% with ordinary least squares. In the profitability category, the investment capacity of the long portfolio is 7.19% with the former procedure, but only 0.03% with the latter.

4 Replication Results

Section 4.1 provides a bird's eye view of our replication results. Section 4.2 details the results for individual anomalies. Section 4.3 examines the commonality underlying the replicated anomalies.

4.1 The Big Picture

We treat an anomaly as a replication success if its high-minus-low decile average return with NYSE breakpoints and value-weighted returns is significant at the 5% threshold ($|t| \geq 1.96$). For cross-sectional regressions, an anomaly is treated as a replication success if its slope from weighted least squares with the market equity as weights is significant with $|t| \geq 1.96$.

Despite our lax criterion without adjusting for multiple testing, most anomalies fail to replicate. Panel A of Table 4 shows that only 158 out of 452 anomaly variables (35%) are replicated in portfolio sorts with NYSE breakpoints and value-weighted returns. These 158 replicated anomalies include 36, 29, 28, 35, 26, and 4, which represent 63.2%, 42%, 73.7%, 44.3%, 25.2%, and 3.8% of the anomalies from the momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions categories, respectively. In particular, 96.2% of the frictions variables fail to replicate.[12]

[12] Although we control for microcaps via NYSE breakpoints and value-weighted returns, we emphasize that microcaps are still in our sample. In the Internet Appendix, we have experimented with dropping microcaps

Cross-sectional regressions with weighted least squares yield largely similar results. Only 152 anomalies (33.6%) are replicated, including 32, 21, 28, 38, 20, and 13 variables, which account for 56.1%, 30.4%, 73.7%, 48.1%, 19.4%, and 12.3% of the anomalies from the momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions categories, respectively. Still, the vast majority, 87.7%, of the frictions variables cannot be replicated.

Adjusting for multiple testing further reduces the number of replicated anomalies. With the $|t|$-cutoff of 2.78, only 81 out of 452 anomalies (17.9%) are replicated in sorts with NYSE breakpoints and value-weighted returns. Only 60 anomalies (13.3%) are replicated in cross-sectional regressions with weighted least squares (Panel B). With the higher $|t|$-cutoff of 3.39, 40 anomalies (8.9%) are replicated in the sorts, and 30 (6.6%) in the cross-sectional regressions (Panel C).

Quantifying the Impact of Microcaps

Controlling for microcaps via our robust procedures goes a long way in explaining the low replication rates, but not completely. Table 4 also reports results from portfolio sorts with NYSE-Amex-NASDAQ breakpoints and equal-weighted returns (All-EW) as well as Fama-MacBeth cross-sectional regressions with ordinary least squares (FM-OLS). Both assign a maximum amount of weights to microcaps. Under All-EW, 265 out of 452 anomalies (58.6%) are replicated, including 48, 54, 37, 44, 40, and 42, which represent 84.2%, 78.3%, 97.4%, 55.7%, 38.8%, and 39.6% of the anomalies in the momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions categories, respectively. The FM-OLS results are quantitatively close.

It is noteworthy that even with maximum weights assigned to microcaps under All-EW, 64 anomalies (60.4%) in the trading frictions category still fail to replicate. Similarly, under FM-OLS, the number of failed replications stands at 66 (62%) in the frictions category. However, overweighting microcaps is more effective in the momentum, value-versus-growth, and investment categories,

when calculating value-weighted decile returns, but after forming portfolios with NYSE breakpoints. The results are quantitatively close. Only 138 anomalies (30.5%) are replicated, including 32, 19, 26, 27, 26, and 8 from the momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions categories, respectively. As such, including microcaps in our sample increases the number of replicated anomalies from 138 to 158.

with high success rates of 84.2%, 78.3%, and 97.4% (55.7% in the profitability category).[13]

Table 4 also explores how different breakpoints and return weights affect the replication. Equal-weights are more effective than NYSE-Amex-NASDAQ breakpoints in overweighting microcaps. In sorts with NYSE-Amex-NASDAQ breakpoints and value-weighted returns (All-VW), 184 out of 452 anomalies (40.7%) are replicated with $|t| \geq 1.96$, increasing modestly from 158 with NYSE breakpoints. The increase is more substantial with NYSE breakpoints and equal-weighted returns (NYSE-EW), yielding 255 replicated anomalies (56.4%), close to 265 under All-EW.

Replication Results from the Shorter Samples in the Original Studies

Our low replication rates are not due to the extended sample through December 2016. We repeat our replication tests, but stop the sample of a given anomaly at the end of its original study. If the start of its original sample is later than January 1967, we begin our sample at the same date. Otherwise, we start in January 1967, which is the earliest date in our sample.

The results from the shorter, original samples are quantitatively close to those from the extended sample. From Panel A of Table 4, with $|t| \geq 1.96$, 157 anomalies are replicated with NYSE breakpoints and value-weighted returns, close to 158 in the extended sample. Across the momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions categories, 33, 24, 27, 42, 22, and 9 are replicated, respectively. Still, 97 anomalies (92%) in the frictions category fail to replicate. Sampling variation plays a limited role. Once the samples are extended through December 2016, 31 anomalies that are significant in the original samples become insignificant. However, 32 insignificant anomalies in the original samples become significant in the extended sample.

Cross-sectional regressions with weighted least squares yield 141 replicated anomalies (31.3%) in the shorter, original samples. As the shorter samples make it harder to clear the $|t| \geq 1.96$ hurdle,

[13] The results are quantitatively similar with microcap breakpoints and equal-weighted returns (Micro-EW, the Internet Appendix). This procedure includes only microcaps in the sample. With the cutoff of $|t| \geq 1.96$, 283 out of the 452 anomalies (62.6%) are replicated, including 50, 52, 36, 55, 46, and 44, which represent 87.7%, 75.4%, 94.7%, 69.6%, 44.7%, and 41.5% of the momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions categories, respectively. As such, most of the frictions category (58.5%) still cannot be replicated.

the number of replicated anomalies is lower than 152 in the extended sample. The number of failed replications remains at 95 (89.6%) in the trading frictions category. Sampling variation again plays a limited role. In total, 22 anomalies that are significant in the original samples lose their significance in the extended sample. However, 33 insignificant anomalies in the original samples gain their significance in the extended sample. On net, the longer sample yields 11 more significant anomalies. Finally, without going through the details, we can report that the results adjusted for multiple testing from the original samples are also largely similar to those from the extended sample.

We interpret the evidence as saying that most anomalies have never existed in the original samples. In particular, the evidence does not lend support to the notion that post publication trading aimed to exploit mispricing opportunities has made the anomalies disappear in the extended sample.

4.2 Individual Anomalies

In this subsection, we detail the replication results for individual anomalies. We compare our estimates with those from the original studies in terms of economic magnitudes and statistical significance. We show that even for replicated anomalies, their magnitudes are much lower than originally reported. We explore possible procedural sources for the differences.

For each of the 452 anomalies, Table 5 reports the average returns of the high-minus-low deciles from different breakpoints and return weights, including NYSE-VW, NYSE-EW, All-VW, and All-EW, the univariate Fama-MacBeth slopes with weighted least squares (FM-WLS) and with ordinary least squares (FM-OLS), as well as their absolute t-values. For NYSE-VW and FM-WLS, we report results from both the extended sample and the shorter samples in the original studies (NYSE-VW-SS and FM-WLS-SS, respectively). Our discussion proceeds category by category.

Momentum

Panel A of Table 5 reports the replication results for the 57 momentum anomalies.

With NYSE-VW, the high-minus-low earnings surprise (Sue) deciles at the 1-, 6-, and 12-month horizons earn on average 0.46%, 0.16%, and 0.08% per month ($t = 3.48$, 1.44, and 0.73), respectively. These estimates are lower than those in Chan, Jegadeesh, and Lakonishok (1996), who report 6- and 12-month buy-and-hold returns of 6.8% and 7.5% (1.13% and 0.63% per month), respectively. Equal-weighting decile returns as in Chan et al. partially explains the differences. With All-EW, we estimate the average returns to be 1.34%, 0.64%, and 0.24% ($t = 10.33$, 5.3, and 2.15), respectively.

The high-minus-low deciles on abnormal returns around earnings announcements (Abr) earn on average 0.7%, 0.33%, and 0.23% per month at the 1-, 6-, and 12-month ($t = 5.45$, 3.41, and 2.99), respectively, with NYSE-VW. The 6- and 12-month estimates are smaller than the buy-and-hold returns of 5.9% and 8.3% (0.98% and 0.69% per month), respectively, over the same horizons in Chan, Jegadeesh, and Lakonishok (1996). The high-minus-low deciles on revisions in analysts' earnings forecasts (Re) earn on average 0.75%, 0.47%, and 0.24% ($t = 3.18$, 2.24, and 1.3) at the 1-, 6- and 12-month, respectively. The 6- and 12-month estimates are again smaller than the buy-and-hold returns of 7.7% and 9.7% (1.28% and 0.81% per month) in Chan et al., respectively.

Price momentum fares well in our replication. In particular, the high-minus-low decile on the prior 6-month return with the 6-month horizon ($R^6 6$) earns on average 0.82% per month ($t = 3.5$) with NYSE-VW. This estimate is smaller than 1.1% ($t = 3.61$) reported in Jegadeesh and Titman (1993). We replicate their estimate with All-EW (closest to their procedure) in their original sample, and obtain 1.18% ($t = 4.22$) (untabulated). However, this estimate falls to 0.7% ($t = 2.63$) in the extended sample. The estimate is 1.06% ($t = 3.82$) in the original sample with NYSE-VW.

The high-minus-low tax expense surprise (Tes) deciles at the 1-, 6-, and 12-month earn average returns of 0.23%, 0.24%, and 0.16% per month ($t = 1.41$, 1.68, and 1.19), respectively. These NYSE-VW estimates are lower than the 3-month buy-and-hold return of 3.9% (1.3% per month) in Thomas and Zhang (2011) based on All-EW. With All-EW, our estimates are at most 0.85% ($t = 8.03$). The remaining difference likely arises from the time lag between the fiscal quarter end and subsequent returns. While Thomas and Zhang impose a three-month lag, we adopt a four-month lag.

The high-minus-low segment momentum (Sm) deciles at the 1-, 6-, and 12-month earn average returns of 0.53%, 0.09%, and 0.12% per month (t = 2.36, 0.94, and 1.94), respectively, with NYSE-VW. The 0.53% estimate is lower than 0.95% in Cohen and Lou (2012), who use NYSE-Amex-NASDAQ breakpoints, and impose a price screen of $5. Using their breakpoints has little impact on our estimate (All-VW). As such, the difference mainly arises from the $5 price screen. We also show that the average return is highly sensitive to the holding period.

The high-minus-low customer momentum (Cm) quintiles earn on average 0.78%, 0.16%, and 0.15% per month (t = 3.85, 1.72, and 2.23) at the 1-, 6-, and 12-month, respectively, with NYSE-VW. Following Cohen and Frazzini (2008), we form quintiles because many firms have the same Cm values, giving rise to fewer than ten portfolios in some months. The 0.78% estimate is substantially lower than 1.58% (t = 3.79) in Cohen and Frazzini based on NYSE-Amex-NASDAQ breakpoints and the $5 price screen. The difference again mainly arises from the price screen.

Finally, the high-minus-low deciles on the industry lead-lag effect in earnings surprise (Ile) at the 1-, 6-, and 12-month earn on average 0.58%, 0.23%, and 0.09% (t = 3.48, 1.55, and 0.64), respectively, with NYSE-VW. In contrast, Hou (2007) reports highly significant effects at short horizons via weekly cross-sectional regressions with ordinary least squares. However, the industry lead-lag effect in prior returns (Ilr) is significant across all horizons with NYSE-VW.

Value-versus-growth

Panel B of Table 5 reports the replication results for the 68 value-versus-growth anomalies.

Several high-profile value-versus-growth variables fail to replicate. The average returns of the high-minus-low debt-to-market equity (Dm) deciles with NYSE-VW, ranging from 0.28% to 0.33%, are insignificant in annual and monthly sorts at all horizons. The insignificant estimates contrast with those from Bhandari (1988) from cross-sectional regressions with the size, beta, and Dm portfolios as testing assets. Overweighting microcaps via equal-weights clears the average returns over the $|t| \geq 1.96$ hurdle. Dividend yield (Dp) and payout yield (Op) are also insignificant in annual sorts and all monthly sorts with NYSE-VW. The evidence contrasts with Litzenberger and Ramaswamy's (1979) results on Dp from cross-sectional regressions, as well as Boudoukh, Michaely, Richardson, and Roberts's (2007) results on Op based on NYSE breakpoints but equal-weighted returns.

The high-minus-low five-year sales growth (Sr) decile with NYSE-VW earns an average return of only −0.19% per month ($t = -1.08$). This estimate is much smaller in magnitude than −7.3% per annum (−0.61% per month) in Lakonishok, Shleifer, and Vishny (1994) based on NYSE-Amex breakpoints and equal-weighted returns (no NASDAQ stocks). Sampling variation plays a role, as our NYSE-VW estimate is −0.45% ($t = -1.97$) in their 1963–1990 original sample. Overweighting microcaps also plays a role, as the All-EW estimate in our extended sample is −0.52% ($t = -3.65$).

Net debt-to-price (Ndp) is insignificant in annual sorts and monthly sorts at all horizons with NYSE-VW. The average returns range from 0.16% to 0.28% per month, and t-values from 0.66 to 1.52. The estimates are much lower than 8.7% per annum (0.73% per month) in Penman, Richardson, and Tuna (2007) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted size-adjusted returns. While individual size-adjusted returns are equal-weighted, the size portfolio returns in the adjustment are value-weighted. With All-EW, our estimate is 0.44% ($t = 2.17$) in annual sorts, but those from monthly sorts remain insignificant.

The high-minus-low decile on long-term analysts' forecasts (Ltg) yields 0.13% per month ($t = 0.38$) with NYSE-VW. This estimate differs drastically from −20.9% per annum (−1.74% per month) in La Porta (1996) with NYSE-Amex breakpoints and equal-weighted returns (no NASDAQ stocks). With All-EW, our estimates are −0.38% ($t = -0.99$) in the extended sample and −0.47% ($t = -0.72$) in La Porta's original 1982–1991 sample. A potential reason why we fail to replicate La Porta's estimate is that I/B/E/S has implemented large-scale and nonrandom revisions to its data (Ljungqvist, Malloy, and Marston 2009). However, based on the latest data, Ltg fails to predict returns regardless of sorting frequency, breakpoints, and return weights.

Turning to the replicated anomalies, Panel B shows that the annually sorted high-minus-low book-to-market (Bm) decile earns on average 0.54% per month ($t = 2.61$) with NYSE-VW. The estimate is 1.41% ($t = 3.1$) in Rosenberg, Reid, and Lanstein's (1985) original sample from January 1973 to September 1984, which is probably too short to be representative. The estimate is 0.69% ($t = 2.39$) from January 1967 to December 1990, which is the sample in Fama and French (1992).

Many other value-versus-growth anomaly variables predict returns reliably, although the average returns are lower in magnitude than original estimates, which often overweight microcaps. For example, the high-minus-low cash flow-to-price (Cp) decile with NYSE-VW earns on average 0.43% per month ($t = 2.14$). This estimate is much lower than 9.9% per annum (0.83% per month) in Lakonishok, Shleifer, and Vishny (1994) based on NYSE-Amex breakpoints and equal-weighted returns (no NASDAQ stocks). For comparison, our All-EW estimate is 0.97% ($t = 5.07$).

In addition, sorting on operating cash flow-to-price (Ocp) yields an average return spread of 0.7% ($t = 3.14$) with NYSE-VW. This estimate is much lower than 14.9% per annum (1.24% per month) in Desai, Rajgopal, and Venkatachalam (2004) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. For comparison, our All-EW estimate is 0.89% ($t = 4.34$).

Asness and Frazzini (2013) show that using the more updated market equity strengthens the predictive power of the value-versus-growth variables. To incorporate their insight, we form monthly sorted value-versus-growth deciles with the most recent market equity and quarterly accounting variables. Consistent with Asness and Frazzini, the monthly sorted deciles generally yield higher average return spreads, especially at the 1-month horizon, than annually sorted deciles. The monthly sorted high-minus-low deciles on earnings-to-price (Ep^{q}), Cp^{q}, enterprise multiple (Em^{q}), and sales-to-price (Sp^{q}), all at the 1-month horizon, earn on average 0.93%, 0.62%, −0.71%, and 0.59% per month ($t = 4.94$, 2.93, −3.21, and 2.39), which are higher in magnitude than 0.44%, 0.43%, −0.54%, and 0.5% ($t = 2.26$, 2.14, −2.86, and 2.37), respectively, for the annually sorted deciles.

Investment

Panel C of Table 5 details the replication results for the 38 investment anomalies.

The high-minus-low decile on total accruals (Ta) earns an average return of -0.22% ($t = -1.63$) with NYSE-VW. In contrast, Richardson, Sloan, Soliman, and Tuna (2005) report an average return of -13.3% per annum (-1.11% per month, $t = -10.25$) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted size-adjusted returns. Although individual size-adjusted returns are equal-weighted, the size portfolio returns in the adjustment are value-weighted. For comparison, our All-EW estimate is -0.53% ($t = -3.29$). The high-minus-low deciles on net external finance (Nxf) and net equity finance (Nef) earn on average -0.29% and -0.18% ($t = -1.58$ and -0.96), which are lower in magnitude than -15.5% and -11.2% per annum (-1.29% and -0.93% per month, $t = -5.7$ and -3.82), respectively, in Bradshaw, Richardson, and Sloan (2006) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted size-adjusted returns. For comparison, our All-EW estimates are -0.99% and -0.78% ($t = -5.85$ and -3.57), respectively.

The high-minus-low operating accruals (Oa) decile with NYSE-VW earns -0.27% per month, albeit significant ($t = -2.19$). This estimate is much lower in magnitude than -10.4% per annum (-0.87% per month, $t = -4.71$) in Sloan (1996). Sloan uses NYSE-Amex breakpoints (no NASDAQ stocks) and equal-weighted size-adjusted returns, in which the size deciles are value-weighted.

The high-minus-low investment-to-assets (I/A) decile with NYSE-VW earns on average -0.44% per month ($t = -2.89$). This estimate is much lower in magnitude than -1.05% ($t = -5.04$) with value-weighted returns and -1.73% ($t = -8.45$) with equal-weighted returns in Cooper, Gulen, and Schill (2008), who use NYSE-Amex-NASDAQ breakpoints. For comparison, our All-VW estimate is -0.56% ($t = -3.4$), and the All-EW estimate -1.27% ($t = -6.99$) in the extended sample.

Profitability

Panel D of Table 5 details the replication results for the 79 anomalies in the profitability category.

The return on equity (Roe) is significant mostly within short horizons with NYSE-VW. The high-minus-low deciles earn on average 0.68%, 0.42%, and 0.23% ($t = 3.12$, 1.98, and 1.18) at the 1-, 6-, and 12-month horizons, respectively. The 1-month evidence is consistent with Hou, Xue, and

Zhang (2015). More generally, many different profitability measures have recently been proposed to predict returns, but not all are equally effective. The high-minus-low gross profits-to-lagged assets (Gla) decile earns an average return of only 0.16% per month ($t = 1.04$). This estimate is lower than 0.38% ($t = 2.62$) for the high-minus-low gross profits-to-assets (Gpa) decile. The difference between Gla and Gpa is that Gla scales gross profits with 1-year-lagged assets, but Gpa scales with current assets. Because both profits and assets are measured at the end of a period in Compustat, profits should be scaled by lagged assets, which in turn produce current profits. In contrast, the current assets at the end of a period are accumulated through investment over the current period, and start to generate profits only in future periods. More important, because Gpa equals Gla divided by asset growth, the Gpa premium is confounded with the investment premium. Purging the investment premium yields an economically small and statistically insignificant gross profitability premium.

Operating profits-to-book equity (Ope), which is the sorting variable underlying the Fama-French (2015) robust-minus-weak profitability factor (RMW), is also insignificant. The high-minus-low Ope decile with NYSE-VW earns an average return of only 0.27% per month ($t = 1.34$). Ope scales operating profits with the current book equity. Scaling with the 1-year-lagged book equity as in operating profits-to-lagged book equity (Ole) reduces the estimate further to 0.11% ($t = 0.58$).

Ball, Gerakos, Linnainmaa, and Nikolaev (2015) add research and development expenses to operating profits, and show that the high-minus-low operating profits-to-assets (Opa) decile earns on average 0.29% ($t = 1.95$). We replicate their result with an average return of 0.41% ($t = 2.09$). However, scaling their operating profits with the lagged assets as in operating profits-to-lagged assets (Ola) reduces the average return to 0.2% ($t = 1.11$).

The fundamental score (F) is also insignificant. The high-minus-low decile with NYSE-VW earns only 0.29% per month ($t = 1.11$), which is lower than 23.5% per annum (1.96% per month, $t = 5.59$) for the high-minus-low quintile in Piotroski (2000) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns in a subsample of value stocks. Our All-EW estimate is

0.46% ($t = 2.06$). Sampling variation plays a role. In Piotroski's 1976–1996 original sample, our estimates are 0.65% ($t = 2.19$) with NYSE-VW and 0.76% ($t = 3$) with All-EW. However, the monthly formed F-score (F^q) is significant over all horizons in the extended sample. For example, at the 1-month, the high-minus-low decile earns on average 0.52% ($t = 2.32$) with NYSE-VW.

The distress anomaly is virtually nonexistent. In annual sorts with NYSE-VW, the high-minus-low failure probability (Fp) decile earns an average return of −0.39% per month ($t = -1.35$) from July 1976 to December 2016. This estimate is lower in magnitude than −9.66% per annum (0.81% per month) in Campbell, Hilscher, and Szilagyi (2008) in their 1981–2003 sample. We replicate their estimate in their sample with an average return of −0.82% ($t = -2.09$). However, prior to their sample, the average return is strongly positive, 0.69% from July 1976 to December 1980 (−0.02% from January 2004 onward). Finally, while Campbell et al. use NYSE-Amex-NASDAQ breakpoints, we use NYSE breakpoints. For comparison, our All-VW estimate is −0.55% ($t = -1.5$).

Several alternative measures of financial distress, such as Altman's (1968) Z-score (Z), Ohlson's (1980) O-score (O), and credit rating (Cr), show even weaker forecasting power than failure probability. None of the high-minus-low deciles with NYSE-VW show any significant average returns. The high-minus-low O decile earns on average −0.09% per month ($t = -0.48$) in annual sorts, and the high-minus-low Z decile 0.01% ($t = 0.06$). These estimates contrast with those in Dichev (1998), who reports an average return of −1.17% ($t = -3.36$) for the highest-10%-minus-lowest-70% O portfolio based on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns, and a significantly positive slope for Z-score in cross-sectional regressions. Sampling variation plays a role. The high-minus-low O decile earns −0.6% ($t = -2.05$) in Dichev's original sample, but Z-score remains weak.

Finally, the high-minus-low credit rating (Cr) deciles all earn average returns that are close to zero. These estimates contrast with Avramov, Chordia, Jostova, and Philipov (2009), who report an average return of −1.09% per month ($t = -2.61$) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. Our All-EW estimate is −0.63% ($t = -1.53$) in the extended sample, but −0.88% (t = −1.96) in their 1985–2007 original sample. In addition to the procedural and sample differences, another difference is that Avramov et al. use credit ratings data from Ratings Xpress, to which we do not have access, because it has been discontinued on WRDS.

Intangibles

Panel E of Table 5 details the replication results for the 103 anomalies in the intangibles category.

R&D-to-sales (Rds), the Kaplan-Zingales index (Kz), and the Whited-Wu index (Ww) are all insignificant in annual sorts and monthly sorts at all horizons with NYSE-VW. This evidence replicates the insignificant results in Chan, Lakonishok, and Sougiannis (2001), Lamont, Polk, and Saa-Requejo (2001), and Whited and Wu (2006), respectively.

The high-minus-low hiring rate (Hn) decile earns an average return of −0.25% per month (t = −1.63) with NYSE-VW. This estimate is lower in magnitude than −5.61% per annum (−0.47% per month, t = −2.26) in Belo, Lin, and Bazdresch (2014). Belo et al. include only firms with December fiscal year end, and lose almost 40% of the sample firms. We include firms with any fiscal year end.

The average returns of the high-minus-low deciles with NYSE-VW on percentage change in sales minus that in inventory (dSi), percentage change in sales minus that in accounts receivable (dSa), percentage change in gross margin minus that in sales (dGs), percentage change in sales minus that in SG&A (dSs), and labor force efficiency (Lfe) are all small and insignificant, ranging from −0.02% to 0.18% per month, with t-values from −0.1 to 1.47. Abarbanell and Bushee (1998) report insignificant results for dSa, dGs, and Lfe, but significant results for dSi and dSs from cross-sectional regressions of size-adjusted returns. However, while Abarbanell and Bushee report insignificant results for effective tax rate (Etr), its high-minus-low decile earns 0.24% (t = 2.29) in our replication.

The high-minus-low corporate governance (Gind) decile earns a tiny average return of 0.02% per month (t = 0.06) from September 1990 to December 2006 (the last available date). In contrast, Gompers, Ishii, and Metrick (2003) report a significant high-minus-low alpha of −0.71% (t = −2.73) in the Carhart (1997) model from September 1990 to December 1999. We come close to replicate their result, with a Carhart alpha of −0.59% ($t = -1.88$) and an average return of −0.73% ($t = -2.04$) in their sample. However, outside their sample from January 2000 to December 2006, the high-minus-low decile earns a positive average return of 1.01% ($t = 2.09$), and its Carhart alpha is 0.2% ($t = 0.56$). Our evidence accords well with Core, Guay, and Rusticus (2006), who show that the high-minus-low decile return exhibits a reversal from 2000 to 2003.

The high-minus-low accrual quality (Acq) decile earns an average return of −0.12% per month ($t = -0.6$) in annual sorts with NYSE-VW. The estimates from monthly sorts are even smaller in magnitude. Also, the average returns of the high-minus-low deciles on earnings persistence (Eper), earnings smoothness (Esm), value relevance of earnings (Evr), and earnings conservatism (Ecs) are all small and insignificant, ranging from −0.04% to 0.18%, with t-values from −0.31 to 1.31.

Our estimates contrast with those of Francis, LaFond, Olsson, and Schipper (2004, 2005), who report that these earnings attributes have significant relations with the cost of equity. Francis et al. base their inferences on ex ante accounting-based measures of cost of capital, not average returns. Although Francis et al. construct factors based on the earnings attributes, their average returns are not reported. Our evidence accords well with Core, Guay, and Verdi (2008), who also report that Acq is not priced in asset pricing tests. We emphasize, however, that the two other attributes in Francis et al., earnings predictability (Eprd) and earnings timeliness (Etl), do produce significant average return spreads, −0.53% ($t = -2.96$) and 0.34% ($t = 2.79$), respectively.

The high-minus-low deciles on the dispersion of analysts' earnings forecasts (Dis) with NYSE-VW earn −0.19%, −0.18%, and −0.08% per month at the 1-, 6-, and 12-month, all of which are within one standard error from zero. The evidence contrasts with Diether, Malloy, and Scherbina (2002), who report an average return of −0.79% ($t = -2.88$) for the low-minus-high Dis quintile at the 1-month horizon based on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns (and a $5 price screen). With All-EW, we come close with an average return of −0.69% ($t = -3.14$).

The high-minus-low decile on R&D-to-market (Rdm) earns an average return of 0.7% per month

($t = 2.75$) with NYSE-VW. For comparison, Chan, Lakonishok, and Sougiannis (2001) report an average return of 10.65% per annum (0.89% per month) for the high-minus-low Rdm quintile with NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. Our All-EW estimate for the high-minus-low decile is huge, 1.77% ($t = 5.44$). Sampling variation makes the Rdm anomaly larger and more significant. In Chan et al.'s 1975–1995 original sample, the NYSE-VW estimate is only 0.47% ($t = 1.38$). We also show that the monthly formed Rdm$^{\text{q}}$ deciles earn significant average returns across all horizons, ranging from 0.8% to 1.12%, and t-values from 2.18 to 2.91.

Heston and Sadka's (2008) seasonality anomalies fare very well in our replication. At the beginning of each month t, we split stocks into deciles with NYSE-VW on various measures of past performance, including returns in month t–12 (R^1_{a}), average returns across months t–24, t–36, t–48, and $t-60$ ($R^{[2,5]}_{\text{a}}$), average returns across months $t-72, t-84, t-96, t-108$, and $t-120$ ($R^{[6,10]}_{\text{a}}$), average returns across months t–132, t–144, t–156, t–168, and t–180 ($R^{[11,15]}_{\text{a}}$), and average returns across months t–192, t–204, t–216, t–228, and t–240 ($R^{[16,20]}_{\text{a}}$). Monthly returns are calculated for the current month t, and the deciles are rebalanced at the beginning of month $t+1$. The average returns of the high-minus-low deciles on R^1_{a}, $R^{[2,5]}_{\text{a}}$, $R^{[6,10]}_{\text{a}}$, $R^{[11,15]}_{\text{a}}$, and $R^{[16,20]}_{\text{a}}$ are 0.67%, 0.69%, 0.83%, 0.62%, and 0.54% per month (t = 3.43, 4.11, 5.06, 4.46, and 3.26), respectively.

Trading Frictions

The biggest casualty of our replication is the trading frictions category, with 102 out of 106 anomalies (96.2%) not replicated. Panel F of Table 5 details the results for the individual anomalies.

Surprisingly, with NYSE-VW, 15 out of 16 volatility measures yield insignificant high-minus-low returns on average. In particular, the high-minus-low deciles on idiosyncratic volatility calculated from the Fama-French (1993) three-factor model (Ivff) earn on average −0.52%, −0.32%, and −0.18% per month ($t = -1.71, -1.12$, and -0.67) at the 1-, 6-, and 12-month horizons, respectively. The high-minus-low deciles on total volatility (Tv) earn on average $-0.39\%, -0.24\%$, and -0.2% ($t = -1.18, -0.77$, and -0.65) over the three horizons, respectively. Systematic volatility (Sv) is insignificant at the 6- and 12-month, -0.18% and -0.14% ($t = -1.27$ and -1.22), respectively, but significant at the 1-month with an average return of -0.49% ($t = -2.24$).

Our estimates are lower than -1.06%, -0.97%, and -1.04% per month ($t = -3.1, -2.86$ and -3.9) for the high-minus-low Ivff, Tv, and Sv quintiles, respectively, all at the 1-month horizon, in Ang, Hodrick, Xing, and Zhang (2006) based on NYSE-Amex-NASDAQ breakpoints and value-weighted returns. With these breakpoints, we obtain -1.22% ($t = -3.38$) and -1.18% ($t = -3.02$) for the high-minus-low Ivff and Tv deciles, respectively, in our sample. For the high-minus-low Sv decile, we obtain -1.1% ($t = -3.1$) in Ang et al.'s original 1986–2000 sample, but only -0.42% ($t = -1.56$) in our extended sample. In the 2001–2016 period, its average return is only 0.04%.

Overweighting microcaps does not save the volatility anomaly. With All-EW, again 15 out of 16 volatility measures produce economically small and statistically insignificant average return spreads. Five measures even produce positive average return spreads, albeit all insignificant. Also, 14 measures have absolute t-values below 1. The evidence is even weaker than that with NYSE-VW. With All-VW, 9 out of 16 volatility measures yield significant average return spreads. As such, consistent with Bali and Cakici (2008), the volatility anomaly is extremely fragile.

Three market beta measures based on rolling window regressions (Fama and MacBeth 1973), the Frazzini-Pedersen (2014) method, and the Dimson (1979) method are all insignificant. In particular, with NYSE-VW, the high-minus-low Frazzini-Pedersen beta deciles earn around -0.2% per month at the 1-, 6-, and 12-month, and are all within one standard error from zero. This evidence replicates the Frazzini-Pedersen results that high beta stocks do not earn significantly higher average returns than low beta stocks. The evidence is robust to breakpoints, return weights, and sample periods.

Traditional liquidity measures fare poorly in our replication. With NYSE-VW, the high-minus-low deciles on the Amihud (2002) absolute return-to-volume (Ami) earn on average 0.25%, 0.34%, and 0.39% per month (t =1.2, 1.64, and 1.91) at the 1-, 6-, and 12-month, respectively. In contrast, Amihud reports a highly significant liquidity effect using cross-sectional regressions that weight microcaps heavily. We replicate this result with cross-sectional regressions with ordinary least squares (FM-OLS) in our sample. With weighted least squares, the effect is significant only at the 12-month with a slope of 0.26 ($t = 1.99$). With All-EW, the high-minus-low deciles earn average returns above 1%, with t-values above 3. As such, the absolute return-to-volume effect only resides in microcaps.

Similarly, the high-minus-low short-term reversal (Srev) decile earns on average only -0.27% per month ($t = -1.4$) with NYSE-VW. This estimate is much lower in magnitude than -1.99% ($t = -12.55$) in Jegadeesh (1990) based on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. We replicate this results with an All-EW estimate of -2.57% ($t = -9.22$). As such, similar to the absolute return-to-volume, short-term reversal also only exists in microcaps.

The Acharya-Pedersen (2005) liquidity betas fare very poorly. With NYSE-VW, all 5 versions of the their liquidity betas, including return-return (β^{ret}), illiquidity-illiquidity (β^{lcc}), return-illiquidity (β^{lrc}), illiquidity-return (β^{lcr}), and net liquidity beta (β^{net}), earn insignificant average return spreads across all 3 monthly horizons. The average returns range from -0.04% to 0.31% per month, most of which are within 1 standard error from zero. In contrast, Acharya and Pedersen report significant results for β^{ret} and β^{net} based on cross-sectional regressions with 25 illiquidity portfolios as testing assets. The replication failure is not due to microcaps. We do not find any significance from cross-sectional regressions with individual stocks as testing assets, even with ordinary least squares. With All-EW, all 15 variables from interacting 5 liquidity betas with 3 monthly horizons earn economically small and statistically insignificant average return spreads.

The Pastor-Stambaugh (2003) liquidity beta does not fare well. With NYSE-VW, the high-minus-low deciles earn on average only 0.08%, 0.11%, and 0.17% per month ($t = 0.47$, 0.74, and 1.24), respectively. The lack of significance is robust to breakpoints, return weights, cross-sectional regressions, and sample periods. In particular, the replication failure is not due to microcaps.

The Easley-Hvidkjaer-O'Hara (2002, 2010) probability of information-based trading (Pin), which is a leading market microstructure variable, also fails to replicate. With NYSE-VW, the high-minus-low Pin decile earns a negative average return of -0.23% per month ($t = -0.91$). With All-EW, the average return becomes positive, 0.4%, but still insignificant ($t = 1.35$). In cross-sectional regressions, the Pin slope is insignificant with both ordinary and weighted least squares. However, in the sample that consists of only microcaps, the high-minus-low Pin decile earns 0.68% ($t = 2.6$) with value-weights and 1.5% ($t = 6.04$) with equal-weights (the Internet Appendix).

The average returns of the high-minus-low share turnover (Tur) deciles range from -0.11% to -0.16% per month, all of which are within 0.7 standard errors from zero. In contrast, Datar, Naik, and Radcliffe (1998) report highly significant results in cross-sectional regressions with ordinary least squares, which we reproduce. We also verify that the turnover effect is strong with All-EW.

The average returns of the high-minus-low deciles on the coefficient of variation for dollar trading volume (Cvd) vary from 0.08% to 0.15% per month, all of which are within 1.1 standard errors from zero. In contrast, Chordia, Subrahmanyam, and Anshuman (2001) report significant results with cross-sectional regressions with OLS, which we reproduce. Also, none of the prior 1-, 6-, and 12-month turnover-adjusted numbers of zero daily trading volume (Lm^1, Lm^6, and Lm^{12}) interacted with 3 monthly horizons (9 measures in total) yield any significance. The high-minus-low average returns range from -0.07% to 0.39%, with t-values from -0.32 to 1.88. In contrast, Liu (2006) reports significant average return spreads for 8 out of 9 measures using NYSE breakpoints but equal-weighted returns (no NASDAQ stocks). We verify the strong Lm effect in equal-weighted returns.

Several recently proposed friction variables also fail to replicate. With NYSE-VW, the high-minus-low tail risk (Tail) deciles earn on average 0.11%, 0.14%, and 0.17% per month ($t = 0.54$, 0.79, and 1.05) at the 1-, 6-, and 12-month, respectively. The high-minus-low deciles on maximum daily return (Mdr) earn on average $-0.36\%, -0.17\%$, and -0.07% ($t = -1.27, -0.65$, and -0.27) across the three horizons, respectively. These estimates are much lower in magnitude than -1.03% ($t = -2.83$) at the 1-month horizon in Bali, Cakici, and Whitelaw (2011) based on NYSE-Amex-NASDAQ breakpoints. Bali et al. report that the average return starts at 1.01% for decile 1, remains roughly flat at decile 7, drops to 0.52% for decile 9, and then precipitously to −0.02% for decile 10. In our replication with NYSE-VW, the average return starts at 0.97% for decile 1, remains roughly flat at 1.03% for decile 9, and then drops only to 0.6% for decile 10.

Finally, with NYSE-VW, the high-minus-low decile on the Adrian-Etula-Muir (2014) financial intermediary leverage beta earns on average 0.39%, 0.26%, and 0.25% (t = 1.9, 1.31, and 1.3) at the 1-, 6-, and 12-month, respectively. With All-EW, the average return is 0.4% (t = 2.29) at the 1-month, but the 6- and 12-month estimates remain insignificant. Adrian et al. conclude that their "*single*-factor model prices size, book-to-market, momentum, and bond portfolios with an R^2 of 77% and an average annual pricing error of 1%—performing as well as standard multifactor benchmarks designed to price these assets (original emphasis, p. 2557)." However, this conclusion is based on a mimicking portfolio from regressing the broker-dealer leverage on the 6 size and book-to-market portfolio excess returns as well as the momentum factor. As such, direct evidence on the intermediary leverage effect is fairly weak, and not comparable with standard multifactor models.

4.3 Commonality among the Replicated Anomalies

Finally, in this subsection, we briefly explore the commonality among the 158 replicated anomalies with $|t| \geq 1.96$ under NYSE-VW. We calculate the pairwise cross-sectional correlations based on each anomaly variable's NYSE percentile rankings, as well as the pairwise time series correlations based on each anomaly's high-minus-low decile returns. All the anomaly variables are realigned to yield positive high-minus-low returns on average. The within-category correlations are averaged across all the pairwise correlations within a category, and the cross-category correlations are averaged across all the pairwise correlations across a given pair of categories.

Panel A of Table 6 shows the rank correlations of NYSE percentiles, and Panel B the time series correlations of the high-minus-low returns. Our categorization of anomalies based on a priori economic arguments is largely consistent with statistical clustering. The average within-category correlations are generally large, while the average cross-category correlations are weak. For example, the within-category correlations in the value-versus-growth category are 0.44 with NYSE rankings and 0.6 with high-minus-low returns. In contrast, the cross-category correlations between the value-versus-growth and investment categories are only 0.1 and 0.18, respectively. However, the within-category correlations in the intangibles category are low, only 0.11 and 0.07, respectively. This category is more diffused, consisting of different anomalies, such as the Heston-Sadka (2008) seasonality anomalies that have correlations close to zero with other anomaly variables.

Panel C conducts principle component analysis for the 158 high-minus-low decile returns. Unlike pairwise correlations, this analysis requires a common sample for all the anomalies. As such, we start the sample in July 1976, which drops only 11 anomalies from our analysis. Starting from January 1967 would drop 62 anomalies. Consistent with the cluster analysis, the first principle component for each category explains a large amount of the total variance of the high-minus-low returns within the category, 53.2%, 59.8%, 36.1%, 55.2%, 20.9%, and 59.5% across the momentum, value-versus-growth, investment, profitability, intangibles, and frictions categories, respectively. For intangibles, the first 4 principle components combine to explain 55% of the total variation. Across all the 158 anomalies, the first principle component explains 25.9%, and the first 4, 6, 8, and 10 components combine to explain 56.3%, 63.5%, 67.9%, and 71.2% of the total variance.

5 Conclusion

We have replicated the bulk of the published anomalies literature by compiling a large data library of 452 anomaly variables. After we control for microcaps via NYSE breakpoints and value-weighted returns, 294 anomalies (65%) fail to replicate at the 5% threshold ($|t| \geq 1.96$). Imposing $|t|$-cutoffs of 2.78 and 3.39 to adjust for multiple testing per Harvey, Liu, and Zhu (2016) increases the number of failed replications further to 371 (82%) and 412 (91%), respectively. Most important, in the trading frictions category that contains liquidity, market microstructure, and other frictions variables, 102 out of 106 variables (96%) fail to clear the hurdle of $|t| \geq 1.96$. Even for replicated anomalies, their economic magnitudes are much lower than originally reported. In all, the evidence suggests that capital markets are more efficient than previously recognized.

Our work has important implications. First, anomalies are not created equal. The value and momentum anomalies replicate well, along with the investment and profitability anomalies. Most of these anomalies reside in value-weighted returns, which account for 97% of the aggregate market cap. In contrast, even with NYSE-Amex-NASDAQ breakpoints and equal-weighted returns, a sorting procedure that assigns microcaps a maximum amount of weight, most frictions variables (60.4%) still fail to replicate. As such, fundamentals are more important than frictions in the cross section.

Second, our work exposes a huge amount of flexibility in test designs, variable definitions, and empirical specifications in the anomalies literature. Most published anomalies are greatly exaggerated by overweighting microcaps. We advocate NYSE breakpoints and value-weighted returns in sorts as a reliable method, as evident in the construction of common factors. While alternative specifications are not technically wrong, they can be very misleading. Results from the reliable method should always be reported per Leamer (1983). Relatedly, authors, referees, and editors should be keenly aware of the complex agency problem that arises from publication biases. Referees can be more open to papers that take care in developing well grounded economic hypotheses, even though their empirical findings might not be strong. With publication biases alleviated, authors would most likely have fewer incentives to engaging in specification search. Empirical results can be very sensitive to the specifications, and those from the standard, reliable procedures are the most credible.

Finally, the credibility of the anomalies literature can improve via a closer connection with economic theory. Ioannidis (2005) emphasizes the importance of theoretical predictions, which raise the ratio of ex ante true relations to false relations tested in a given field. Harvey, Liu, and Zhu (2016) also argue that a theory-based factor should have a lower absolute t-cutoff than a purely empirical factor. While theory is not immune to problems of its own, such as hypothesizing after the results are known (Kerr 1998), more emphasis on theory based on first principles is likely to increase the credibility of the anomalies literature, which is still largely statistical in nature.

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Table 1 : List of Anomaly Variables

The 452 anomalies are grouped into 6 categories: (i) momentum; (ii) value-versus-growth; (iii) investment; (iv) profitability; (v) intangibles; and (vi) trading frictions. The number in parenthesis in a panel's title is the number of anomalies in the category. For each anomaly, we list its symbol, brief description, and its source. Appendix A details variable definitions and portfolio construction.

Panel A: Momentum (57)			
Sue1	Earnings surprise, 1-month horizon, Foster, Olsen, and Shevlin (1984)	Sue6	Earnings surprise, 6-month horizon, Foster, Olsen, and Shevlin (1984)
Sue12	Earnings surprise, 12-month horizon, Foster, Olsen, and Shevlin (1984)	Abr1	Cumulative abnormal stock returns around earnings announcements, 1-month horizon, Chan, Jegadeesh, and Lakonishok (1996)
Abr6	Cumulative abnormal stock returns around earnings announcements, 6-month horizon, Chan, Jegadeesh, and Lakonishok (1996)	Abr12	Cumulative abnormal stock returns around earnings announcements, 12-month horizon, Chan, Jegadeesh, and Lakonishok (1996)
Re1	Revisions in analysts' earnings forecasts, 1-month horizon, Chan, Jegadeesh, and Lakonishok (1996)	Re6	Revisions in analysts' earnings forecasts, 6-month horizon, Chan, Jegadeesh, and Lakonishok (1996)
Re12	Revisions in analysts' earnings forecasts, 12-month horizon, Chan, Jegadeesh, and Lakonishok (1996)	$R^6 1$	Price momentum, 6-month prior returns, 1-month horizon, Jegadeesh and Titman (1993)
$R^6 6$	Price momentum, 6-month prior returns, 6-month horizon, Jegadeesh and Titman (1993)	$R^6 12$	Price momentum, 6-month prior returns, 12-month horizon, Jegadeesh and Titman (1993)
$R^{11} 1$	Price momentum, 11-month prior returns, 1-month horizon, Fama and French (1996)	$R^{11} 6$	Price momentum, 11-month prior returns, 6-month horizon, Fama and French (1996)
$R^{11} 12$	Price momentum, 11-month prior returns, 12-month horizon, Fama and French (1996)	Im1	Industry momentum, 1-month horizon, Moskowitz and Grinblatt (1999)
Im6	Industry momentum, 6-month horizon, Moskowitz and Grinblatt (1999)	Im12	Industry momentum, 12-month horizon, Moskowitz and Grinblatt (1999)
Rs1	Revenue surprise, 1-month horizon, Jegadeesh and Livnat (2006)	Rs6	Revenue surprise, 6-month horizon, Jegadeesh and Livnat (2006)
Rs12	Revenue surprise, 12-month horizon, Jegadeesh and Livnat (2006)	Tes1	Tax expense surprise, 1-month horizon, Thomas and Zhang (2011)
Tes6	Tax expense surprise, 6-month horizon, Thomas and Zhang (2011)	Tes12	Tax expense surprise, 12-month horizon, Thomas and Zhang (2011)
dEf1	Analysts' forecast change, 1-month horizon, Hawkins, Chamberlin, and Daniel (1984)	dEf6	Analysts' forecast change, 6-month horizon, Hawkins, Chamberlin, and Daniel (1984)
dEf12	Analysts' forecast change, 12-month horizon, Hawkins, Chamberlin, and Daniel (1984)	Nei1	# of consecutive quarters with earnings increases, 1-month horizon, Barth, Elliott, and Finn (1999)
Nei6	# consecutive quarters with earnings increases, 6-month horizon, Barth, Elliott, and Finn (1999)	Nei12	# consecutive quarters with earnings increases, 12-month horizon, Barth, Elliott, and Finn (1999)

52w1	52-week high, 1-month horizon, George and Hwang (2004)	52w6	52-week high, 6-month horizon, George and Hwang (2004)
52w12	52-week high, 12-month horizon, George and Hwang (2004)	$\epsilon^{6}1$	6-month residual momentum, 1-month horizon, Blitz, Huij, and Martens (2011)
$\epsilon^{6}6$	6-month residual momentum, 6-month horizon, Blitz, Huij, and Martens (2011)	$\epsilon^{6}12$	6-month residual momentum, 12-month horizon, Blitz, Huij, and Martens (2011)
$\epsilon^{11}1$	11-month residual momentum, 1-month horizon, Blitz, Huij, and Martens (2011)	$\epsilon^{11}6$	11-month residual momentum, 6-month horizon, Blitz, Huij, and Martens (2011)
$\epsilon^{11}12$	11-month residual momentum, 12-month horizon, Blitz, Huij, and Martens (2011)	Sm1	Segment momentum, 1-month horizon, Cohen and Lou (2012)
Sm6	Segment momentum, 6-month horizon, Cohen and Lou (2012)	Sm12	Segment momentum, 12-month horizon, Cohen and Lou (2012)
Ilr1	Industry lead-lag effect in prior returns, 1-month horizon, Hou (2007)	Ilr6	Industry lead-lag effect in prior returns, 6-month horizon, Hou (2007)
Ilr12	Industry lead-lag effect in prior returns, 12-month horizon, Hou (2007)	Ile1	Industry lead-lag effect in earnings surprises, 1-month horizon, Hou (2007)
Ile6	Industry lead-lag effect in earnings surprises, 6-month horizon, Hou (2007)	Ile12	Industry lead-lag effect in earnings surprises, 12-month horizon, Hou (2007)
Cm1	Customer momentum, 1-month horizon, Cohen and Frazzini (2008)	Cm6	Customer momentum, 6-month horizon, Cohen and Frazzini (2008)
Cm12	Customer momentum, 12-month horizon, Cohen and Frazzini (2008)	Sim1	Supplier industries momentum, 1-month horizon, Menzly and Ozbas (2010)
Sim6	Supplier industries momentum, 6-month, Menzly and Ozbas (2010)	Sim12	Supplier industries momentum, 12-month, Menzly and Ozbas (2010)
Cim1	Customer industries momentum, 1-month, Menzly and Ozbas (2010)	Cim6	Customer industries momentum, 6-month, Menzly and Ozbas (2010)
Cim12	Customer industries momentum, 12-month, Menzly and Ozbas (2010)		

Panel B: Value-versus-growth (69)

Bm	Book-to-market equity, Rosenberg, Reid, and Lanstein (1985)	Bmj	Book-to-June-end market equity, Asness and Frazzini (2013)
$\text{Bm}^{q}1$	Book-to-market, 1-month horizon	$\text{Bm}^{q}6$	Book-to-market, 6-month horizon
$\text{Bm}^{q}12$	Book-to-market, 12-month horizon	Dm	Debt-to-market, Bhandari (1988)
$\text{Dm}^{q}1$	Debt-to-market, 1-month horizon	$\text{Dm}^{q}6$	Debt-to-market, 6-month horizon
$\text{Dm}^{q}12$	Debt-to-market, 12-month horizon	Am	Assets-to-market, Fama and French (1992)
$\text{Am}^{q}1$	Assets-to-market, 1-month horizon	$\text{Am}^{q}6$	Assets-to-market, 6-month horizon
$\text{Am}^{q}12$	Assets-to-market, 12-month horizon	Rev1	Reversal, 1-month horizon De Bondt and Thaler (1985)
Rev6	Reversal, 6-month horizon, De Bondt and Thaler (1985)	Rev12	Reversal, 12-month horizon De Bondt and Thaler (1985)
Ep	Earnings-to-price, Basu (1983)	$\text{Ep}^{q}1$	Earnings-to-price, 1-month horizon
$\text{Ep}^{q}6$	Earnings-to-price, 6-month horizon	$\text{Ep}^{q}12$	Earnings-to-price, 12-month horizon

Efp1	Analysts' earnings forecasts-to-price, 1-month horizon, Elgers, Lo, and Pfeiffer (2001)	Efp6	Analysts' earnings forecasts-to-price, 6-month horizon Elgers, Lo, and Pfeiffer (2001)
Efp12	Analysts' earnings forecasts-to-price, 12-month horizon, Elgers, Lo, and Pfeiffer (2001)	Cp	Cash flow-to-price, Lakonishok, Shleifer, and Vishny (1994)
Cp^{q}1	Cash flow-to-price, 1-month horizon	Cp^{q}6	Cash flow-to-price, 6-month horizon
Cp^{q}12	Cash flow-to-price, 12-month horizon	Dp	Dividend yield, Litzenberger and Ramaswamy (1979)
Dp^{q}1	Dividend yield, 1-month horizon	Dp^{q}6	Dividend yield, 6-month horizon
Dp^{q}12	Dividend yield, 12-month horizon	Op	Payout yield, Boudoukh, Michaely, Richardson, and Roberts (2007)
Op^{q}1	Payout yield, 1-month horizon	Op^{q}6	Payout yield, 6-month horizon
Op^{q}12	Payout yield, 12-month horizon	Nop	Net payout yield, Boudoukh, Michaely, Richardson, and Roberts (2007)
Nop^{q}1	Net payout yield, 1-month horizon	Nop^{q}6	Net payout yield, 6-month horizon
Nop^{q}12	Net payout yield, 12-month horizon	Sr	5-year sales growth rank, Lakonishok, Shleifer, and Vishny (1994)
Sg	Annual sales growth, Lakonishok, Shleifer, and Vishny (1994)	Em	Enterprise multiple, Loughran and Wellman (2011)
Em^{q}1	Enterprise multiple, 1-month horizon	Em^{q}6	Enterprise multiple, 6-month horizon
Em^{q}12	Enterprise multiple, 12-month horizon	Sp	Sales-to-price, Barbee, Mukherji, and Raines (1996)
Sp^{q}1	Sales-to-price, 1-month horizon	Sp^{q}6	Sales-to-price, 6-month horizon
Sp^{q}12	Sales-to-price, 12-month horizon	Ocp	Operating cash flow-to-price, Desai, Rajgopal, and Venkatachalam (2004)
Ocp^{q}1	Operating cash flow-to-price, 1-month horizon	Ocp^{q}6	Operating cash flow-to-price, 6-month horizon
Ocp^{q}12	Operating cash flow-to-price, 12-month horizon	Ir	Intangible return, Daniel and Titman (2006)
Vhp	Intrinsic value-to-market, Frankel and Lee (1998)	Vfp	Analysts-based intrinsic value-to-market, Frankel and Lee (1998)
Ebp	Enterprise book-to-price, Penman, Richardson, and Tuna (2007)	Ebp^{q}1	Enterprise book-to-price, 1-month horizon
Ebp^{q}6	Enterprise book-to-price, 6-month horizon	Ebp^{q}12	Enterprise book-to-price, 12-month horizon
Ndp	Net debt-to-price, Penman, Richardson, and Tuna (2007)	Ndp^{q}1	Net debt-to-price, 1-month horizon
Ndp^{q}6	Net debt-to-price, 6-month horizon	Ndp^{q}12	Net debt-to-price, 12-month horizon
Dur	Equity duration, Dechow, Sloan, and Soliman (2004)	Ltg	Long-term growth forecasts of analysts, La Porta (1996)
Ltg1	Long-term growth forecasts of analysts, 1-month horizon, La Porta (1996)	Ltg6	Long-term growth forecasts of analysts, 6-month horizon, La Porta (1996)
Ltg12	Long-term growth forecasts of analysts, 12-month horizon, La Porta (1996)		

Panel C: Investment (38)

Aci	Abnormal corporate investment, Titman, Wei, and Xie (2004)	I/A	Investment-to-assets, Cooper, Gulen, and Schill (2008)
Ia^{q}1	Investment-to-assets, 1-month horizon	Ia^{q}6	Investment-to-assets, 6-month horizon
Ia^{q}12	Investment-to-assets, 12-month horizon	dPia	Changes in PPE and inventory/assets, Lyandres, Sun, and Zhang (2008)
Noa	Net operating assets, Hirshleifer, Hou, Teoh, and Zhang (2004)	dNoa	Changes in net operating assets, Hirshleifer, Hou, Teoh, and Zhang (2004)
dLno	Change in long-term net operating assets, Fairfield, Whisenant, and Yohn (2003)	Ig	Investment growth, Xing (2008)
2Ig	2-year investment growth, Anderson and Garcia-Feijoo (2006)	3Ig	3-year investment growth, Anderson and Garcia-Feijoo (2006)
Nsi	Net stock issues, Pontiff and Woodgate (2008)	dIi	% change in investment relative to industry Abarbanell and Bushee (1998)
Cei	Composite equity issuance, Daniel and Titman (2006)	Cdi	Composite debt issuance, Lyandres, Sun, and Zhang (2008)
Ivg	Inventory growth, Belo and Lin (2011)	Ivc	Inventory changes, Thomas and Zhang (2002)
Oa	Operating accruals, Sloan (1996)	Ta	Total accruals, Richardson, Sloan, Soliman, and Tuna (2005)
dWc	Change in net non-cash working capital, Richardson, Sloan, Soliman, and Tuna (2005)	dCoa	Change in current operating assets, Richardson, Sloan, Soliman, and Tuna (2005)
dCol	Change in current operating liabilities, Richardson, Sloan, Soliman, and Tuna (2005)	dNco	Change in net non-current operating assets, Richardson, Sloan, Soliman, and Tuna (2005)
dNca	Change in non-current operating assets, Richardson, Sloan, Soliman, and Tuna (2005)	dNcl	Change in non-current operating liabilities, Richardson, Sloan, Soliman, and Tuna (2005)
dFin	Change in net financial assets, Richardson, Sloan, Soliman, and Tuna (2005)	dSti	Change in short-term investments, Richardson, Sloan, Soliman, and Tuna (2005)
dLti	Change in long-term investments, Richardson, Sloan, Soliman, and Tuna (2005)	dFnl	Change in financial liabilities, Richardson, Sloan, Soliman, and Tuna (2005)
dBe	Change in common equity, Richardson, Sloan, Soliman, and Tuna (2005)	Dac	Discretionary accruals, Xie (2001)
Poa	Percent operating accruals, Hafzalla, Lundholm, and Van Winkle (2011)	Pta	Percent total accruals, Hafzalla, Lundholm, and Van Winkle (2011)
Pda	Percent discretionary accruals	Nxf	Net external finance, Bradshaw, Richardson, and Sloan (2006)
Nef	Net equity finance, Bradshaw, Richardson, and Sloan (2006)	Ndf	Net debt finance, Bradshaw, Richardson, and Sloan (2006)

Panel D: Profitability (79)

Roe1	Return on equity, 1-month horizon, Hou, Xue, and Zhang (2015)	Roe6	Return on equity, 6-month horizon, Hou, Xue, and Zhang (2015)
Roe12	Return on equity, 12-month horizon, Hou, Xue, and Zhang (2015)	dRoe1	Change in Roe, 1-month horizon,
dRoe6	Change in Roe, 6-month horizon	dRoe12	Change in Roe, 12-month horizon
Roa1	Return on assets, 1-month horizon, Balakrishnan, Bartov, and Faurel (2010)	Roa6	Return on assets, 6-month horizon, Balakrishnan, Bartov, and Faurel (2010)

Roa12	Return on assets, 12-month horizon, Balakrishnan, Bartov, and Faurel (2010)	dRoa1	Change in Roa, 1-month horizon
dRoa6	Change in Roa, 6-month horizon	dRoa12	Change in Roa, 12-month horizon
Rna	Return on net operating assets, Soliman (2008)	Pm	Profit margin, Soliman (2008)
Ato	Asset turnover, Soliman (2008)	Cto	Capital turnover, Haugen and Baker (1996)
Rna^{q}1	Return on net operating assets 1-month horizon	Rna^{q}6	Return on net operating assets, 6-month horizon
Rna^{q}12	Return on net operating assets, 12-month horizon	Pm^{q}1	Profit margin, 1-month horizon
Pm^{q}6	Profit margin, 6-month horizon	Pm^{q}12	Profit margin, 12-month horizon
Ato^{q}1	Asset turnover, 1-month horizon	Ato^{q}6	Asset turnover, 6-month horizon
Ato^{q}12	Asset turnover, 12-month horizon	Cto^{q}1	Capital turnover, 1-month horizon
Cto^{q}6	Capital turnover, 6-month horizon	Cto^{q}12	Capital turnover, 12-month horizon
Gpa	Gross profits-to-assets, Novy-Marx (2013)	Gla	Gross profits-to-lagged assets
Gla^{q}1	Gross profits-to-lagged assets, 1-month horizon	Gla^{q}6	Gross profits-to-lagged assets, 6-month horizon
Gla^{q}12	Gross profits-to-lagged assets, 12-month horizon	Ope	Operating profits-to-equity, Fama and French (2015)
Ole	Operating profits-to-lagged equity	Ole^{q}1	Operating profits-to-lagged equity, 1-month horizon
Ole^{q}6	Operating profits-to-lagged equity, 6-month horizon	Ole^{q}12	Operating profits-to-lagged equity, 12-month horizon
Opa	Operating profits-to-assets, Ball, Gerakos, Linnainmaa, and Nikolaev (2015)	Ola	Operating profits-to-lagged assets
Ola^{q}1	Operating profits-to-lagged assets, 1-month horizon	Ola^{q}6	Operating profits-to-lagged assets, 6-month horizon
Ola^{q}12	Operating profits-to-lagged assets (12-month horizon)	Cop	Cash-based operating profitability, Ball, Gerakos, Linnainmaa, and Nikolaev (2016)
Cla	Cash-based operating profits-to-lagged assets	Cla^{q}1	Cash-based operating profits-to-lagged assets, 1-month horizon
Cla^{q}6	Cash-based operating profits-to-lagged assets, 6-month horizon	Cla^{q}12	Cash-based operating profits-to-lagged assets, 12-month horizon
F	Fundamental score, Piotroski (2000)	F^{q}1	F-score, 1-month horizon
F^{q}6	F-score, 6-month horizon	F^{q}12	F-score, 12-month horizon
Fp	Failure probability, Campbell, Hilscher, and Szilagyi (2008)	Fp^{q}1	Failure probability, 1-month horizon, Campbell, Hilscher, and Szilagyi (2008)
Fp^{q}6	Failure probability, 6-month horizon, Campbell, Hilscher, and Szilagyi (2008)	Fp^{q}12	Failure probability, 12-month horizon, Campbell, Hilscher, and Szilagyi (2008)
O	O-score, Dichev (1998)	O^{q}1	O-score, 1-month horizon
O^{q}6	O-score, 6-month horizon	O^{q}12	O-score, 12-month horizon
Z	Z-score, Dichev (1998)	Z^{q}1	Z-score, 1-month horizon
Z^{q}6	Z-score, 6-month horizon	Z^{q}12	Z-score, 12-month horizon
G	Growth score, Mohanram (2005)	Cr1	Credit ratings, 1-month horizon, Avramov, Chordia, Jostova, and Philipov (2009)
Cr6	Credit ratings, 6-month horizon, Avramov, Chordia, Jostova, and Philipov (2009)	Cr12	Credit ratings, 12-month horizon, Avramov, Chordia, Jostova, and Philipov (2009)

Tbi	Taxable income-to-book income, Lev and Nissim (2004)	Tbi^{q}1	Taxable income-to-book income, 1-month horizon
Tbi^{q}6	Taxable income-to-book income, 6-month horizon	Tbi^{q}12	Taxable income-to-book income, 12-month horizon
Bl	Book leverage, Fama and French (1992)	Bl^{q}1	Book leverage, 1-month horizon
Bl^{q}6	Book leverage, 6-month horizon	Bl^{q}12	Book leverage, 12-month horizon
Sg^{q}1	Sales growth, 1-month horizon	Sg^{q}6	Sales growth, 6-month horizon
Sg^{q}12	Sales growth, 12-month horizon		

Panel E: Intangibles (103)

Oca	Organizational capital/assets, Eisfeldt and Papanikolaou (2013)	Ioca	Industry-adjusted organizational capital /assets, Eisfeldt and Papanikolaou (2013)
Adm	Advertising expense-to-market, Chan, Lakonishok, and Sougiannis (2001)	gAd	Growth in advertising expense, Lou (2014)
Rdm	R&D-to-market, Chan, Lakonishok, and Sougiannis (2001)	Rdm^{q}1	R&D-to-market, 1-month horizon
Rdm^{q}6	R&D-to-market, 6-month horizon	Rdm^{q}12	R&D-to-market, 12-month horizon
Rds	R&D-to-sales, Chan, Lakonishok, and Sougiannis (2001)	Rds^{q}1	R&D-to-sales, 1-month horizon
Rds^{q}6	R&D-to-sales, 6-month horizon	Rds^{q}12	R&D-to-sales, 12-month horizon
Ol	Operating leverage, Novy-Marx (2011)	Ol^{q}1	Operating leverage, 1-month horizon
Ol^{q}6	Operating leverage, 6-month horizon	Ol^{q}12	Operating leverage, 12-month horizon
Hn	Hiring rate, Belo, Lin, and Bazdresch (2014)	Rca	R&D capital-to-assets, Li (2011)
Bca	Brand capital-to-assets, Belo, Lin, and Vitorino (2014)	Aop	Analysts optimism, Frankel and Lee (1998)
Pafe	Predicted analysts forecast error, Frankel and Lee (1998)	Parc	Patent-to-R&D capital, Hirshleifer, Hsu, and Li (2013)
Crd	Citations-to-R&D expense, Hirshleifer, Hsu, and Li (2013)	Hs	Industry concentration in sales, Hou and Robinson (2006)
Ha	Industry concentration in total assets, Hou and Robinson (2006)	He	Industry concentration in book equity, Hou and Robinson (2006)
Age1	Firm age, 1-month horizon, Jiang, Lee, and Zhang (2005)	Age6	Firm age, 6-month horizon, Jiang, Lee, and Zhang (2005)
Age12	Firm age, 12-month horizon, Jiang, Lee, and Zhang (2005)	D1	Price delay based on R^2, Hou and Moskowitz (2005)
D2	Price delay in slopes, Hou and Moskowitz (2005)	D3	Price delay in adjusted slopes, Hou and Moskowitz (2005)
dSi	% change in sales minus inventory, Abarbanell and Bushee (1998)	dSa	% change in sales minus accounts receivable, Abarbanell and Bushee (1998)
dGs	% change in gross margin minus sales, Abarbanell and Bushee (1998)	dSs	% change in sales minus SG&A, Abarbanell and Bushee (1998)
Etr	Effective tax rate, Abarbanell and Bushee (1998)	Lfe	Labor force efficiency, Abarbanell and Bushee (1998)
Ana1	Analysts coverage, 1-month horizon, Elgers, Lo, and Pfeiffer (2001)	Ana6	Analysts coverage, 6-month horizon, Elgers, Lo, and Pfeiffer (2001)

Ana12	Analysts coverage, 12-month horizon, Elgers, Lo, and Pfeiffer (2001)	Tan	Tangibility of assets, Hahn and Lee (2009)
Tan^{q}1	Tangibility, 1-month horizon	Tan^{q}6	Tangibility, 6-month horizon
Tan^{q}12	Tangibility, 12-month horizon	Rer	Real estate ratio, Tuzel (2010)
Kz	The Kaplan-Zingales index, Lamont, Polk, and Saa-Requejo (2001)	Kz^{q}1	The Kaplan-Zingales index, 1-month horizon
Kz^{q}6	The Kaplan-Zingales index, 6-month horizon	Kz^{q}12	The Kaplan-Zingales index, 12-month horizon
Ww	The Whited-Wu index, Whited and Wu (2006)	Ww^{q}1	The Whited-Wu index, 1-month horizon
Ww^{q}6	The Whited-Wu index, 6-month horizon	Ww^{q}12	The Whited-Wu index, 12-month horizon
Sdd	Secured-to-total debt, Valta (2016)	Cdd	Convertible-to-total debt, Valta (2016)
Vcf1	Cash flow volatility, 1-month horizon Huang (2009)	Vcf6	Cash flow volatility, 6-month horizon Huang (2009)
Vcf12	Cash flow volatility, 12-month horizon Huang (2009)	Cta1	Cash-to-assets, 1-month horizon, Palazzo (2012)
Cta6	Cash-to-assets, 6-month horizon, Palazzo (2012)	Cta12	Cash-to-assets, 12-month horizon, Palazzo (2012)
Gind	Corporate governance, Gompers, Ishii, and Metrick (2003)	Acq	Accrual quality, Francis, Lafond, Olsson, and Schipper (2005)
Acq1	Accrual quality, 1-month horizon	Acq6	Accrual quality, 6-month horizon
Acq12	Accrual quality, 12-month horizon	Ob	Order backlog, Rajgopal, Shevlin, and Venkatachalam (2003)
Eper	Earnings persistence, Francis, Lafond, Olsson, and Schipper (2004)	Eprd	Earnings predictability, Francis, Lafond, Olsson, and Schipper (2004)
Esm	Earnings smoothness, Francis, Lafond, Olsson, and Schipper (2004)	Evr	Value relevance of earnings, Francis, Lafond, Olsson, and Schipper (2004)
Etl	Earnings timeliness, Francis, Lafond, Olsson, and Schipper (2004)	Ecs	Earnings conservatism, Francis, Lafond, Olsson, and Schipper (2004)
Frm	Pension funding rate scaled by market equity, Franzoni and Martin (2006)	Fra	Pension funding rate scaled by assets, Franzoni and Martin (2006)
Ala	Book assets liquidity, Ortiz-Molina and Phillips (2014)	Alm	Market assets liquidity, Ortiz-Molina and Phillips (2014)
Ala^{q}1	Book assets liquidity, 1-month horizon	Ala^{q}6	Book assets liquidity, 6-month horizon
Ala^{q}12	Book assets liquidity, 12-month horizon	Alm^{q}1	Market assets liquidity, 1-month horizon
Alm^{q}6	Market assets liquidity, 6-month horizon	Alm^{q}12	Market assets liquidity, 12-month horizon
Dls1	Disparity between long- and short-term earnings growth forecasts, 1-month horirzon, Da and Warachka (2011)	Dls6	Disparity between long- and short-term earnings growth forecasts, 6-month horizon, Da and Warachka (2011)
Dls12	Disparity between long- and short-term earnings growth forecasts, 12-month horizon, Da and Warachka (2011)	Dis1	Dispersion of analysts' earnings forecasts, 1-month horizon, Diether, Malloy, and Scherbina (2002)
Dis6	Dispersion of analysts' earnings forecasts, 6-month horizon, Diether, Malloy, and Scherbina (2002)	Dis12	Dispersion of analysts' earnings forecasts, 12-month horizon, Diether, Malloy, and Scherbina (2002)

Dlg1	Dispersion in analyst long-term growth forecasts, 1-month horizon, Anderson, Ghysels, and Juergens (2005)	Dlg6	Dispersion in analyst long-term growth forecasts, 6-month horizon, Anderson, Ghysels, and Juergens (2005)
Dlg12	Dispersion in analyst long-term growth forecasts, 12-month horizon, Anderson, Ghysels, and Juergens (2005)	R_{a}^{1}	12-month-lagged return, Heston and Sadka (2008)
R_{n}^{1}	Year 1–lagged return, nonannual Heston and Sadka (2008)	$R_{\mathrm{a}}^{[2,5]}$	Years 2–5 lagged returns, annual Heston and Sadka (2008)
$R_{\mathrm{n}}^{[2,5]}$	Years 2–5 lagged returns, nonannual Heston and Sadka (2008)	$R_{\mathrm{a}}^{[6,10]}$	Years 6–10 lagged returns, annual Heston and Sadka (2008)
$R_{\mathrm{n}}^{[6,10]}$	Years 6–10 lagged returns, nonannual Heston and Sadka (2008)	$R_{\mathrm{a}}^{[11,15]}$	Years 11–15 lagged returns, annual Heston and Sadka (2008)
$R_{\mathrm{n}}^{[11,15]}$	Years 11–15 lagged returns, nonannual Heston and Sadka (2008)	$R_{\mathrm{a}}^{[16,20]}$	Years 16–20 lagged returns, annual Heston and Sadka (2008)
$R_{\mathrm{n}}^{[16,20]}$	Years 16–20 lagged returns, nonannual Heston and Sadka (2008)		

Panel F: Trading frictions (106)

Me	Market equity, Banz (1981)	Iv	Idiosyncratic volatility, Ali, Hwang, and Trombley (2003)
Ivff1	Idiosyncratic volatility from the 3-factor model, 1-month horizon, Ang, Hodrick, Xing, and Zhang (2006)	Ivff6	Idiosyncratic volatility from the 3-factor model, 6-month horizon, Ang, Hodrick, Xing, and Zhang (2006)
Ivff12	Idiosyncratic volatility from the 3-factor model, 12-month horizon, Ang, Hodrick, Xing, and Zhang (2006)	Ivc1	Idiosyncratic volatility from the CAPM, 1-month horizon
Ivc6	Idiosyncratic volatility from the CAPM, 6-month horizon	Ivc12	Idiosyncratic volatility from the CAPM, 12-month horizon
Ivq1	Idiosyncratic volatility from the *q*-factor model, 1-month horizon	Ivq6	Idiosyncratic volatility from the *q*-factor model, 6-month horizon
Ivq12	Idiosyncratic volatility from the *q*-factor model, 12-month horizon	Tv1	Total volatility, 1-month horizon, Ang, Hodrick, Xing, and Zhang (2006)
Tv6	Total volatility, 6-month horizon, Ang, Hodrick, Xing, and Zhang (2006)	Tv12	Total volatility, 12-month horizon, Ang, Hodrick, Xing, and Zhang (2006)
Sv1	Systematic volatility, 1-month horizon, Ang, Hodrick, Xing, and Zhang (2006)	Sv6	Systematic volatility, 6-month horizon, Ang, Hodrick, Xing, and Zhang (2006)
Sv12	Systematic volatility, 12-month horizon, Ang, Hodrick, Xing, and Zhang (2006)	$\beta 1$	The market beta, 1-month horizon, Fama and MacBeth (1973)
$\beta 6$	The market beta, 6-month horizon, Fama and MacBeth (1973)	$\beta 12$	The market beta, 12-month horizon, Fama and MacBeth (1973)
$\beta^{\mathrm{FP}}1$	The Frazzini-Pedersen beta, 1-month horizon	$\beta^{\mathrm{FP}}6$	The Frazzini-Pedersen beta, 6-month horizon
$\beta^{\mathrm{FP}}12$	The Frazzini-Pedersen beta, 12-month horizon	$\beta^{\mathrm{D}}1$	The Dimson beta, 1-month horizon
$\beta^{\mathrm{D}}6$	The Dimson beta, 6-month horizon	$\beta^{\mathrm{D}}12$	The Dimson beta, 12-month horizon

Tur1 Share turnover, 1-month horizon, Datar, Naik, and Radcliffe (1998)

Tur6 Share turnover, 6-month horizon, Datar, Naik, and Radcliffe (1998)

Tur12 Share turnover, 12-month horizon, Datar, Naik, and Radcliffe (1998)

Cvt1 Coefficient of variation for share turnover, 1-month horizon, Chordia, Subrahmanyam, and Anshuman (2001)

Cvt6 Coefficient of variation for share turnover, 1-month horizon, Chordia, Subrahmanyam, and Anshuman (2001)

Cvt12 Coefficient of variation for share turnover, 12-month horizon, Chordia, Subrahmanyam, and Anshuman (2001)

Dtv1 Dollar trading volume, 1-month horizon, Brennan, Chordia, and Subrahmanyam (1998)

Dtv6 Dollar trading volume, 6-month horizon, Brennan, Chordia, and Subrahmanyam (1998)

Dtv12 Dollar trading volume, 12-month horizon Brennan, Chordia, and Subrahmanyam (1998)

Cvd1 Coefficient of variation for dollar trading volume, 1-month horizon, Chordia, Subrahmanyam, and Anshuman (2001)

Cvd6 Coefficient of variation for dollar trading volume, 6-month horizon, Chordia, Subrahmanyam, and Anshuman (2001)

Cvd12 Coefficient of variation for dollar trading volume, 12-month horizon, Chordia, Subrahmanyam, and Anshuman (2001)

Pps1 Share price, 1-month horizon, Miller and Scholes (1982)

Pps6 Share price, 6-month horizon, Miller and Scholes (1982)

Pps12 Share price, 12-month horizon, Miller and Scholes (1982)

Ami1 Absolute return-to-volume, 1-month horizon, Amihud (2002)

Ami6 Absolute return-to-volume, 6-month horizon, Amihud (2002)

Ami12 Absolute return-to-volume, 12-month horizon, Amihud (2002)

Lm^{1}1 Prior 1-month turnover-adjusted number of zero daily trading volume, 1-month horizon, Liu (2006)

Lm^{1}6 Prior 1-month turnover-adjusted number of zero daily trading volume, 6-month horizon, Liu (2006)

Lm^{1}12 Prior 1-month turnover-adjusted number of zero daily trading volume, 12-month horizon, Liu (2006)

Lm^{6}1 Prior 6-month turnover-adjusted number of zero daily trading volume, 1-month horizon, Liu (2006)

Lm^{6}6 Prior 6-month turnover-adjusted number of zero daily trading volume, 6-month horizon, Liu (2006)

Lm^{6}12 Prior 6-month turnover-adjusted number of zero daily trading volume, 12-month horizon, Liu (2006)

Lm^{12}1 Prior 12-month turnover-adjusted number of zero daily trading volume, 1-month horizon, Liu (2006)

Lm^{12}6 Prior 12-month turnover-adjusted number of zero daily trading volume, 6-month horizon, Liu (2006)

Lm^{12}12 Prior 12-month turnover-adjusted number of zero daily trading volume, 12-month horizon, Liu (2006)

Mdr1 Maximum daily return, 1-month horizon, Bali, Cakici, and Whitelaw (2011)

Mdr6 Maximum daily returns, 6-month horizon Bali, Cakici, and Whitelaw (2011)

Mdr12 Maximum daily return, 12-month horizon Bali, Cakici, and Whitelaw (2011)

Ts1 Total skewness, 1-month horizon, Bali, Engle, and Murray (2015)

Ts6 Total skewness, 6-month horizon, Bali, Engle, and Murray (2015)

Ts12 Total skewness, 12-month horizon, Bali, Engle, and Murray (2015)

Isc1 Idiosyncratic skewness from the CAPM, 1-month horizon

Isc6 Idiosyncratic skewness from the CAPM, 6-month horizon

Isc12 Idiosyncratic skewness from the CAPM, 12-month horizon

Isff1 Idiosyncratic skewness from the 3-factor model, 1-month horizon

Isff6 Idiosyncratic skewness from the 3-factor model, 6-month horizon

Isff12	Idiosyncratic skewness from the 3-factor model, 12-month horizon	Isq1	Idiosyncratic skewness from the q-factor model, 1-month horizon
Isq6	Idiosyncratic skewness from the q-factor model, 6-month horizon	Isq12	Idiosyncratic skewness from the q-factor model, 12-month horizon
Cs1	Coskewness, 1-month horizon, Harvey and Siddique (2000)	Cs6	Coskewness, 6-month horizon, Harvey and Siddique (2000)
Cs12	Coskewness, 12-month horizon, Harvey and Siddique (2000)	Srev	Short-term reversal, Jegadeesh (1990)
$\beta^{-}1$	Downside beta, 1-month horizon, Ang, Chen, and Xing (2006)	$\beta^{-}6$	Downside beta, 6-month horizon, Ang, Chen, and Xing (2006)
$\beta^{-}12$	Downside beta, 12-month horizon, Ang, Chen, and Xing (2006)	Tail1	Tail risk, 1-month horizon Kelly and Jiang (2014)
Tail6	Tail risk, 6-month horizon Kelly and Jiang (2014)	Tail12	Tail risk, 12-month horizon Kelly and Jiang (2014)
$\beta^{\text{ret}}1$	Liquidity beta (return-return), 1-month horizon, Acharya and Pedersen (2005)	$\beta^{\text{ret}}6$	Liquidity beta (return-return), 6-month horizon, Acharya and Pedersen (2005)
$\beta^{\text{ret}}12$	Liquidity beta (return-return), 12-month horizon, Acharya and Pedersen (2005)	$\beta^{\text{lcc}}1$	Liquidity beta (illiquidity-illiquidity), 1-month horizon, Acharya and Pedersen (2005)
$\beta^{\text{lcc}}6$	Liquidity beta (illiquidity-illiquidity), 6-month horizon, Acharya and Pedersen (2005)	$\beta^{\text{lcc}}12$	Liquidity beta (illiquidity-illiquidity), 12-month horizon, Acharya and Pedersen (2005)
$\beta^{\text{lrc}}1$	Liquidity beta (return-illiquidity), 1-month horizon, Acharya and Pedersen (2005)	$\beta^{\text{lrc}}6$	Liquidity beta (return-illiquidity), 6-month horizon, Acharya and Pedersen (2005)
$\beta^{\text{lrc}}12$	Liquidity beta (return-illiquidity), 12-month horizon, Acharya and Pedersen (2005)	$\beta^{\text{lcr}}1$	Liquidity beta (illiquidity-return), 1-month horizon, Acharya and Pedersen (2005)
$\beta^{\text{lcr}}6$	Liquidity beta (illiquidity-return), 6-month horizon, Acharya and Pedersen (2005)	$\beta^{\text{lcr}}12$	Liquidity beta (illiquidity-return), 12-month horizon, Acharya and Pedersen (2005)
$\beta^{\text{net}}1$	Net liquidity beta, 1-month horizon Acharya and Pedersen (2005)	$\beta^{\text{net}}6$	Net liquidity beta, 6-month horizon Acharya and Pedersen (2005)
$\beta^{\text{net}}12$	Net liquidity beta, 12-month horizon Acharya and Pedersen (2005)	Shl1	The high-low bid-ask spread, 1-month horizon, Corwin and Schultz (2012)
Shl6	The high-low bid-ask spread, 6-month horizon, Corwin and Schultz (2012)	Shl12	The high-low bid-ask spread, 12-month horizon, Corwin and Schultz (2012)
Sba1	The bid-ask spread, 1-month horizon, Hou and Loh (2016)	Sba6	The bid-ask spread, 6-month horizon, Hou and Loh (2016)
Sba12	The bid-ask spread, 12-month horizon, Hou and Loh (2016)	$\beta^{\text{lev}}1$	The leverage beta, 1-month horizon, Adrian, Etula, and Muir (2014)
$\beta^{\text{lev}}6$	The leverage beta, 6-month horizon, Adrian, Etula, and Muir (2014)	$\beta^{\text{lev}}12$	The leverage beta, 12-month horizon, Adrian, Etula, and Muir (2014)
$\beta^{\text{PS}}1$	The Pastor-Stambaugh beta, 1-month horizon, Pastor and Stambaugh (2003)	$\beta^{\text{PS}}6$	The Pastor-Stambaugh beta, 6-month horizon, Pastor and Stambaugh (2003)
$\beta^{\text{PS}}12$	The Pastor-Stambaugh beta, 12-month horizon, Pastor and Stambaugh (2003)	Pin	Probability of information-based trading, Easley, Hvidkjaer, and O'Hara (2002)

Table 2 : Value- and Equal-weighted Average Monthly Returns, and Averages and Cross-sectional Standard Deviations of Selected Anomaly Variables, January 1967–December 2016, 600 Months

Pane A shows averages of monthly value- and equal-weighted average returns, and monthly cross-sectional standard deviations (std) of returns for all stocks (Market) and microcaps (Micro), small, big, and all but micro stocks. Panel A also shows the average number of stocks and the average percent of the aggregate market capitalization in each size group each month. Panel B shows average monthly cross-sectional standard deviations of selected anomaly variables. Micro stocks are below the 20th percentile of NYSE market equity, small stocks are between the 20th and 50th percentiles, and big stocks are above the NYSE median. The anomaly variables are the log market equity (log(Me)), book-to-market (Bm), standardized unexpected earnings (Sue), prior six-month returns (R^6), investment-to-assets (I/A), return on equity (Roe), net payout yield (Nop), operating accruals (Oa), R&D-to-market (Rdm), and cash-based operating profitability (Cop). In Panel B, we winsorize all the variables at the 1–99% level before computing the cross-sectional standard deviations. Appendix A details the variable definitions.

Panel A: Average monthly values

	Number of firms	% of total market cap	Value-weighted returns Average	Value-weighted returns Std	Equal-weighted returns Average	Equal-weighted returns Std	Cross-sectional std of returns
Market	3,896	100.00	0.91	4.48	1.17	6.27	16.46
Micro	2,365	3.21	1.07	6.89	1.27	7.10	19.26
Small	766	6.71	1.14	6.29	1.15	6.40	11.85
Big	765	90.09	0.90	4.37	1.01	5.06	8.84
All but micro	1,532	96.79	0.91	4.45	1.08	5.66	10.52

Panel B: Average monthly cross-sectional standard deviations

	log(Me)	Bm	Sue	R^6	I/A	Roe	Nop	Oa	Rdm	Cop
Market	1.91	0.68	1.74	0.35	0.40	0.11	0.09	0.12	0.10	0.14
Micro	1.07	0.77	1.59	0.38	0.42	0.13	0.11	0.13	0.12	0.15
Small	0.47	0.50	1.77	0.35	0.39	0.08	0.07	0.10	0.06	0.11
Big	0.95	0.43	1.89	0.28	0.31	0.06	0.06	0.08	0.05	0.10
All but micro	1.21	0.47	1.84	0.32	0.35	0.07	0.07	0.09	0.06	0.11

Table 3 : Portfolio Weights on Microcaps and Investment Capacity, January 1967–December 2016, 600 Months

The 6 categories of anomalies, momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions, are denoted by "Mom," "VvG," "Inv," "Prof," "Intan," and "Fric," respectively. In portfolio sorts, "Low" denotes the low decile, and "High" the high decile. "NYSE-VW" denotes NYSE breakpoints and value-weighted returns, "NYSE-EW" NYSE breakpoints and equal-weighted returns, "All-VW" NYSE-Amex-NASDAQ breakpoints and value-weighted returns, and "All-EW" NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. In Fama-MacBeth regressions, "FM-WLS" denotes weighted least squares with the market equity as weights, "FM-OLS" ordinary least squares. We separate each zero-investment slope portfolio into two: "Low" is the short portfolio with negative weights on individual stocks, and "High" the long portfolio with positive weights on individual stocks. To ease comparison with the results from sorts, we scale the long and short portfolios to make their total weights sum up to 1 and −1, respectively. In Panel A, we calculate the time series average of weights on microcaps for the low and high portfolios of each anomaly, and report the average across all the anomalies in a given category. In Panel B, the investment capacity of a portfolio is $\min_i\{\text{Me}_i/w_i\}$, in which Me_i is stock i's market equity, and w_i its weight. For the low and high portfolios of each anomaly, we compute the investment capacity at each month, take its time series average, and report the average across all the anomalies in a given category.

	Panel A: Portfolio weights allocated to microcaps (in %)							Panel B: Investment capacity as a fraction of the aggregate market capitalization (in %)						
	All	Mom	VvG	Inv	Prof	Intan	Fric	All	Mom	VvG	Inv	Prof	Intan	Fric
	Low							Low						
NYSE-VW	7.19	8.00	3.89	7.36	9.46	4.00	10.24	10.70	5.95	13.12	5.96	8.52	9.88	15.80
NYSE-EW	55.24	62.23	48.58	68.47	65.48	46.56	51.88	0.12	0.02	0.04	0.01	0.03	0.19	0.27
All-VW	10.40	10.76	5.53	9.99	15.04	4.93	15.38	10.16	5.00	8.52	4.39	6.29	11.24	17.91
All-EW	57.56	63.86	51.05	71.21	68.86	47.51	54.86	0.11	0.02	0.03	0.01	0.03	0.19	0.23
FM-WLS	3.88	4.82	2.37	3.59	5.60	2.43	4.57	17.94	10.71	22.00	9.03	10.70	19.60	26.14
FM-OLS	54.31	62.64	46.20	62.08	63.52	46.45	53.11	0.09	0.09	0.07	0.02	0.05	0.14	0.13
	High							High						
NYSE-VW	10.12	3.87	7.38	5.54	5.84	10.29	19.96	8.56	8.93	5.64	7.50	11.10	8.59	8.74
NYSE-EW	59.53	47.66	62.87	58.26	53.52	59.00	69.21	0.08	0.04	0.02	0.02	0.03	0.06	0.24
All-VW	14.97	4.41	8.93	7.11	8.18	15.98	31.46	7.19	8.60	4.47	4.71	9.57	7.17	7.35
All-EW	62.12	48.65	64.16	60.53	54.89	62.41	73.72	0.07	0.04	0.02	0.02	0.02	0.05	0.19
FM-WLS	8.22	2.73	4.79	4.93	3.51	7.79	18.52	6.87	11.28	4.22	3.91	7.19	7.08	6.84
FM-OLS	60.14	47.72	63.00	59.20	53.47	59.79	70.59	0.09	0.06	0.02	0.02	0.03	0.07	0.24

Table 4 : The Numbers of Replicated Anomalies from Different Procedures and Absolute t-cutoffs, January 1967–December 2016, 600 Months

The 6 categories of anomalies, momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions, are denoted by "Mom," "VvG," "Inv," "Prof," "Intan," and "Fric," respectively. For portfolio sorts, "NYSE-VW" denotes NYSE breakpoints and value-weighted returns, "NYSE-EW" NYSE breakpoints and equal-weighted returns, "All-VW" NYSE-Amex-NASDAQ breakpoints and value-weighted returns, "All-EW" NYSE-Amex-NASDAQ breakpoints and equal-weighted returns, and "NYSE-VW-SS" NYSE breakpoints and value-weighted returns in the shorter samples in the original studies. For univariate Fama-MacBeth regressions, "FM-WLS" denotes weighted least squares with the market equity as weights, "FM-OLS" ordinary least squares, and "FM-WLS-SS" weighted least squares in the shorter, original samples. We winsorize the regressors at the 1–99% level each month, and standardize them before performing cross-sectional regressions. Standardizing a variable means subtracting its cross-sectional mean and then dividing by its cross-sectional standard deviation. We apply the absolute t-cutoffs of 1.96, 2.78, and 3.39 in Panels A, B, and C, respectively.

	All	Mom	VvG	Inv	Prof	Intan	Fric
	Panel A: $\|t\| \geq 1.96$						
NYSE-VW	158	36	29	28	35	26	4
NYSE-EW	255	48	54	37	42	41	33
All-VW	184	39	27	26	47	28	17
All-EW	265	48	54	37	44	40	42
FM-WLS	152	32	21	28	38	20	13
FM-OLS	263	46	48	38	49	42	40
NYSE-VW-SS	157	33	24	27	42	22	9
FM-WLS-SS	141	32	12	25	42	19	11
	Panel B: $\|t\| \geq 2.78$						
NYSE-VW	81	28	7	19	14	11	2
NYSE-EW	211	44	44	36	34	31	22
All-VW	100	30	11	18	25	9	7
All-EW	217	42	45	36	33	33	28
FM-WLS	60	19	2	14	18	5	2
FM-OLS	219	42	42	37	34	35	29
NYSE-VW-SS	74	27	6	16	15	7	3
FM-WLS-SS	63	21	5	13	16	5	3
	Panel C: $\|t\| \geq 3.39$						
NYSE-VW	40	16	3	7	9	5	0
NYSE-EW	178	38	39	35	28	23	15
All-VW	49	20	4	12	8	5	0
All-EW	190	38	41	35	25	28	23
FM-WLS	30	12	1	7	8	2	0
FM-OLS	185	36	38	36	28	28	19
NYSE-VW-SS	35	16	1	7	5	5	1
FM-WLS-SS	29	12	0	6	6	4	1

Table 5 : Average Returns of the High-minus-low Deciles, the Univariate Fama-MacBeth Slopes, and their Absolute t-values, 452 Anomalies, January 1967–December 2016, 600 Months

"NYSE-VW" denotes NYSE breakpoints and value-weighted returns, "NYSE-EW" NYSE breakpoints and equal-weighted returns, "All-VW" NYSE-Amex-NASDAQ breakpoints and value-weighted returns, "All-EW" NYSE-Amex-NASDAQ breakpoints and equal-weighted returns, "NYSE-VW-SS" NYSE breakpoints and value-weighted returns in the shorter samples in the original studies. For each sorting procedure, we show the average return, $\overline{R}$, and the absolute t-value, $|t|$, adjusted for heteroscedasticity and autocorrelations, for the high-minus-low decile formed on each of the 452 anomaly variables. For univariate Fama-MacBeth regressions, "FM-WLS" denotes weighted least squares with the market equity as weights, "FM-OLS" ordinary least squares, and "FM-WLS-SS" weighted least squares in the original samples. We winsorize the regressors at the 1–99% level each month, and then standardize them before performing cross-sectional regressions. Standardizing a variable means subtracting its cross-sectional mean and then dividing by its cross-sectional standard deviation. For each anomaly variable, we report the slope and its absolute Fama-MacBeth t-value. The superscripts, ^{a}, ^{b}, and ^{c}, indicate absolute t-values exceeding the thresholds of 1.96, 2.78, and 3.39, respectively. Table 1 describes the symbols of anomalies, and Appendix A details variable definitions and portfolio construction.

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
								Panel A: Momentum								
Sue1	0.46	3.48^c	1.33	9.96^c	0.48	3.68^c	1.34	10.33^c	0.12	3.67^c	0.38	10.58^c	0.50	1.14	0.15	1.38
Sue6	0.16	1.44	0.63	5.10^c	0.17	1.55	0.64	5.30^c	0.06	1.84	0.19	5.55^c	0.37	0.85	0.09	0.81
Sue12	0.08	0.73	0.23	1.98^a	0.08	0.74	0.24	2.15^a	0.02	0.69	0.07	2.26^a	0.01	0.01	−0.01	0.14
Abr1	0.70	5.45^c	1.26	14.44^c	1.01	5.98^c	1.52	14.60^c	0.26	5.53^c	0.41	14.41^c	0.96	5.36^c	0.35	5.49^c
Abr6	0.33	3.41^c	0.74	10.89^c	0.44	3.72^c	0.84	10.89^c	0.12	3.14^b	0.23	10.59^c	0.41	3.39^c	0.17	3.64^c
Abr12	0.23	2.99^b	0.46	8.13^c	0.32	3.20^b	0.53	8.06^c	0.10	2.91^b	0.15	8.56^c	0.30	2.70^a	0.13	3.11^b
Re1	0.75	3.18^b	1.21	6.55^c	0.77	3.01^b	1.40	7.27^c	0.26	2.01^a	0.31	4.88^c	1.06	3.09^b	0.46	2.96^b
Re6	0.47	2.24^a	0.73	4.43^c	0.53	2.25^a	0.85	4.92^c	0.17	1.48	0.19	3.20^b	0.59	1.76	0.31	2.09^a
Re12	0.24	1.30	0.41	2.92^b	0.27	1.28	0.48	3.15^b	0.08	0.79	0.10	1.79	0.26	0.84	0.14	1.02
$R^6 1$	0.60	2.08^a	0.67	2.72^a	1.41	4.01^c	0.69	2.31^a	0.20	2.00^a	0.20	2.57^a	0.90	2.95^b	0.22	1.86
$R^6 6$	0.82	3.50^c	0.64	2.90^b	1.29	4.63^c	0.70	2.63^a	0.28	3.18^b	0.20	2.85^b	1.06	3.82^c	0.30	2.71^a
$R^6 12$	0.55	2.91^b	0.26	1.46	0.85	3.81^c	0.26	1.15	0.20	2.48^a	0.07	1.16	0.85	3.66^c	0.24	2.51^a
$R^{11} 1$	1.16	3.99^c	0.89	3.35^b	1.62	4.29^c	0.87	2.69^a	0.36	3.39^c	0.28	3.30^b	1.58	4.94^c	0.45	3.73^c
$R^{11} 6$	0.80	3.13^b	0.42	1.76	1.10	3.51^c	0.42	1.43	0.27	2.69^a	0.12	1.53	1.26	4.48^c	0.37	3.26^b
$R^{11} 12$	0.43	1.93	−0.03	0.14	0.54	2.01^a	−0.11	0.41	0.15	1.70	−0.03	0.53	0.79	3.17^b	0.22	2.24^a
Im1	0.68	2.86^b	1.46	7.21^c	0.68	2.86^b	1.46	7.21^c	0.13	1.92	0.41	6.86^c	0.76	2.68^a	0.15	2.03^a
Im6	0.60	3.01^b	0.93	5.55^c	0.60	3.01^b	0.93	5.55^c	0.09	1.68	0.26	4.99^c	0.69	2.91^b	0.08	1.22
Im12	0.63	3.57^c	0.80	5.13^c	0.63	3.57^c	0.80	5.13^c	0.09	1.68	0.20	4.28^c	0.75	3.71^c	0.11	1.89
Rs1	0.32	2.28^a	0.88	5.82^c	0.30	2.05^a	0.92	5.97^c	0.07	1.96	0.23	5.16^c	0.31	1.15	0.07	1.00
Rs6	0.15	1.12	0.41	2.84^b	0.15	1.11	0.43	2.92^b	0.04	1.19	0.10	2.30^a	0.24	0.93	0.06	0.80
Rs12	0.07	0.52	0.10	0.68	0.06	0.51	0.11	0.75	0.02	0.64	0.01	0.19	0.24	0.99	0.06	0.86

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Tes1	0.23	1.41	0.78	8.31^{c}	0.30	1.55	0.85	8.03^{c}	0.10	1.98^{a}	0.20	7.15^{c}	0.26	1.40	0.13	1.96^{a}
Tes6	0.24	1.68	0.40	4.89^{c}	0.32	1.91	0.43	4.81^{c}	0.10	1.88	0.10	4.17^{c}	0.37	2.20^{a}	0.14	2.15^{a}
Tes12	0.16	1.19	0.15	2.02^{a}	0.15	1.02	0.17	2.08^{a}	0.06	1.15	0.04	1.78	0.29	1.83	0.10	1.63
dEf1	0.94	4.33^{c}	1.51	9.87^{c}	1.25	5.29^{c}	1.66	10.53^{c}	0.34	4.25^{c}	0.34	7.94^{c}	1.91	3.68^{c}	0.62	3.58^{c}
dEf6	0.56	3.19^{b}	0.82	6.81^{c}	0.71	4.04^{c}	0.92	7.31^{c}	0.20	3.17^{b}	0.19	5.07^{c}	1.47	2.89^{b}	0.48	2.95^{b}
dEf12	0.33	2.38^{a}	0.49	4.80^{c}	0.41	2.92^{b}	0.54	5.08^{c}	0.12	2.23^{a}	0.11	3.17^{b}	0.84	1.80	0.31	2.07^{a}
Nei1	0.33	3.04^{b}	0.76	5.58^{c}	0.33	3.04^{b}	0.76	5.58^{c}	0.08	2.27^{a}	0.27	6.74^{c}	0.42	1.89	0.13	1.74
Nei6	0.19	1.78	0.39	2.93^{b}	0.19	1.78	0.39	2.93^{b}	0.04	1.16	0.13	3.28^{b}	0.26	1.20	0.08	1.18
Nei12	0.12	1.11	0.16	1.19	0.12	1.11	0.16	1.19	0.02	0.53	0.05	1.34	0.19	0.90	0.06	0.84
52w1	0.13	0.38	−0.16	0.46	0.30	0.74	−0.72	1.72	0.13	1.08	−0.05	0.44	0.35	1.09	0.19	1.50
52w6	0.56	2.01^{a}	0.39	1.29	0.92	2.57^{a}	0.30	0.81	0.26	2.50^{a}	0.16	1.45	0.87	3.16^{b}	0.34	3.04^{b}
52w12	0.45	1.88	0.22	0.82	0.62	1.96^{a}	0.14	0.40	0.21	2.34^{a}	0.08	0.83	0.65	2.66^{a}	0.29	2.87^{b}
$\epsilon^{6}1$	0.18	1.15	0.68	4.90^{c}	0.23	1.37	0.69	4.88^{c}	0.04	0.88	0.20	5.09^{c}	0.28	1.54	0.06	1.22
$\epsilon^{6}6$	0.45	3.74^{c}	0.62	5.28^{c}	0.48	3.89^{c}	0.64	5.42^{c}	0.12	3.55^{c}	0.18	5.42^{c}	0.57	4.20^{c}	0.15	3.92^{c}
$\epsilon^{6}12$	0.37	3.85^{c}	0.39	4.14^{c}	0.38	3.91^{c}	0.40	4.18^{c}	0.10	3.44^{c}	0.12	4.28^{c}	0.46	4.28^{c}	0.12	3.74^{c}
$\epsilon^{11}1$	0.61	3.72^{c}	1.18	8.22^{c}	0.62	3.71^{c}	1.20	8.15^{c}	0.19	4.11^{c}	0.36	8.88^{c}	0.76	4.18^{c}	0.24	4.60^{c}
$\epsilon^{11}6$	0.50	3.82^{c}	0.66	5.31^{c}	0.52	3.88^{c}	0.68	5.34^{c}	0.14	3.50^{c}	0.57	5.38^{c}	0.62	4.21^{c}	0.18	3.92^{c}
$\epsilon^{11}12$	0.33	2.88^{b}	0.30	2.95^{b}	0.33	2.80^{b}	0.31	2.95^{b}	0.09	2.46^{a}	0.26	2.94^{b}	0.40	3.09^{b}	0.10	2.67^{a}
Sm1	0.53	2.36^{a}	1.22	6.62^{c}	0.56	2.40^{a}	1.29	6.86^{c}	0.16	2.46^{a}	0.37	7.65^{c}	0.63	2.45^{a}	0.20	2.64^{a}
Sm6	0.09	0.94	0.45	4.58^{c}	0.10	1.06	0.47	4.80^{c}	0.02	0.50	0.13	4.86^{c}	0.14	1.30	0.03	0.75
Sm12	0.14	1.94	0.39	5.81^{c}	0.13	1.69	0.41	5.80^{c}	0.04	1.95	0.11	5.86^{c}	0.17	1.92	0.05	1.94
Ilr1	0.69	3.33^{b}	1.29	7.43^{c}	0.69	3.33^{b}	1.29	7.43^{c}	0.21	3.59^{c}	0.42	8.03^{c}	0.83	3.57^{c}	0.33	4.53^{c}
Ilr6	0.34	3.36^{b}	0.64	6.88^{c}	0.34	3.35^{b}	0.64	6.88^{c}	0.04	1.41	0.17	5.99^{c}	0.36	2.95^{b}	0.07	1.83
Ilr12	0.35	4.27^{c}	0.49	6.50^{c}	0.35	4.27^{c}	0.49	6.50^{c}	0.06	2.95^{b}	0.14	6.33^{c}	0.41	4.27^{c}	0.09	3.27^{b}
Ile1	0.58	3.48^{c}	0.70	4.37^{c}	0.58	3.48^{c}	0.70	4.37^{c}	0.06	1.32	0.19	4.81^{c}	0.67	3.33^{b}	0.08	1.27
Ile6	0.23	1.55	0.35	2.60^{a}	0.23	1.55	0.35	2.60^{a}	0.03	0.62	0.09	2.44^{a}	0.30	1.63	0.04	0.59
Ile12	0.09	0.64	0.14	1.15	0.09	0.63	0.14	1.15	0.00	0.02	0.03	0.87	0.16	0.94	0.00	0.03
Cm1	0.78	3.85^{c}	0.79	5.47^{c}	0.78	3.92^{c}	0.83	5.68^{c}	0.25	3.20^{b}	0.26	5.04^{c}	0.89	3.34^{b}	0.35	3.31^{b}
Cm6	0.16	1.72	0.37	6.19^{c}	0.21	1.98^{a}	0.41	6.29^{c}	0.08	1.88	0.14	6.01^{c}	0.15	1.19	0.10	1.73
Cm12	0.15	2.23^{a}	0.30	5.79^{c}	0.17	2.34^{a}	0.33	6.01^{c}	0.07	2.41^{a}	0.12	6.29^{c}	0.14	1.61	0.07	2.09^{a}

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$
Sim1	0.79	3.65^c	1.29	6.00^c	0.79	3.65^c	1.29	6.00^c	0.21	4.15^c	0.36	6.43^c	0.90	3.44^c	0.25	3.87^c
Sim6	0.10	0.96	0.46	3.70^c	0.10	0.96	0.46	3.70^c	0.03	1.12	0.14	4.07^c	0.14	1.11	0.04	1.11
Sim12	0.11	1.42	0.31	3.69^c	0.11	1.42	0.31	3.69^c	0.04	2.06^a	0.10	4.30^c	0.14	1.46	0.04	1.77
Cim1	0.75	3.35^b	1.36	6.50^c	0.75	3.35^b	1.36	6.50^c	0.20	3.70^c	0.34	6.51^c	0.83	3.15^b	0.23	3.71^c
Cim6	0.29	2.76^a	0.58	5.48^c	0.29	2.76^a	0.58	5.48^c	0.07	2.88^b	0.14	5.24^c	0.33	2.70^a	0.09	2.79^b
Cim12	0.27	3.41^c	0.46	6.17^c	0.27	3.41^c	0.46	6.17^c	0.08	4.08^c	0.11	6.03^c	0.31	3.44^c	0.09	4.16^c
Panel B: Value-versus-growth																
Bm	0.54	2.61^a	1.19	6.08^c	0.64	2.80^b	1.39	6.43^c	0.20	2.06^a	0.34	5.95^c	1.41	3.10^b	0.57	3.10^b
Bmj	0.46	2.12^a	1.12	5.44^c	0.52	2.01^a	1.25	5.46^c	0.17	1.49	0.33	5.20^c	0.53	2.32^a	0.20	1.60
Bm^{q}1	0.43	1.70	1.53	5.83^c	0.38	1.31	1.78	6.03^c	0.21	1.59	0.53	6.65^c	0.54	1.97^a	0.25	1.71
Bm^{q}6	0.42	1.78	1.12	4.75^c	0.39	1.46	1.27	4.91^c	0.18	1.43	0.35	4.99^c	0.50	2.00^a	0.21	1.59
Bm^{q}12	0.48	2.21^a	1.13	5.19^c	0.50	2.05^a	1.28	5.39^c	0.19	1.66	0.34	5.20^c	0.55	2.42^a	0.22	1.81
Dm	0.31	1.61	0.40	1.97^a	0.33	1.46	0.48	2.18^a	0.13	1.55	0.09	1.49	0.51	1.38	0.21	1.31
Dm^{q}1	0.29	1.25	0.54	1.99^a	0.32	1.09	0.61	2.15^a	0.17	1.13	0.09	1.15	0.94	1.56	0.38	1.32
Dm^{q}6	0.28	1.25	0.30	1.19	0.34	1.27	0.36	1.36	0.18	1.26	0.01	0.16	0.92	1.69	0.36	1.38
Dm^{q}12	0.33	1.57	0.35	1.53	0.43	1.71	0.41	1.67	0.19	1.51	0.04	0.56	0.87	1.70	0.37	1.44
Am	0.31	1.52	0.83	3.73^c	0.44	1.93	1.06	4.35^c	0.16	1.69	0.19	3.20^b	0.38	1.43	0.14	1.43
Am^{q}1	0.33	1.20	1.19	3.83^c	0.34	1.18	1.36	4.03^c	0.20	1.39	0.29	3.52^c	0.27	0.89	0.18	1.52
Am^{q}6	0.38	1.48	0.82	2.94^b	0.38	1.37	0.91	3.07^b	0.18	1.33	0.15	1.93	0.27	0.94	0.15	1.35
Am^{q}12	0.37	1.59	0.81	3.15^b	0.40	1.56	0.94	3.43^c	0.17	1.37	0.16	2.13^a	0.30	1.09	0.14	1.24
Rev1	−0.43	1.92	−0.95	4.41^c	−0.37	1.35	−1.13	4.23^c	−0.05	0.83	−0.25	4.50^c	−0.87	2.11^a	−0.19	1.66
Rev6	−0.42	2.01^a	−0.85	4.25^c	−0.37	1.45	−1.01	3.98^c	−0.05	0.74	−0.23	4.50^c	−0.81	2.06^a	−0.18	1.55
Rev12	−0.39	1.99^a	−0.80	4.33^c	−0.33	1.36	−0.95	4.00^c	−0.05	0.86	−0.22	4.62^c	−0.76	2.07^a	−0.18	1.63
Ep	0.44	2.26^a	0.65	4.55^c	0.64	3.01^b	0.75	4.86^c	0.20	2.38^a	0.19	4.52^c	0.77	1.97^a	0.32	2.01^a
Ep^{q}1	0.93	4.94^c	1.70	10.58^c	0.96	4.46^c	1.80	10.38^c	0.38	3.78^c	0.48	10.25^c	1.18	2.94^b	0.47	2.89^b
Ep^{q}6	0.59	3.42^c	1.04	7.72^c	0.66	3.46^c	1.11	7.75^c	0.26	2.89^b	0.29	7.39^c	0.81	2.25^a	0.38	2.45^a
Ep^{q}12	0.43	2.60^a	0.66	5.47^c	0.49	2.69^a	0.72	5.70^c	0.20	2.31^a	0.19	5.46^c	0.64	1.83	0.32	2.13^a
Efp1	0.42	1.80	0.59	2.59^a	0.43	1.50	0.64	2.52^a	0.13	1.06	0.18	2.66^a	−0.01	0.02	−0.07	0.61
Efp6	0.38	1.62	0.28	1.26	0.40	1.46	0.31	1.28	0.11	0.95	0.09	1.33	−0.07	0.26	−0.10	0.95
Efp12	0.34	1.52	0.28	1.37	0.37	1.40	0.30	1.32	0.11	0.98	0.09	1.46	−0.03	0.12	−0.08	0.85

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Cp	0.43	2.14^a	0.87	5.07^c	0.37	1.59	0.97	5.07^c	0.20	2.20^a	0.25	5.03^c	0.75	2.60^a	0.29	2.71^a
Cp^{q}1	0.62	2.93^b	1.27	6.39^c	0.72	3.18^b	1.46	6.70^c	0.31	2.75^a	0.36	6.31^c	0.83	2.85^b	0.37	2.93^b
Cp^{q}6	0.48	2.42^a	0.85	4.64^c	0.57	2.59^a	0.98	4.96^c	0.25	2.39^a	0.24	4.63^c	0.63	2.34^a	0.31	2.87^b
Cp^{q}12	0.40	2.12^a	0.76	4.47^c	0.50	2.41^a	0.86	4.71^c	0.22	2.22^a	0.21	4.35^c	0.63	2.43^a	0.30	2.82^b
Dp	0.25	1.03	0.16	0.89	0.21	0.87	0.19	1.03	0.10	1.29	0.05	1.00	0.49	1.10	0.18	1.25
Dp^{q}1	0.28	1.12	0.38	2.12^a	0.26	1.05	0.37	2.02^a	0.13	1.74	0.12	2.58^a	0.50	1.10	0.22	1.47
Dp^{q}6	0.19	0.80	0.20	1.11	0.18	0.78	0.19	1.06	0.11	1.42	0.06	1.18	0.46	1.04	0.19	1.32
Dp^{q}12	0.21	0.90	0.25	1.45	0.21	0.89	0.25	1.42	0.10	1.40	0.07	1.50	0.44	0.99	0.19	1.28
Op	0.38	1.86	0.51	3.54^c	0.43	1.87	0.58	3.50^c	0.17	2.16^a	0.15	4.01^c	0.56	1.84	0.15	1.13
Op^{q}1	0.11	0.49	0.39	2.90^b	0.12	0.52	0.42	2.77^a	0.18	1.97^a	0.13	3.18^b	0.23	0.75	0.24	1.77
Op^{q}6	0.11	0.61	0.33	2.66^a	0.16	0.78	0.39	2.96^b	0.11	1.34	0.09	2.62^a	0.16	0.60	0.14	1.16
Op^{q}12	0.17	0.91	0.31	2.76^a	0.23	1.19	0.36	2.96^b	0.11	1.35	0.09	2.98^b	0.28	1.06	0.17	1.38
Nop	0.64	3.40^c	0.69	4.15^c	0.61	3.01^b	0.81	4.16^c	0.21	2.11^a	0.19	3.47^c	0.97	3.02^b	0.26	1.34
Nop^{q}1	0.19	0.86	0.49	2.40^a	0.27	1.07	0.61	2.38^a	0.14	1.36	0.13	2.15^a	0.41	1.19	0.20	1.34
Nop^{q}6	0.25	1.19	0.61	3.15^b	0.38	1.62	0.82	3.48^c	0.14	1.35	0.19	3.56^c	0.47	1.47	0.20	1.31
Nop^{q}12	0.31	1.55	0.54	2.95^b	0.47	2.14^a	0.78	3.52^c	0.14	1.43	0.19	3.76^c	0.53	1.72	0.23	1.58
Sr	−0.19	1.08	−0.47	3.52^c	−0.13	0.68	−0.52	3.65^c	−0.02	0.37	−0.12	3.26^b	−0.45	1.97^a	−0.11	1.56
Sg	−0.03	0.19	−0.66	5.56^c	−0.17	0.96	−0.87	6.49^c	−0.15	1.94	−0.23	6.45^c	−0.20	0.90	−0.16	1.59
Em	−0.54	2.86^b	−0.85	5.92^c	−0.71	3.21^b	−0.98	5.74^c	−0.17	2.16^a	−0.18	4.30^c	−0.67	3.27^b	−0.21	2.32^a
Em^{q}1	−0.71	3.21^b	−1.63	8.97^c	−1.02	3.83^c	−1.87	8.93^c	−0.22	2.64^a	−0.32	6.64^c	−0.86	3.43^c	−0.25	2.52^a
Em^{q}6	−0.43	2.05^a	−0.99	6.49^c	−0.64	2.62^a	−1.13	6.58^c	−0.14	1.78	−0.22	5.25^c	−0.58	2.46^a	−0.18	1.87
Em^{q}12	−0.43	2.15^a	−0.83	5.80^c	−0.65	2.75^a	−0.96	6.00^c	−0.14	1.71	−0.18	4.68^c	−0.57	2.51^a	−0.17	1.82
Sp	0.50	2.37^a	0.89	4.07^c	0.74	2.87^b	1.14	4.38^c	0.29	2.30^a	0.22	3.99^c	0.41	1.30	0.12	0.69
Sp^{q}1	0.59	2.39^a	1.33	4.91^c	0.72	2.55^a	1.58	5.30^c	0.40	2.51^a	0.35	4.90^c	0.24	0.68	0.18	0.95
Sp^{q}6	0.56	2.43^a	1.00	4.00^c	0.61	2.30^a	1.19	4.32^c	0.35	2.31^a	0.25	3.71^c	0.21	0.64	0.12	0.69
Sp^{q}12	0.53	2.47^a	0.91	3.85^c	0.60	2.39^a	1.09	4.14^c	0.31	2.22^a	0.22	3.64^c	0.30	0.97	0.10	0.59
Ocp	0.70	3.14^b	0.81	4.31^c	0.83	3.26^b	0.89	4.34^c	0.27	2.63^a	0.19	3.56^c	0.57	2.11^a	0.21	1.88
Ocp^{q}1	0.64	2.28^a	0.93	3.44^c	0.65	2.19^a	0.94	3.17^b	0.39	1.89	0.23	2.78^a	0.27	0.81	0.07	0.32
Ocp^{q}6	0.47	1.82	0.62	2.39^a	0.63	2.28^a	0.66	2.42^a	0.28	1.50	0.14	1.80	0.22	0.75	−0.01	0.05
Ocp^{q}12	0.37	1.56	0.59	2.54^a	0.54	2.11^a	0.63	2.57^a	0.24	1.41	0.13	1.79	0.18	0.65	0.01	0.04
Ir	−0.47	2.22^a	−0.97	5.09^c	−0.57	2.32^a	−1.09	5.06^c	−0.14	1.87	−0.30	5.04^c	−0.63	2.39^a	−0.17	1.74

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Vhp	0.38	2.05^{a}	0.46	3.51^{c}	0.55	2.58^{a}	0.59	4.02^{c}	0.20	2.51^{a}	0.15	4.01^{c}	0.21	0.70	0.13	1.24
Vfp	0.47	2.18^{a}	0.27	1.39	0.45	1.69	0.33	1.54	0.13	1.19	0.08	1.43	0.33	1.15	0.07	0.71
Ebp	0.41	2.00^{a}	0.90	4.74^{c}	0.41	1.68	1.11	5.20^{c}	0.16	1.56	0.30	5.53^{c}	0.44	1.90	0.15	1.20
$\text{Ebp}^{q}1$	0.25	0.90	1.30	5.08^{c}	0.34	1.04	1.72	5.87^{c}	0.13	0.90	0.48	6.32^{c}	0.25	0.81	0.09	0.48
$\text{Ebp}^{q}6$	0.21	0.84	0.93	3.92^{c}	0.25	0.83	1.21	4.52^{c}	0.11	0.80	0.34	5.01^{c}	0.22	0.74	0.05	0.28
$\text{Ebp}^{q}12$	0.31	1.28	0.95	4.23^{c}	0.38	1.31	1.19	4.75^{c}	0.13	1.04	0.33	5.15^{c}	0.36	1.30	0.08	0.51
Ndp	0.28	1.52	0.42	2.25^{a}	0.35	1.68	0.44	2.17^{a}	0.15	1.80	0.09	1.57	0.26	1.21	0.13	1.46
$\text{Ndp}^{q}1$	0.16	0.66	0.40	1.42	0.36	1.35	0.46	1.49	0.13	0.82	0.05	0.51	−0.06	0.20	0.10	0.58
$\text{Ndp}^{q}6$	0.17	0.75	0.25	0.93	0.35	1.27	0.27	0.91	0.15	0.99	−0.02	0.27	0.00	0.01	0.06	0.39
$\text{Ndp}^{q}12$	0.26	1.25	0.33	1.39	0.43	1.79	0.34	1.31	0.18	1.36	0.02	0.23	0.15	0.59	0.11	0.79
Dur	−0.42	2.19^{a}	−0.76	3.97^{c}	−1.06	4.06^{c}	−0.86	3.61^{c}	−0.23	2.23^{a}	−0.25	3.76^{c}	−0.62	2.62^{a}	−0.23	2.21^{a}
Ltg	0.13	0.38	−0.18	0.57	−0.06	0.14	−0.38	0.99	−0.04	0.30	−0.13	1.23	0.16	0.25	−0.06	0.29
Ltg1	0.02	0.05	−0.32	1.01	−0.14	0.30	−0.52	1.34	−0.06	0.40	−0.16	1.40	0.05	0.07	−0.01	0.02
Ltg6	0.01	0.02	−0.34	1.09	−0.19	0.40	−0.57	1.51	−0.07	0.49	−0.18	1.62	−0.05	0.07	−0.03	0.13
Ltg12	0.02	0.07	−0.32	1.06	−0.18	0.39	−0.55	1.47	−0.07	0.46	−0.17	1.60	0.02	0.02	−0.03	0.16
Panel C: Investment																
Aci	−0.30	2.13^{a}	−0.30	4.30^{c}	−0.28	2.03^{a}	−0.36	4.45^{c}	−0.09	2.12^{a}	−0.09	5.31^{c}	−0.39	2.50^{a}	−0.11	2.13^{a}
I/A	−0.44	2.89^{b}	−1.02	6.91^{c}	−0.56	3.40^{c}	−1.27	6.99^{c}	−0.18	2.91^{b}	−0.36	9.29^{c}	−0.57	3.03^{b}	−0.26	3.27^{b}
$\text{Ia}^{q}1$	−0.31	1.74	−1.08	5.84^{c}	−0.34	1.54	−1.30	5.72^{c}	−0.14	2.12^{a}	−0.39	8.02^{c}	−0.44	1.89	−0.18	1.99^{a}
$\text{Ia}^{q}6$	−0.50	3.00^{b}	−1.18	6.46^{c}	−0.66	3.42^{c}	−1.43	6.45^{c}	−0.19	2.95^{b}	−0.41	8.86^{c}	−0.69	3.26^{b}	−0.25	2.89^{b}
$\text{Ia}^{q}12$	−0.48	3.11^{b}	−1.16	6.79^{c}	−0.61	3.50^{c}	−1.40	6.70^{c}	−0.20	3.20^{b}	−0.40	9.46^{c}	−0.66	3.40^{c}	−0.26	3.21^{b}
dPia	−0.48	3.64^{c}	−0.98	7.58^{c}	−0.61	4.43^{c}	−1.08	8.06^{c}	−0.13	2.84^{b}	−0.30	8.85^{c}	−0.55	3.60^{c}	−0.15	2.77^{a}
Noa	−0.44	3.25^{b}	−0.88	5.64^{c}	−0.49	3.06^{b}	−1.01	5.23^{c}	−0.18	4.87^{c}	−0.29	5.94^{c}	−0.48	2.88^{b}	−0.20	4.38^{c}
dNoa	−0.55	4.14^{c}	−1.04	8.05^{c}	−0.68	4.47^{c}	−1.20	8.03^{c}	−0.22	4.36^{c}	−0.35	9.58^{c}	−0.68	4.14^{c}	−0.26	4.04^{c}
dLno	−0.39	2.99^{b}	−0.84	6.64^{c}	−0.47	3.66^{c}	−0.91	6.76^{c}	−0.12	3.36^{b}	−0.27	7.83^{c}	−0.39	2.34^{a}	−0.11	2.16^{a}
Ig	−0.46	3.76^{c}	−0.56	6.52^{c}	−0.49	3.19^{b}	−0.71	6.67^{c}	−0.17	2.43^{a}	−0.17	6.54^{c}	−0.55	3.91^{c}	−0.20	2.33^{a}
2Ig	−0.33	2.52^{a}	−0.46	5.17^{c}	−0.27	1.61	−0.57	5.20^{c}	−0.16	2.28^{a}	−0.16	5.53^{c}	−0.34	2.12^{a}	−0.16	1.85
3Ig	−0.16	1.15	−0.47	5.09^{c}	−0.28	1.58	−0.54	4.71^{c}	−0.12	1.80	−0.15	5.79^{c}	−0.15	0.79	−0.10	1.13
Nsi	−0.64	4.47^{c}	−0.99	6.32^{c}	−0.78	5.19^{c}	−1.13	6.70^{c}	−0.17	4.32^{c}	−0.30	6.83^{c}	−0.86	4.77^{c}	−0.21	4.38^{c}
dIi	−0.29	2.61^{a}	−0.45	6.32^{c}	−0.45	3.36^{b}	−0.57	7.13^{c}	−0.14	2.30^{a}	−0.14	5.50^{c}	−0.32	2.03^{a}	−0.10	1.34

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Cei	−0.57	3.32^b	−0.67	3.67^c	−0.63	3.41^c	−0.81	3.89^c	−0.19	3.09^b	−0.24	3.82^c	−0.69	3.13^b	−0.24	3.23^b
Cdi	0.05	0.43	−0.37	5.42^c	−0.02	0.15	−0.42	5.32^c	−0.03	0.72	−0.11	5.09^c	0.01	0.06	−0.03	0.63
Ivg	−0.33	2.44^a	−0.72	6.79^c	−0.44	2.90^b	−0.82	6.37^c	−0.13	2.56^a	−0.23	8.23^c	−0.45	3.16^b	−0.17	3.13^b
Ivc	−0.44	3.33^b	−0.66	6.36^c	−0.45	2.74^a	−0.78	6.52^c	−0.13	2.29^a	−0.21	6.64^c	−0.49	2.80^b	−0.15	1.86
Oa	−0.27	2.19^a	−0.38	3.61^c	−0.28	1.71	−0.44	3.40^c	−0.10	1.66	−0.11	2.79^b	−0.33	1.98^a	−0.13	1.96^a
Ta	−0.22	1.63	−0.45	3.54^c	−0.22	1.24	−0.53	3.29^b	−0.10	1.73	−0.17	4.06^c	−0.31	1.83	−0.13	1.77
dWc	−0.42	3.25^b	−0.44	5.08^c	−0.43	2.46^a	−0.63	5.52^c	−0.16	2.86^b	−0.18	6.17^c	−0.53	3.38^b	−0.21	2.94^b
dCoa	−0.31	2.28^a	−0.83	7.22^c	−0.47	2.93^b	−1.01	7.82^c	−0.15	2.18^a	−0.29	8.49^c	−0.41	2.55^a	−0.21	2.43^a
dCol	−0.12	0.81	−0.64	6.90^c	−0.18	1.02	−0.79	7.37^c	−0.03	0.48	−0.24	7.96^c	−0.12	0.69	−0.06	0.74
dNco	−0.41	3.52^c	−0.97	7.51^c	−0.55	4.16^c	−1.07	7.86^c	−0.16	4.12^c	−0.32	9.77^c	−0.48	3.40^c	−0.18	3.75^c
dNca	−0.42	3.47^c	−0.96	7.14^c	−0.50	4.01^c	−1.05	7.42^c	−0.15	3.88^c	−0.32	9.54^c	−0.51	3.48^c	−0.17	3.62^c
dNcl	−0.08	0.64	−0.24	2.66^a	−0.11	1.00	−0.22	2.57^a	−0.03	0.97	−0.09	3.91^c	−0.23	1.65	−0.04	1.21
dFin	0.28	2.39^a	0.58	7.81^c	0.28	1.93	0.56	5.86^c	0.11	2.45^a	0.17	6.72^c	0.35	2.44^a	0.12	2.31^a
dSti	0.18	1.22	−0.10	1.03	−0.19	0.92	−0.23	1.70	0.02	0.34	−0.08	2.38^a	0.40	2.20^a	0.04	0.54
dLti	−0.23	1.59	−0.42	4.62^c	−0.04	0.22	−0.50	4.48^c	−0.05	0.90	−0.14	4.62^c	−0.29	1.59	−0.08	1.17
dFnl	−0.32	3.09^b	−0.81	10.52^c	−0.29	2.53^a	−0.89	10.61^c	−0.15	4.09^c	−0.27	10.39^c	−0.37	2.89^b	−0.18	4.08^c
dBe	−0.32	2.03^a	−0.63	4.39^c	−0.69	3.57^c	−0.83	4.79^c	−0.17	2.45^a	−0.25	6.36^c	−0.38	1.89	−0.20	2.28^a
Dac	−0.39	2.95^b	−0.37	4.47^c	−0.42	2.39^a	−0.39	3.60^c	−0.14	2.45^a	−0.12	3.67^c	−0.39	2.46^a	−0.15	2.96^b
Poa	−0.39	2.89^b	−0.55	6.30^c	−0.46	2.68^a	−0.64	6.69^c	−0.07	1.51	−0.11	5.02^c	−0.41	1.70	0.01	0.18
Pta	−0.42	3.14^b	−0.36	5.22^c	−0.56	3.72^c	−0.45	5.90^c	−0.15	3.50^c	−0.11	6.02^c	−0.23	0.92	−0.07	1.26
Pda	−0.48	3.91^c	−0.37	5.66^c	−0.40	2.97^b	−0.35	4.52^c	−0.10	2.77^a	−0.08	4.40^c	−0.55	2.88^b	−0.02	0.31
Nxf	−0.29	1.58	−0.79	5.84^c	−0.51	2.44^a	−0.99	5.85^c	−0.15	2.13^a	−0.31	6.38^c	−0.45	2.01^a	−0.22	2.54^a
Nef	−0.18	0.96	−0.53	2.84^b	−0.44	1.97^a	−0.78	3.57^c	−0.12	1.50	−0.20	3.54^c	−0.34	1.43	−0.21	2.11^a
Ndf	−0.30	2.45^a	−0.69	8.82^c	−0.23	1.70	−0.78	8.82^c	−0.08	2.34^a	−0.23	9.54^c	−0.37	2.31^a	−0.10	2.14^a
Panel D: Profitability																
Roe1	0.68	3.12^b	1.23	6.32^c	0.77	3.03^b	1.36	5.47^c	0.24	2.69^a	0.35	4.90^c	0.82	3.22^b	0.28	2.62^a
Roe6	0.42	1.98^a	0.72	3.73^c	0.38	1.58	0.89	3.58^c	0.18	2.17^a	0.25	3.44^c	0.48	1.92	0.21	2.13^a
Roe12	0.23	1.18	0.27	1.45	0.26	1.14	0.41	1.71	0.12	1.49	0.14	1.88	0.28	1.23	0.14	1.45
dRoe1	0.75	5.53^c	1.46	12.26^c	0.88	5.04^c	1.56	12.04^c	0.26	4.75^c	0.35	9.38^c	0.83	5.35^c	0.28	4.43^c
dRoe6	0.36	3.16^b	0.78	7.94^c	0.41	3.00^b	0.85	7.83^c	0.14	2.92^b	0.20	6.23^c	0.42	3.17^b	0.16	2.98^b

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
dRoe12	0.24	2.39^a	0.37	4.28^c	0.27	2.45^a	0.38	4.02^c	0.10	2.43^a	0.10	3.57^c	0.31	2.67^a	0.13	2.58^a
Roa1	0.57	2.63^a	1.06	4.97^c	0.77	2.90^b	1.12	4.04^c	0.25	2.64^a	0.31	3.53^c	0.68	2.50^a	0.31	2.59^a
Roa6	0.39	1.82	0.64	3.02^b	0.53	1.98^a	0.71	2.52^a	0.20	2.17^a	0.21	2.33^a	0.35	1.34	0.24	2.15^a
Roa12	0.25	1.27	0.24	1.16	0.40	1.60	0.30	1.09	0.13	1.49	0.09	1.07	0.27	1.11	0.19	1.76
dRoa1	0.57	3.76^c	1.44	11.90^c	0.72	3.98^c	1.38	10.20^c	0.26	4.74^c	0.34	8.86^c	0.70	4.21^c	0.28	4.15^c
dRoa6	0.27	1.99^a	0.75	7.38^c	0.41	2.71^a	0.70	6.03^c	0.15	2.97^b	0.17	5.13^c	0.39	2.53^a	0.18	3.05^b
dRoa12	0.17	1.45	0.33	3.82^c	0.31	2.44^a	0.30	3.04^b	0.10	2.07^a	0.07	2.44^a	0.30	2.24^a	0.15	2.63^a
Rna	0.15	0.81	−0.13	0.69	0.34	1.25	−0.01	0.05	0.09	1.38	0.01	0.13	0.37	1.18	0.25	1.99^a
Rna^q1	0.64	2.77^a	0.79	3.64^c	0.93	2.86^b	0.90	3.01^b	0.36	4.04^c	0.17	2.32^a	0.92	2.45^a	0.62	3.93^c
Rna^q6	0.43	2.01^a	0.44	2.06^a	0.86	2.78^b	0.61	2.08^a	0.28	3.27^b	0.13	1.79	0.71	2.06^a	0.54	3.69^c
Rna^q12	0.35	1.68	0.20	0.95	0.69	2.25^a	0.34	1.18	0.24	2.86^b	0.08	1.14	0.67	2.00^a	0.48	3.31^b
Pm	0.03	0.14	−0.17	0.73	0.44	1.48	0.04	0.14	0.12	1.47	0.03	0.50	0.40	0.98	0.29	1.76
Pm^q1	0.36	1.68	0.53	2.35^a	0.82	2.94^b	0.82	2.90^b	0.21	2.66^a	0.13	2.43^a	0.70	1.64	0.44	2.63^a
Pm^q6	0.17	0.87	0.24	1.12	0.66	2.44^a	0.51	1.83	0.15	2.00^a	0.10	1.93	0.50	1.24	0.39	2.42^a
Pm^q12	0.17	0.90	0.04	0.18	0.57	2.16^a	0.27	0.96	0.14	1.82	0.07	1.37	0.47	1.20	0.36	2.20^a
Ato	0.33	1.89	0.25	1.60	0.33	1.92	0.25	1.57	0.05	1.03	0.01	0.44	0.48	1.48	0.10	0.93
Ato^q1	0.62	3.44^c	1.02	6.53^c	0.81	4.06^c	1.05	6.58^c	0.18	3.73^c	0.21	6.18^c	0.94	3.24^b	0.27	2.96^b
Ato^q6	0.53	3.07^b	0.79	5.09^c	0.62	3.34^b	0.81	5.09^c	0.16	3.27^b	0.16	4.96^c	0.80	2.90^b	0.26	2.77^a
Ato^q12	0.42	2.56^a	0.60	3.86^c	0.51	2.85^b	0.62	3.87^c	0.14	2.85^b	0.12	3.61^c	0.64	2.32^a	0.21	2.24^a
Cto	0.28	1.67	0.25	1.29	0.32	1.73	0.23	1.08	0.06	1.29	0.02	0.39	0.44	1.27	0.11	1.21
Cto^q1	0.44	2.44^a	0.99	5.35^c	0.73	3.13^b	1.03	4.95^c	0.14	2.89^b	0.26	5.35^c	0.69	2.05^a	0.19	2.08^a
Cto^q6	0.40	2.34^a	0.77	4.15^c	0.61	2.78^a	0.82	3.97^c	0.12	2.61^a	0.20	4.25^c	0.61	1.79	0.16	1.84
Cto^q12	0.36	2.14^a	0.58	3.12^b	0.50	2.39^a	0.62	3.00^b	0.10	2.19^a	0.13	2.88^b	0.55	1.61	0.13	1.49
Gpa	0.37	2.63^a	0.67	4.35^c	0.58	2.83^b	0.64	3.29^b	0.12	2.05^a	0.18	3.97^c	0.41	2.64^a	0.12	1.96^a
Gla	0.17	1.13	0.24	1.54	0.31	1.67	0.24	1.24	0.06	0.96	0.04	0.92	0.16	1.03	0.06	0.85
Gla^q1	0.51	3.48^c	0.96	5.48^c	0.87	4.42^c	0.96	4.40^c	0.18	2.93^b	0.29	5.84^c	0.53	3.28^b	0.19	2.79^b
Gla^q6	0.33	2.46^a	0.69	3.96^c	0.65	3.36^b	0.66	2.94^b	0.14	2.33^a	0.21	4.29^c	0.38	2.53^a	0.15	2.31^a
Gla^q12	0.29	2.18^a	0.50	2.89^b	0.58	3.23^b	0.46	2.04^a	0.12	2.06^a	0.15	3.16^b	0.32	2.25^a	0.13	2.05^a
Ope	0.27	1.34	0.13	0.66	0.57	1.88	0.29	1.03	0.17	2.08^a	0.11	1.38	0.26	1.20	0.18	2.06^a
Ole	0.11	0.58	−0.13	0.70	0.68	2.40^a	0.14	0.52	0.07	1.22	0.04	0.51	0.07	0.38	0.07	1.17
Ole^q1	0.71	3.40^c	0.93	4.49^c	0.78	3.17^b	1.19	4.20^c	0.24	3.63^c	0.32	4.18^c	0.69	3.15^b	0.25	3.49^c

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Ole^{q}6	0.48	2.40^a	0.50	2.54^a	0.55	2.36^a	0.75	2.77^a	0.18	2.93^b	0.23	3.00^b	0.47	2.25^a	0.19	2.91^b
Ole^{q}12	0.36	1.90	0.21	1.06	0.50	2.20^a	0.44	1.63	0.14	2.47^a	0.14	1.83	0.36	1.81	0.15	2.44^a
Opa	0.41	2.09^a	0.43	2.43^a	0.81	2.58^a	0.59	2.49^a	0.13	1.86	0.17	2.39^a	0.34	1.70	0.12	1.59
Ola	0.20	1.11	0.03	0.14	0.62	2.18^a	0.20	0.86	0.03	0.42	0.05	0.85	0.17	0.91	0.01	0.17
Ola^{q}1	0.75	3.53^c	1.05	5.34^c	1.00	3.66^c	1.34	5.20^c	0.25	3.45^c	0.38	5.13^c	0.70	3.19^b	0.24	3.17^b
Ola^{q}6	0.52	2.59^a	0.67	3.50^c	0.75	3.00^b	0.91	3.64^c	0.16	2.31^a	0.27	3.82^c	0.49	2.34^a	0.16	2.09^a
Ola^{q}12	0.46	2.46^a	0.41	2.22^a	0.67	2.82^b	0.59	2.45^a	0.15	2.13^a	0.19	2.74^a	0.45	2.29^a	0.14	1.92
Cop	0.63	3.57^c	0.69	4.81^c	0.82	3.34^b	0.81	4.15^c	0.16	2.42^a	0.23	4.13^c	0.62	3.41^c	0.16	2.33^a
Cla	0.55	3.23^b	0.46	3.03^b	0.93	3.97^c	0.72	3.68^c	0.10	1.57	0.20	3.67^c	0.52	3.01^b	0.10	1.45
Cla^{q}1	0.52	3.26^b	0.90	6.01^c	0.54	3.09^b	1.06	5.82^c	0.20	3.58^c	0.33	6.16^c	0.50	3.04^b	0.21	3.55^c
Cla^{q}6	0.49	3.60^c	0.73	5.50^c	0.60	3.95^c	0.92	5.52^c	0.17	3.22^b	0.27	5.62^c	0.48	3.48^c	0.17	3.13^b
Cla^{q}12	0.46	3.63^c	0.62	4.96^c	0.56	4.09^c	0.80	5.30^c	0.17	3.44^c	0.23	5.21^c	0.47	3.59^c	0.17	3.38^b
F	0.29	1.11	0.46	2.06^a	0.29	1.11	0.46	2.06^a	0.07	1.54	0.12	2.15^a	0.65	2.19^a	0.09	1.55
F^{q}1	0.52	2.32^a	1.42	5.61^c	0.52	2.32^a	1.42	5.61^c	0.12	2.46^a	0.37	5.08^c	0.65	2.38^a	0.17	2.69^a
F^{q}6	0.48	2.39^a	0.98	4.13^c	0.48	2.39^a	0.98	4.13^c	0.09	2.06^a	0.26	3.71^c	0.61	2.44^a	0.15	2.57^a
F^{q}12	0.38	2.05^a	0.65	2.81^b	0.38	2.05^a	0.65	2.81^b	0.06	1.57	0.17	2.50^a	0.55	2.54^a	0.12	2.50^a
Fp	−0.39	1.35	−0.29	1.12	−0.55	1.50	−0.34	1.03	−0.19	1.62	−0.09	0.84	−0.82	2.09^a	−0.40	2.27^a
Fp^{q}1	−0.45	1.38	−0.57	2.06^a	−0.85	2.29^a	−0.78	2.42^a	−0.20	1.46	−0.23	2.42^a	−0.97	2.31^a	−0.39	1.99^a
Fp^{q}6	−0.62	1.99^a	−0.53	1.96	−0.89	2.46^a	−0.71	2.23^a	−0.23	1.86	−0.21	2.08^a	−1.15	2.92^b	−0.43	2.40^a
Fp^{q}12	−0.36	1.26	−0.28	1.07	−0.53	1.55	−0.35	1.11	−0.17	1.45	−0.10	1.00	−0.74	2.04^a	−0.32	1.95
O	−0.09	0.48	−0.01	0.04	−0.52	1.82	−0.10	0.40	−0.04	0.63	−0.04	0.51	−0.60	2.05^a	−0.11	1.09
O^{q}1	−0.37	1.66	−0.14	0.65	−0.94	2.62^a	−0.24	0.74	−0.15	1.70	−0.08	0.88	−0.83	2.71^a	−0.19	1.56
O^{q}6	−0.23	1.06	−0.04	0.20	−0.80	2.29^a	−0.11	0.34	−0.13	1.52	−0.04	0.47	−0.75	2.48^a	−0.17	1.44
O^{q}12	−0.16	0.76	0.01	0.05	−0.71	2.11^a	−0.06	0.18	−0.12	1.41	−0.03	0.31	−0.68	2.27^a	−0.17	1.43
Z	0.01	0.06	−0.21	1.26	−0.13	0.61	−0.43	2.26^a	−0.05	0.64	−0.15	3.52^c	−0.04	0.13	−0.06	0.40
Z^{q}1	0.00	0.00	−0.17	0.78	−0.10	0.37	−0.38	1.41	−0.04	0.54	−0.14	2.39^a	0.08	0.23	−0.03	0.20
Z^{q}6	−0.03	0.17	−0.28	1.34	−0.21	0.82	−0.49	1.95	−0.06	0.73	−0.16	3.02^b	0.06	0.18	−0.04	0.32
Z^{q}12	−0.09	0.46	−0.29	1.48	−0.20	0.85	−0.51	2.15^a	−0.05	0.73	−0.15	3.17^b	−0.01	0.02	−0.06	0.45
G	0.24	1.22	0.18	0.81	0.24	1.22	0.18	0.81	0.06	1.10	0.06	0.88	0.71	2.73^a	0.17	2.83^b
Cr1	0.03	0.09	−0.28	0.82	−0.10	0.26	−0.63	1.53	−0.03	0.31	−0.15	1.18	−0.08	0.20	−0.05	0.44
Cr6	−0.01	0.03	−0.26	0.77	−0.12	0.31	−0.57	1.41	−0.02	0.27	−0.13	1.01	−0.11	0.26	−0.04	0.38

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Cr12	−0.01	0.02	−0.26	0.78	−0.13	0.36	−0.54	1.38	−0.02	0.19	−0.12	0.93	−0.08	0.19	−0.03	0.30
Tbi	0.14	1.06	0.13	1.40	0.04	0.29	0.06	0.60	0.05	1.37	0.05	2.34^a	0.14	0.67	0.06	1.14
Tbi^{q}1	0.18	1.41	−0.04	0.43	0.23	1.58	−0.02	0.16	0.02	0.58	0.01	0.39	0.18	0.80	0.06	1.12
Tbi^{q}6	0.21	1.90	0.05	0.61	0.18	1.59	0.04	0.43	0.04	1.22	0.02	1.17	0.24	1.16	0.06	1.22
Tbi^{q}12	0.20	1.88	0.09	1.17	0.11	1.00	0.07	0.73	0.04	1.28	0.03	1.72	0.27	1.34	0.07	1.27
Bl	−0.02	0.12	−0.30	2.36^a	0.17	0.94	−0.20	1.36	0.00	0.11	−0.09	2.97^b	−0.02	0.10	−0.06	1.10
Bl^{q}1	0.10	0.58	−0.25	1.61	0.29	1.32	−0.13	0.74	0.05	1.12	−0.09	2.30^a	0.15	0.69	0.03	0.45
Bl^{q}6	0.12	0.71	−0.28	1.91	0.31	1.46	−0.18	1.12	0.04	0.90	−0.10	2.69^a	0.19	0.93	0.01	0.15
Bl^{q}12	0.09	0.52	−0.27	1.93	0.26	1.24	−0.19	1.18	0.03	0.66	−0.10	2.77^a	0.13	0.62	−0.01	0.13
Sg^{q}1	0.30	1.76	0.56	4.28^c	0.30	1.61	0.48	3.29^b	0.08	1.09	0.06	1.55	0.30	1.19	0.12	1.29
Sg^{q}6	0.12	0.72	0.04	0.33	0.07	0.41	−0.06	0.45	−0.03	0.36	−0.07	1.92	0.06	0.26	−0.01	0.16
Sg^{q}12	−0.09	0.63	−0.33	2.83^b	−0.09	0.58	−0.44	3.53^c	−0.08	1.28	−0.16	4.80^c	−0.23	1.08	−0.08	1.01
Panel E: Intangibles																
Oca	0.54	2.67^a	0.78	3.77^c	0.43	2.26^a	0.78	3.57^c	0.14	1.71	0.20	3.90^c	0.51	2.15^a	0.12	1.26
Ioca	0.53	4.31^c	0.67	5.33^c	0.50	3.93^c	0.72	5.23^c	0.14	2.48^a	0.18	4.62^c	0.59	4.16^c	0.18	2.70^a
Adm	0.66	2.71^a	0.72	3.14^b	0.67	2.48^a	0.90	3.45^c	0.30	2.01^a	0.13	2.38^a	0.82	2.73^a	0.46	3.23^b
gAd	−0.07	0.38	−0.59	5.02^c	−0.13	0.59	−0.66	4.45^c	−0.06	0.82	−0.19	4.92^c	−0.14	0.66	−0.08	0.95
Rdm	0.70	2.75^a	1.56	6.43^c	0.79	2.23^a	1.77	5.44^c	0.37	2.32^a	0.44	4.98^c	0.47	1.38	0.11	0.69
Rdm^{q}1	1.12	2.91^b	2.36	5.77^c	1.78	3.34^b	3.24	5.97^c	0.90	3.03^b	0.98	6.38^c	1.12	1.76	0.41	1.09
Rdm^{q}6	0.80	2.18^a	2.01	5.38^c	1.13	2.42^a	2.52	5.21^c	0.66	2.59^a	0.70	5.03^c	0.79	1.21	0.33	0.91
Rdm^{q}12	0.82	2.43^a	2.03	5.88^c	1.06	2.54^a	2.44	5.59^c	0.61	2.66^a	0.66	5.18^c	0.76	1.43	0.25	0.74
Rds	0.09	0.35	0.30	1.09	−0.29	0.64	−0.05	0.13	−0.08	0.60	−0.04	0.56	0.08	0.25	−0.17	1.03
Rds^{q}1	0.35	1.21	0.33	0.89	−0.40	0.71	−0.15	0.31	−0.04	0.31	−0.13	1.75	0.46	0.98	−0.07	0.30
Rds^{q}6	0.45	1.71	0.42	1.16	−0.33	0.61	0.01	0.01	−0.04	0.36	−0.10	1.36	0.69	1.66	−0.06	0.23
Rds^{q}12	0.45	1.70	0.44	1.19	−0.25	0.46	0.03	0.05	−0.04	0.27	−0.09	1.21	0.73	1.87	−0.02	0.06
Ol	0.44	2.63^a	0.52	3.05^b	0.49	2.77^a	0.58	3.26^b	0.11	2.30^a	0.14	3.54^c	0.50	2.65^a	0.13	2.36^a
Ol^{q}1	0.49	2.60^a	0.62	3.37^b	0.48	2.39^a	0.65	3.41^c	0.13	2.53^a	0.17	4.22^c	0.53	2.42^a	0.15	2.50^a
Ol^{q}6	0.48	2.62^a	0.56	3.10^b	0.49	2.58^a	0.62	3.27^b	0.12	2.40^a	0.16	3.99^c	0.54	2.53^a	0.14	2.43^a
Ol^{q}12	0.48	2.77^a	0.52	2.89^b	0.48	2.62^a	0.58	3.08^b	0.12	2.41^a	0.15	3.67^c	0.55	2.74^a	0.14	2.47^a
Hn	−0.25	1.63	−0.68	5.84^c	−0.19	1.08	−0.85	6.34^c	−0.08	1.21	−0.22	5.96^c	−0.29	1.80	−0.09	1.09

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Rca	0.35	1.49	0.69	2.46[a]	0.34	0.76	0.80	1.91	0.20	1.18	0.17	1.46	0.31	1.08	0.17	0.78
Bca	0.15	0.65	0.25	1.61	0.19	0.81	0.33	1.94	0.07	0.90	0.05	1.23	0.27	1.01	0.11	1.14
Aop	−0.16	0.92	−0.05	0.44	−0.16	0.92	−0.13	1.06	−0.04	0.72	−0.03	0.90	−0.17	0.63	−0.02	0.17
Pafe	0.25	0.73	0.00	0.00	0.08	0.22	−0.05	0.15	0.07	0.61	−0.02	0.22	0.15	0.25	0.03	0.16
Parc	0.09	0.38	−0.04	0.34	0.82	2.33[a]	−0.10	0.68	0.12	1.16	−0.04	1.10	0.09	0.38	0.12	1.16
Crd	0.16	0.64	0.07	0.61	0.40	1.03	0.22	1.51	0.07	0.53	0.01	0.35	0.16	0.64	0.07	0.53
Hs	−0.31	2.12[a]	−0.20	1.53	−0.32	2.18[a]	−0.17	1.41	−0.04	1.18	−0.04	1.07	−0.37	2.30[a]	−0.06	1.40
Ha	−0.24	1.71	−0.01	0.05	−0.29	1.81	−0.15	0.92	−0.05	1.26	−0.04	0.82	−0.26	1.55	−0.05	1.21
He	−0.22	1.58	0.02	0.10	−0.24	1.53	−0.14	0.80	−0.05	1.21	−0.04	0.87	−0.29	1.66	−0.06	1.37
Age1	0.02	0.09	0.07	0.32	−0.02	0.09	0.31	1.43	−0.01	0.23	0.05	0.69	0.07	0.28	0.00	0.06
Age6	0.02	0.13	0.07	0.35	0.03	0.15	0.36	1.70	−0.01	0.20	0.05	0.81	0.07	0.29	0.00	0.04
Age12	0.01	0.07	0.04	0.22	0.05	0.23	0.34	1.61	−0.01	0.24	0.05	0.72	0.05	0.24	0.00	0.08
D1	0.20	0.98	0.40	1.92	0.26	0.96	0.98	3.74[c]	0.17	0.97	0.24	2.99[b]	0.18	0.71	0.12	0.60
D2	0.23	1.10	0.41	1.88	0.25	0.88	1.04	3.73[c]	0.21	1.12	0.26	3.09[b]	0.23	0.88	0.17	0.75
D3	0.24	1.13	0.39	1.79	0.28	0.98	1.03	3.69[c]	0.20	1.09	0.26	3.08[b]	0.24	0.92	0.16	0.71
dSi	0.10	0.74	0.13	2.26[a]	0.10	0.67	0.13	1.76	0.06	1.63	0.07	3.59[c]	0.05	0.27	0.13	2.23[a]
dSa	0.18	1.47	0.13	2.03[a]	0.00	0.00	0.12	1.63	0.09	2.43[a]	0.06	3.24[b]	0.29	2.01[a]	0.13	2.38[a]
dGs	0.09	0.70	0.13	1.61	0.08	0.57	0.16	1.86	0.01	0.13	0.03	1.69	0.10	0.52	0.02	0.32
dSs	−0.02	0.10	−0.14	1.51	0.09	0.52	−0.23	2.45[a]	−0.02	0.32	−0.07	3.04[b]	−0.10	0.54	−0.04	0.51
Etr	0.24	2.29[a]	0.01	0.21	0.19	1.67	0.00	0.04	0.05	1.54	−0.01	0.52	0.20	1.47	0.08	1.74
Lfe	0.17	1.40	−0.06	1.03	0.24	1.72	−0.10	1.28	−0.04	0.87	−0.06	2.33[a]	0.12	0.69	−0.06	0.77
Ana1	−0.13	0.82	−0.14	0.77	−0.13	0.81	−0.08	0.44	−0.04	0.97	−0.04	0.70	0.33	1.32	0.09	1.35
Ana6	−0.12	0.72	−0.14	0.79	−0.07	0.46	−0.10	0.59	−0.04	0.86	−0.04	0.68	0.38	1.53	0.09	1.35
Ana12	−0.11	0.66	−0.14	0.78	−0.09	0.56	−0.12	0.68	−0.04	0.85	−0.04	0.68	0.39	1.59	0.09	1.30
Tan	0.02	0.16	0.49	3.25[b]	−0.11	0.71	0.46	2.72[a]	0.01	0.33	0.14	3.13[b]	−0.12	0.66	−0.03	0.61
$\text{Tan}^{q}1$	0.20	1.08	0.73	4.74[c]	0.18	0.94	0.75	4.26[c]	0.07	1.31	0.21	4.50[c]	0.06	0.25	0.02	0.30
$\text{Tan}^{q}6$	0.19	1.14	0.67	4.24[c]	0.12	0.66	0.69	3.99[c]	0.06	1.19	0.21	4.37[c]	−0.01	0.05	0.00	0.06
$\text{Tan}^{q}12$	0.12	0.78	0.58	3.82[c]	0.02	0.14	0.58	3.43[c]	0.04	0.85	0.18	3.83[c]	−0.08	0.45	−0.02	0.39
Rer	0.34	2.44[a]	0.22	2.50[a]	0.27	1.72	0.26	2.38[a]	0.07	1.76	0.06	2.34[a]	0.43	2.58[a]	0.08	1.70
Kz	−0.11	0.62	−0.20	1.30	−0.14	0.63	−0.18	1.02	0.03	0.54	0.03	1.02	−0.20	0.86	0.01	0.13
$\text{Kz}^{q}1$	−0.13	0.65	−0.44	2.16[a]	−0.33	1.41	−0.57	2.44[a]	−0.02	0.38	−0.02	0.62	−0.24	0.91	−0.06	0.85

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$	$\overline{R}$	$\lvert t \rvert$
Kz^{q}6	−0.14	0.75	−0.33	1.75	−0.27	1.18	−0.38	1.73	−0.02	0.34	0.01	0.31	−0.26	0.99	−0.06	0.87
Kz^{q}12	−0.13	0.69	−0.30	1.72	−0.25	1.12	−0.34	1.68	−0.04	0.65	0.01	0.19	−0.26	1.01	−0.07	1.05
Ww	0.17	0.70	0.37	1.54	−0.52	1.66	0.54	1.71	0.08	0.91	0.14	1.54	0.24	0.66	0.09	0.66
Ww^{q}1	0.03	0.10	0.21	0.82	−0.68	1.97[a]	0.26	0.75	0.06	0.62	0.06	0.56	0.08	0.20	0.04	0.31
Ww^{q}6	0.07	0.27	0.26	1.02	−0.60	1.75	0.34	1.00	0.07	0.73	0.08	0.77	0.13	0.34	0.05	0.37
Ww^{q}12	0.08	0.29	0.32	1.25	−0.55	1.64	0.40	1.20	0.06	0.67	0.10	0.98	0.14	0.35	0.06	0.41
Sdd	0.08	0.32	0.19	1.57	−0.21	0.90	0.07	0.71	0.02	0.23	0.01	0.30	0.18	0.64	0.04	0.40
Cdd	0.10	0.41	0.01	0.06	−0.05	0.20	−0.02	0.11	−0.01	0.14	0.04	0.62	0.14	0.43	−0.02	0.19
Vcf1	−0.36	1.69	−0.42	1.60	−0.54	1.82	−0.62	1.89	−0.14	1.88	−0.09	1.47	−0.60	2.01[a]	−0.24	2.30[a]
Vcf6	−0.33	1.63	−0.41	1.60	−0.52	1.79	−0.61	1.88	−0.13	1.74	−0.09	1.47	−0.57	2.01[a]	−0.23	2.21[a]
Vcf12	−0.29	1.41	−0.38	1.49	−0.47	1.68	−0.56	1.76	−0.12	1.59	−0.08	1.33	−0.49	1.78	−0.22	2.10[a]
Cta1	0.27	1.36	0.27	1.35	0.32	1.14	0.20	0.82	0.10	1.09	0.05	0.63	0.22	0.99	0.10	0.88
Cta6	0.14	0.69	0.15	0.76	0.18	0.66	0.09	0.34	0.07	0.74	0.02	0.24	0.06	0.28	0.05	0.48
Cta12	0.11	0.58	0.13	0.67	0.18	0.70	0.07	0.29	0.05	0.60	0.01	0.14	0.04	0.20	0.04	0.33
Gind	0.02	0.06	−0.20	0.81	0.02	0.06	−0.20	0.81	−0.04	0.52	−0.05	0.69	−0.73	2.04[a]	−0.16	1.92
Acq	−0.12	0.60	0.10	0.45	−0.22	0.93	0.03	0.14	−0.01	0.15	0.00	0.01	−0.19	0.63	−0.04	0.40
Acq1	−0.07	0.34	0.03	0.14	−0.19	0.85	0.01	0.03	−0.03	0.41	−0.01	0.07	−0.19	0.67	−0.06	0.63
Acq6	−0.04	0.19	0.07	0.33	−0.16	0.73	0.03	0.14	−0.01	0.17	0.00	0.05	−0.18	0.64	−0.05	0.49
Acq12	−0.01	0.04	0.11	0.52	−0.12	0.54	0.08	0.34	0.00	0.03	0.01	0.17	−0.14	0.50	−0.04	0.35
Ob	0.18	0.77	0.03	0.18	0.19	0.76	0.03	0.19	0.02	0.31	−0.02	0.50	0.08	0.23	−0.05	0.53
Eper	−0.02	0.11	−0.21	1.89	−0.07	0.53	−0.19	1.74	−0.01	0.15	−0.09	2.60[a]	−0.05	0.23	0.01	0.10
Eprd	−0.53	2.96[b]	−0.75	4.05[c]	−0.51	2.79[b]	−0.75	3.98[c]	−0.19	2.75[a]	−0.12	2.98[b]	−0.61	2.50[a]	−0.22	2.21[a]
Esm	−0.04	0.31	0.07	0.51	−0.04	0.31	0.09	0.66	0.05	1.30	0.03	0.68	−0.06	0.31	0.06	1.07
Evr	0.18	1.31	0.07	0.87	0.25	1.78	0.04	0.52	0.05	1.48	0.02	0.77	0.18	0.86	0.03	0.56
Etl	0.34	2.79[b]	0.19	2.17[a]	0.35	2.74[a]	0.14	1.63	0.06	2.03[a]	0.04	1.76	0.32	1.77	0.05	1.13
Ecs	0.03	0.25	0.08	1.20	0.05	0.49	0.07	1.06	−0.01	0.41	0.02	1.41	0.09	0.63	−0.02	0.55
Frm	0.06	0.30	0.01	0.05	0.11	0.55	0.02	0.13	0.01	0.26	0.01	0.22	0.31	1.23	0.12	1.82
Fra	−0.14	0.96	0.05	0.36	−0.11	0.82	0.04	0.31	−0.02	0.57	0.02	0.57	−0.13	0.64	−0.01	0.12
Ala	−0.08	0.42	−0.39	3.15[b]	−0.13	0.57	−0.66	4.48[c]	−0.10	1.38	−0.24	5.60[c]	−0.10	0.35	−0.13	1.02
Alm	0.13	0.71	0.34	2.46[a]	−0.07	0.34	0.35	2.26[a]	0.06	0.84	0.08	2.02[a]	−0.05	0.20	0.02	0.16
Ala^{q}1	0.40	1.67	0.37	2.17[a]	0.46	1.60	0.29	1.38	0.08	0.96	0.06	1.07	0.36	0.98	0.11	0.85

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Ala^q6	0.26	1.11	0.24	1.38	0.36	1.29	0.06	0.30	0.04	0.56	−0.01	0.10	0.16	0.43	0.06	0.47
Ala^q12	0.19	0.81	0.09	0.51	0.22	0.83	−0.14	0.70	0.01	0.10	−0.06	1.00	0.14	0.40	0.02	0.15
Alm^q1	0.58	2.75^a	1.21	6.34^c	0.65	2.61^a	1.52	6.99^c	0.17	1.72	0.42	6.88^c	0.56	1.89	0.16	1.07
Alm^q6	0.60	3.05^b	1.18	6.47^c	0.65	3.00^b	1.42	6.93^c	0.20	2.09^a	0.40	6.99^c	0.59	2.17^a	0.21	1.43
Alm^q12	0.54	2.84^b	1.04	5.91^c	0.50	2.44^a	1.24	6.31^c	0.18	1.93	0.34	6.20^c	0.47	1.77	0.18	1.29
Dls1	−0.29	1.48	−0.57	3.64^c	−0.48	2.15^a	−0.64	3.39^b	−0.08	1.25	−0.06	1.55	−0.19	0.81	−0.09	1.29
Dls6	−0.01	0.07	−0.17	1.22	−0.21	1.10	−0.22	1.24	−0.01	0.24	0.02	0.43	0.05	0.27	−0.01	0.16
Dls12	0.06	0.46	−0.10	0.83	−0.06	0.38	−0.13	0.87	0.00	0.06	0.02	0.82	0.08	0.44	−0.01	0.13
Dis1	−0.19	0.72	−0.64	3.04^b	−0.23	0.86	−0.69	3.14^b	−0.06	0.86	−0.16	3.93^c	−0.62	1.47	−0.15	1.38
Dis6	−0.18	0.71	−0.44	2.15^a	−0.14	0.58	−0.49	2.31^a	−0.02	0.37	−0.10	2.51^a	−0.60	1.47	−0.11	1.14
Dis12	−0.08	0.32	−0.27	1.39	−0.03	0.11	−0.32	1.58	0.00	0.01	−0.06	1.39	−0.47	1.22	−0.08	0.80
Dlg1	−0.11	0.45	−0.16	0.81	0.02	0.06	−0.19	0.86	−0.02	0.17	−0.07	0.91	−0.26	0.67	−0.04	0.23
Dlg6	−0.08	0.32	−0.13	0.71	0.03	0.13	−0.14	0.69	0.00	0.01	−0.06	0.80	−0.26	0.67	−0.03	0.17
Dlg12	−0.06	0.26	−0.11	0.62	0.04	0.15	−0.12	0.58	0.02	0.18	−0.04	0.60	−0.21	0.57	−0.01	0.08
R_{a}^1	0.67	3.43^c	0.70	5.46^c	0.72	3.34^b	0.81	5.36^c	0.26	2.92^b	0.24	5.06^c	0.93	3.90^c	0.38	3.49^c
R_{n}^1	0.54	1.76	−0.01	0.05	0.76	2.04^a	−0.37	1.11	0.24	1.90	−0.05	0.51	0.77	2.26^a	0.34	2.19^a
$R_{\text{a}}^{[2,5]}$	0.69	4.11^c	0.69	6.07^c	0.80	3.66^c	0.87	6.19^c	0.21	3.23^b	0.25	5.93^c	0.97	4.98^c	0.32	4.16^c
$R_{\text{n}}^{[2,5]}$	−0.50	2.22	−1.08	5.70^c	−0.74	2.70^a	−1.35	6.07^c	−0.17	1.81	−0.35	5.57^c	−0.81	2.92^b	−0.28	2.36^a
$R_{\text{a}}^{[6,10]}$	0.83	5.06^c	0.76	6.96^c	0.90	4.59^c	0.82	6.22^c	0.30	4.91^c	0.26	6.78^c	0.94	4.76^c	0.33	4.35^c
$R_{\text{n}}^{[6,10]}$	−0.46	2.38^a	−0.57	4.70^c	−0.50	2.36^a	−0.66	4.72^c	−0.14	1.97^a	−0.20	4.72^c	−0.41	1.65	−0.15	1.55
$R_{\text{a}}^{[11,15]}$	0.62	4.46^c	0.61	6.36^c	0.72	4.46^c	0.69	6.25^c	0.19	3.94^c	0.21	6.74^c	0.84	4.96^c	0.23	3.96^c
$R_{\text{n}}^{[11,15]}$	−0.30	1.88	−0.19	1.55	−0.14	0.80	−0.21	1.58	−0.08	1.61	−0.06	1.42	−0.29	1.46	−0.09	1.44
$R_{\text{a}}^{[16,20]}$	0.54	3.26^b	0.51	4.66^c	0.65	3.56^c	0.59	5.10^c	0.14	2.54^a	0.18	5.57^c	0.67	3.35^b	0.18	2.62^a
$R_{\text{n}}^{[16,20]}$	−0.26	1.60	−0.29	2.59^a	−0.28	1.56	−0.33	2.77^a	−0.04	1.00	−0.08	2.57^a	−0.27	1.42	−0.02	0.46

Panel F: Trading frictions

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
Me	−0.25	1.02	−0.46	1.83	−0.31	1.06	−1.14	3.91^c	−0.11	1.32	−0.23	2.59^a	−0.26	0.41	−0.05	0.25
Iv	−0.25	0.77	0.09	0.26	−0.83	2.07^a	0.23	0.56	−0.03	0.14	0.06	0.50	−0.14	0.31	0.06	0.21
Ivff1	−0.52	1.71	−0.07	0.22	−1.22	3.38^b	−0.31	0.89	−0.18	1.02	−0.15	1.43	−0.72	2.04^a	−0.26	1.28
Ivff6	−0.32	1.12	−0.10	0.34	−0.81	2.50^a	−0.10	0.28	−0.12	0.70	−0.05	0.46	−0.43	1.28	−0.17	0.87

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Ivff12	−0.18	0.67	−0.03	0.10	−0.53	1.69	0.08	0.24	−0.05	0.31	0.02	0.14	−0.25	0.75	−0.08	0.41
Ivc1	−0.48	1.52	−0.08	0.27	−1.15	3.19^{b}	−0.33	0.94	−0.17	1.00	−0.16	1.51	−0.69	1.89	−0.26	1.27
Ivc6	−0.31	1.07	−0.10	0.34	−0.80	2.41^{a}	−0.10	0.28	−0.12	0.72	−0.05	0.49	−0.42	1.24	−0.18	0.90
Ivc12	−0.20	0.72	−0.03	0.11	−0.56	1.75	0.08	0.24	−0.06	0.36	0.01	0.11	−0.28	0.82	−0.09	0.44
Ivq1	−0.48	1.59	−0.09	0.31	−1.14	3.19^{b}	−0.33	0.95	−0.17	1.02	−0.16	1.52	−0.72	1.98^{a}	−0.27	1.38
Ivq6	−0.31	1.10	−0.12	0.41	−0.80	2.47^{a}	−0.11	0.31	−0.12	0.73	−0.06	0.54	−0.42	1.28	−0.18	0.93
Ivq12	−0.20	0.75	−0.05	0.18	−0.53	1.72	0.07	0.21	−0.06	0.36	0.01	0.07	−0.29	0.88	−0.10	0.50
Tv1	−0.39	1.18	−0.08	0.26	−1.18	3.02^{b}	−0.33	0.92	−0.14	0.78	−0.16	1.48	−0.55	1.43	−0.20	0.96
Tv6	−0.24	0.77	−0.10	0.33	−0.79	2.16^{a}	−0.10	0.28	−0.11	0.62	−0.06	0.54	−0.33	0.88	−0.15	0.73
Tv12	−0.20	0.65	−0.04	0.15	−0.60	1.72	0.07	0.19	−0.07	0.38	0.00	0.03	−0.24	0.66	−0.08	0.40
Sv1	−0.49	2.24^{a}	−0.27	2.32^{a}	−0.42	1.56	−0.33	2.13^{a}	−0.25	2.32^{a}	−0.10	2.25^{a}	−1.06	3.57^{c}	−0.52	3.50^{c}
Sv6	−0.18	1.27	−0.07	1.24	−0.21	1.25	−0.08	1.11	−0.09	1.42	−0.03	1.18	−0.30	1.53	−0.19	2.19^{a}
Sv12	−0.14	1.22	−0.04	0.75	−0.17	1.25	−0.05	0.86	−0.07	1.18	−0.02	0.95	−0.28	1.77	−0.17	2.36^{a}
β1	0.02	0.06	−0.07	0.26	0.00	0.00	−0.11	0.39	−0.01	0.10	−0.06	0.62	2.34	1.85	0.79	1.71
β6	0.02	0.05	−0.03	0.13	−0.04	0.10	−0.09	0.29	0.00	0.03	−0.05	0.51	1.95	1.57	0.77	1.72
β12	−0.02	0.08	−0.09	0.34	−0.09	0.24	−0.13	0.46	0.00	0.00	−0.06	0.63	1.82	1.43	0.80	1.71
β^{FP}1	−0.22	0.66	−0.47	1.53	−0.31	0.88	−0.50	1.52	−0.10	0.85	−0.15	1.51	−0.17	0.48	−0.10	0.76
β^{FP}6	−0.23	0.72	−0.40	1.34	−0.27	0.80	−0.40	1.27	−0.09	0.78	−0.12	1.24	−0.19	0.58	−0.09	0.74
β^{FP}12	−0.18	0.57	−0.34	1.18	−0.22	0.67	−0.36	1.16	−0.07	0.65	−0.10	1.09	−0.14	0.43	−0.08	0.63
β^{D}1	0.15	0.71	−0.17	1.21	0.04	0.18	−0.27	1.80	0.01	0.12	−0.08	1.74	0.07	0.17	−0.02	0.13
β^{D}6	0.07	0.39	−0.11	0.98	0.02	0.14	−0.20	1.71	0.05	0.54	−0.05	1.25	−0.22	0.79	−0.08	0.73
β^{D}12	0.01	0.06	−0.16	1.59	−0.05	0.33	−0.24	2.32^{a}	0.01	0.17	−0.06	1.78	−0.24	0.96	−0.10	1.00
Tur1	−0.15	0.61	−0.91	4.22^{c}	−0.15	0.54	−0.86	3.53^{c}	−0.04	0.42	−0.30	4.72^{c}	−0.32	0.99	−0.12	1.08
Tur6	−0.16	0.62	−0.99	4.71^{c}	−0.18	0.69	−0.98	4.19^{c}	−0.03	0.31	−0.31	5.04^{c}	−0.27	0.85	−0.11	1.01
Tur12	−0.11	0.46	−0.96	4.78^{c}	−0.17	0.65	−0.97	4.26^{c}	−0.03	0.31	−0.31	5.15^{c}	−0.24	0.76	−0.11	1.01
Cvt1	0.12	0.82	0.33	1.81	0.04	0.25	0.40	2.47^{a}	0.06	0.86	0.13	3.03^{b}	0.14	0.89	0.07	0.94
Cvt6	0.09	0.64	0.39	2.18^{a}	0.09	0.58	0.46	2.86^{b}	0.08	1.05	0.15	3.55^{c}	0.16	1.06	0.08	1.08
Cvt12	0.15	1.10	0.43	2.44^{a}	0.12	0.89	0.50	3.26^{b}	0.09	1.19	0.15	3.82^{c}	0.26	1.73	0.11	1.66
Dtv1	−0.25	1.37	−0.57	2.62^{a}	−0.26	1.27	−1.16	4.75^{c}	−0.03	1.63	−0.11	2.47^{a}	−0.20	0.89	−0.03	1.42
Dtv6	−0.34	1.92	−0.61	2.86^{b}	−0.34	1.71	−1.17	4.95^{c}	−0.03	1.68	−0.11	2.57^{a}	−0.29	1.30	−0.04	1.47
Dtv12	−0.40	2.23^{a}	−0.65	3.09^{b}	−0.37	1.95	−1.18	5.09^{c}	−0.04	1.83	−0.12	2.80^{b}	−0.36	1.66	−0.04	1.62

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Cvd1	0.08	0.57	0.30	1.58	0.03	0.20	0.32	1.77	0.08	1.02	0.09	2.07^{a}	0.15	0.94	0.07	0.96
Cvd6	0.11	0.75	0.38	1.98^{a}	0.09	0.61	0.43	2.48^{a}	0.09	1.11	0.13	2.98^{b}	0.17	1.08	0.08	1.08
Cvd12	0.15	1.10	0.42	2.23^{a}	0.14	0.99	0.48	2.87^{b}	0.09	1.16	0.14	3.30^{b}	0.27	1.79	0.12	1.67
Pps1	−0.02	0.07	−0.28	0.99	−0.27	0.60	−1.36	3.45^{c}	−0.02	0.35	−0.09	1.07	−0.69	1.12	−0.07	0.87
Pps6	0.05	0.16	−0.21	0.76	0.22	0.53	−0.93	2.45^{a}	0.00	0.10	−0.07	0.85	−0.44	0.75	−0.06	0.73
Pps12	−0.04	0.14	−0.30	1.14	0.18	0.46	−0.94	2.59^{a}	−0.01	0.32	−0.10	1.25	−0.48	0.84	−0.06	0.78
Ami1	0.25	1.20	0.44	1.81	0.09	0.33	1.01	3.49^{c}	0.11	0.81	0.33	4.97^{c}	0.18	0.69	0.09	0.45
Ami6	0.34	1.64	0.49	2.07^{a}	0.28	1.07	1.13	3.90^{c}	0.20	1.47	0.36	5.43^{c}	0.27	1.06	0.17	0.90
Ami12	0.39	1.91	0.54	2.29^{a}	0.41	1.56	1.16	4.09^{c}	0.26	1.99^{a}	0.37	5.68^{c}	0.34	1.33	0.26	1.37
$\text{Lm}^{1}1$	−0.07	0.32	0.44	2.33^{a}	0.04	0.17	0.47	2.08^{a}	−0.03	0.66	0.06	1.33	−0.07	0.27	−0.05	0.80
$\text{Lm}^{1}6$	0.21	0.96	0.85	4.90^{c}	0.31	1.29	1.00	4.67^{c}	0.08	1.59	0.18	4.14^{c}	0.32	1.28	0.08	1.23
$\text{Lm}^{1}12$	0.21	0.99	0.89	5.30^{c}	0.34	1.46	1.05	5.09^{c}	0.10	2.00^{a}	0.20	4.79^{c}	0.31	1.29	0.11	1.64
$\text{Lm}^{6}1$	0.38	1.85	1.00	5.55^{c}	0.33	1.35	1.19	5.15^{c}	0.09	1.63	0.19	4.26^{c}	0.49	2.09^{a}	0.09	1.28
$\text{Lm}^{6}6$	0.36	1.74	1.02	5.77^{c}	0.42	1.74	1.24	5.56^{c}	0.12	2.22^{a}	0.23	5.10^{c}	0.49	2.08^{a}	0.13	1.84
$\text{Lm}^{6}12$	0.31	1.48	1.00	5.92^{c}	0.38	1.66	1.17	5.50^{c}	0.13	2.34^{a}	0.22	5.18^{c}	0.43	1.84	0.14	2.01^{a}
$\text{Lm}^{12}1$	0.39	1.88	1.00	5.52^{c}	0.44	1.86	1.21	5.30^{c}	0.11	2.00^{a}	0.22	4.92^{c}	0.49	2.03^{a}	0.12	1.64
$\text{Lm}^{12}6$	0.34	1.65	0.99	5.68^{c}	0.39	1.67	1.17	5.37^{c}	0.12	2.29^{a}	0.23	5.24^{c}	0.45	1.90	0.14	1.94
$\text{Lm}^{12}12$	0.25	1.19	0.94	5.59^{c}	0.31	1.35	1.10	5.22^{c}	0.12	2.30^{a}	0.22	5.09^{c}	0.39	1.60	0.14	2.01^{a}
Mdr1	−0.36	1.27	−0.44	1.63	−0.80	2.40^{a}	−0.77	2.48^{a}	−0.14	0.87	−0.30	3.34^{b}	−0.39	1.19	−0.16	0.87
Mdr6	−0.17	0.65	−0.15	0.58	−0.45	1.47	−0.22	0.74	−0.09	0.57	−0.07	0.80	−0.22	0.69	−0.12	0.66
Mdr12	−0.07	0.27	−0.05	0.18	−0.28	0.94	−0.03	0.10	−0.03	0.18	0.00	0.03	−0.10	0.33	−0.05	0.25
Ts1	0.20	1.90	−0.52	4.80^{c}	0.31	2.59^{a}	−0.46	4.06^{c}	0.09	2.53^{a}	−0.12	4.03^{c}	0.22	1.93	0.10	2.60^{a}
Ts6	0.03	0.45	−0.05	0.69	0.07	1.05	−0.04	0.52	0.00	0.05	−0.02	0.75	0.02	0.28	−0.01	0.26
Ts12	0.03	0.53	0.00	0.04	0.07	1.32	0.01	0.19	0.00	0.29	0.00	0.13	0.02	0.43	0.00	0.20
Isc1	0.15	1.55	−0.44	4.23^{c}	0.35	2.91^{b}	−0.38	3.57^{c}	0.09	3.09^{b}	−0.11	3.87^{c}	0.17	1.57	0.10	3.16^{b}
Isc6	−0.02	0.43	−0.02	0.30	0.04	0.62	−0.03	0.39	0.01	0.58	−0.01	0.52	−0.03	0.45	0.01	0.51
Isc12	0.05	0.93	0.03	0.51	0.09	1.65	0.02	0.31	0.02	1.54	0.00	0.21	0.05	0.92	0.03	1.52
Isff1	0.28	3.11^{b}	−0.29	3.03^{b}	0.33	3.08^{b}	−0.23	2.38^{a}	0.09	3.05^{b}	−0.07	2.85^{b}	0.30	3.08^{b}	0.10	3.22^{b}
Isff6	0.05	0.92	−0.01	0.10	0.07	1.31	−0.02	0.22	0.01	0.94	0.00	0.18	0.05	0.83	0.02	0.92
Isff12	0.08	1.72	0.03	0.52	0.11	2.05^{a}	0.03	0.45	0.03	1.74	0.01	0.38	0.08	1.57	0.03	1.66

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$	$\overline{R}$	$\|t\|$
Isq1	0.25	2.80^b	−0.28	3.12^b	0.33	3.32^b	−0.23	2.52^a	0.07	2.46^a	−0.07	2.99^b	0.28	2.94^b	0.08	2.65^a
Isq6	0.07	1.23	−0.01	0.16	0.11	1.82	−0.01	0.10	0.02	1.45	−0.01	0.30	0.07	1.09	0.02	1.41
Isq12	0.09	1.77	0.03	0.50	0.11	2.27^a	0.03	0.45	0.03	2.04^a	0.01	0.32	0.09	1.74	0.03	1.97^a
Cs1	−0.11	0.93	−0.01	0.15	−0.18	1.46	−0.03	0.44	−0.01	0.36	0.01	0.65	0.08	0.54	0.04	0.99
Cs6	−0.02	0.32	0.01	0.35	−0.05	0.74	0.01	0.36	0.00	0.25	0.00	0.16	−0.05	0.79	−0.01	0.80
Cs12	−0.02	0.34	0.01	0.39	−0.04	0.78	0.01	0.44	−0.01	0.46	0.00	0.23	−0.08	1.49	−0.03	1.88
Srev	−0.27	1.40	−1.86	8.90^c	−0.36	1.42	−2.57	9.22^c	−0.14	1.67	−0.63	8.24^c	−0.65	2.39^a	−0.27	2.61^a
$\beta^{-}1$	−0.15	0.51	−0.72	2.86^b	−0.42	1.28	−0.82	2.94^b	−0.08	0.69	−0.24	2.83^b	−0.09	0.29	−0.06	0.46
$\beta^{-}6$	−0.19	0.66	−0.83	3.45^c	−0.33	1.02	−0.96	3.61^c	−0.10	0.83	−0.27	3.34^b	−0.11	0.36	−0.08	0.63
$\beta^{-}12$	−0.13	0.47	−0.70	3.01^b	−0.16	0.55	−0.80	3.15^b	−0.08	0.68	−0.23	2.95^b	−0.04	0.15	−0.06	0.48
Tail1	0.11	0.54	0.22	1.58	0.12	0.51	0.21	1.20	0.09	1.16	0.07	1.29	0.11	0.50	0.10	1.09
Tail6	0.14	0.79	0.28	2.34^a	0.10	0.47	0.30	2.01^a	0.07	0.96	0.09	1.79	0.14	0.69	0.08	0.91
Tail12	0.17	1.05	0.30	2.78^b	0.18	0.94	0.33	2.40^a	0.09	1.25	0.10	2.17^a	0.19	1.04	0.10	1.20
$\beta^{\text{ret}}1$	0.00	0.01	−0.07	0.29	−0.04	0.12	−0.15	0.50	−0.02	0.12	−0.07	0.75	0.19	0.51	0.05	0.39
$\beta^{\text{ret}}6$	0.00	0.01	−0.07	0.28	−0.07	0.19	−0.13	0.46	−0.01	0.05	−0.06	0.67	0.22	0.59	0.07	0.52
$\beta^{\text{ret}}12$	−0.03	0.09	−0.11	0.46	−0.12	0.34	−0.17	0.62	0.00	0.04	−0.07	0.77	0.20	0.55	0.08	0.58
$\beta^{\text{lcc}}1$	0.31	1.48	0.26	1.80	0.31	1.40	0.26	1.48	0.11	0.93	0.09	1.61	0.25	0.94	0.12	0.77
$\beta^{\text{lcc}}6$	0.30	1.42	0.25	1.75	0.34	1.62	0.26	1.49	0.12	1.01	0.09	1.59	0.27	1.03	0.13	0.83
$\beta^{\text{lcc}}12$	0.29	1.46	0.21	1.55	0.31	1.48	0.24	1.42	0.12	1.01	0.08	1.45	0.29	1.15	0.13	0.89
$\beta^{\text{lrc}}1$	0.07	0.24	−0.04	0.20	0.08	0.24	0.00	0.01	0.01	0.05	0.01	0.13	0.07	0.23	−0.02	0.16
$\beta^{\text{lrc}}6$	0.05	0.18	−0.10	0.50	0.11	0.35	−0.03	0.14	0.00	0.04	−0.02	0.19	0.10	0.31	0.00	0.02
$\beta^{\text{lrc}}12$	0.07	0.28	−0.04	0.22	0.17	0.55	0.01	0.06	0.01	0.06	−0.01	0.10	0.08	0.24	0.00	0.00
$\beta^{\text{lcr}}1$	0.06	0.49	0.05	0.62	0.16	1.15	0.05	0.45	0.00	0.04	0.00	0.07	0.06	0.37	0.02	0.21
$\beta^{\text{lcr}}6$	−0.02	0.13	0.00	0.05	0.20	1.52	0.02	0.20	−0.01	0.06	−0.01	0.23	0.03	0.23	0.02	0.23
$\beta^{\text{lcr}}12$	−0.04	0.32	−0.02	0.30	0.25	2.11^a	0.03	0.28	0.00	0.04	0.00	0.08	−0.02	0.13	0.02	0.19
$\beta^{\text{net}}1$	0.09	0.27	0.04	0.18	0.14	0.39	0.09	0.33	0.01	0.04	0.01	0.09	0.34	0.93	0.10	0.38
$\beta^{\text{net}}6$	0.11	0.33	0.03	0.15	0.02	0.04	0.02	0.06	0.01	0.06	0.00	0.05	0.39	1.06	0.11	0.43
$\beta^{\text{net}}12$	0.06	0.20	0.00	0.00	−0.09	0.27	−0.04	0.17	0.01	0.05	−0.01	0.07	0.34	0.95	0.11	0.45
Shl1	−0.16	0.55	0.02	0.09	−0.43	1.13	0.53	1.54	−0.06	0.22	0.20	2.04^a	−0.15	0.48	−0.06	0.19
Shl6	−0.16	0.61	0.05	0.20	−0.43	1.26	0.54	1.65	−0.12	0.45	0.20	2.12^a	−0.20	0.68	−0.14	0.46
Shl12	−0.13	0.50	0.13	0.53	−0.27	0.84	0.66	2.09^a	−0.03	0.14	0.22	2.45^a	−0.14	0.52	−0.05	0.17

	NYSE-VW		NYSE-EW		All-VW		All-EW		FM-WLS		FM-OLS		NYSE-VW-SS		FM-WLS-SS	
	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$	$\overline{R}$	$\lvert t\rvert$
Sba1	−0.18	0.68	0.08	0.27	−0.67	1.94	0.49	1.24	−0.05	0.19	0.16	1.47	−0.23	0.80	−0.07	0.24
Sba6	−0.07	0.28	0.09	0.31	−0.41	1.28	0.56	1.51	0.04	0.14	0.19	1.78	−0.10	0.36	0.03	0.12
Sba12	−0.01	0.04	0.15	0.53	−0.26	0.84	0.62	1.71	0.10	0.39	0.21	1.99[a]	−0.03	0.12	0.10	0.35
$\beta^{\text{lev}}1$	0.39	1.90	0.38	2.37[a]	0.35	1.48	0.40	2.29[a]	0.12	1.42	0.13	2.32[a]	0.43	1.79	0.13	1.35
$\beta^{\text{lev}}6$	0.26	1.31	0.28	1.95	0.27	1.17	0.28	1.71	0.08	1.01	0.10	1.92	0.29	1.27	0.09	1.00
$\beta^{\text{lev}}12$	0.25	1.30	0.23	1.65	0.28	1.27	0.22	1.44	0.07	0.91	0.08	1.69	0.28	1.27	0.08	0.89
$\beta^{\text{PS}}1$	0.08	0.47	0.02	0.18	0.02	0.10	0.03	0.26	0.05	0.77	0.01	0.42	0.16	0.98	0.04	0.53
$\beta^{\text{PS}}6$	0.11	0.74	0.02	0.23	0.06	0.34	0.04	0.41	0.04	0.70	0.02	0.67	0.10	0.60	0.02	0.21
$\beta^{\text{PS}}12$	0.17	1.24	0.04	0.47	0.08	0.50	0.05	0.48	0.06	1.00	0.03	0.99	0.17	1.17	0.04	0.58
Pin	−0.23	0.91	0.21	0.71	−0.24	0.92	0.40	1.35	0.01	0.04	0.10	1.10	−0.23	0.91	0.01	0.04

Table 6 : Pairwise Cross-sectional Correlations and Principle Component Analysis for the 158 Significant Anomalies under NYSE Breakpoints and Value-weighted Returns

The 6 categories of anomalies, momentum, value-versus-growth, investment, profitability, intangibles, and trading frictions, are denoted by "Mom," "VvG," "Inv," "Prof," "Intan," and "Fric," respectively. All the variables are realigned to yield positive high-minus-low returns on average. Panel A shows the average within- and cross-category rank correlations based on each anomaly variable's NYSE percentile rankings in the cross section, and Panel B shows within- and cross-category time series correlations based on each anomaly's high-minus-low decile returns. The average within-category correlations are averaged across all the pairwise correlations within a category, and the average cross-category correlations are averaged across all possible pairwise correlations across a given pair of categories. Panel C reports the proportion of the sum of variances for all high-minus-low decile returns captured by a principle component, denoted PC. We report the first 10 principle components, denoted PC1, PC2, . . ., and PC10, respectively.

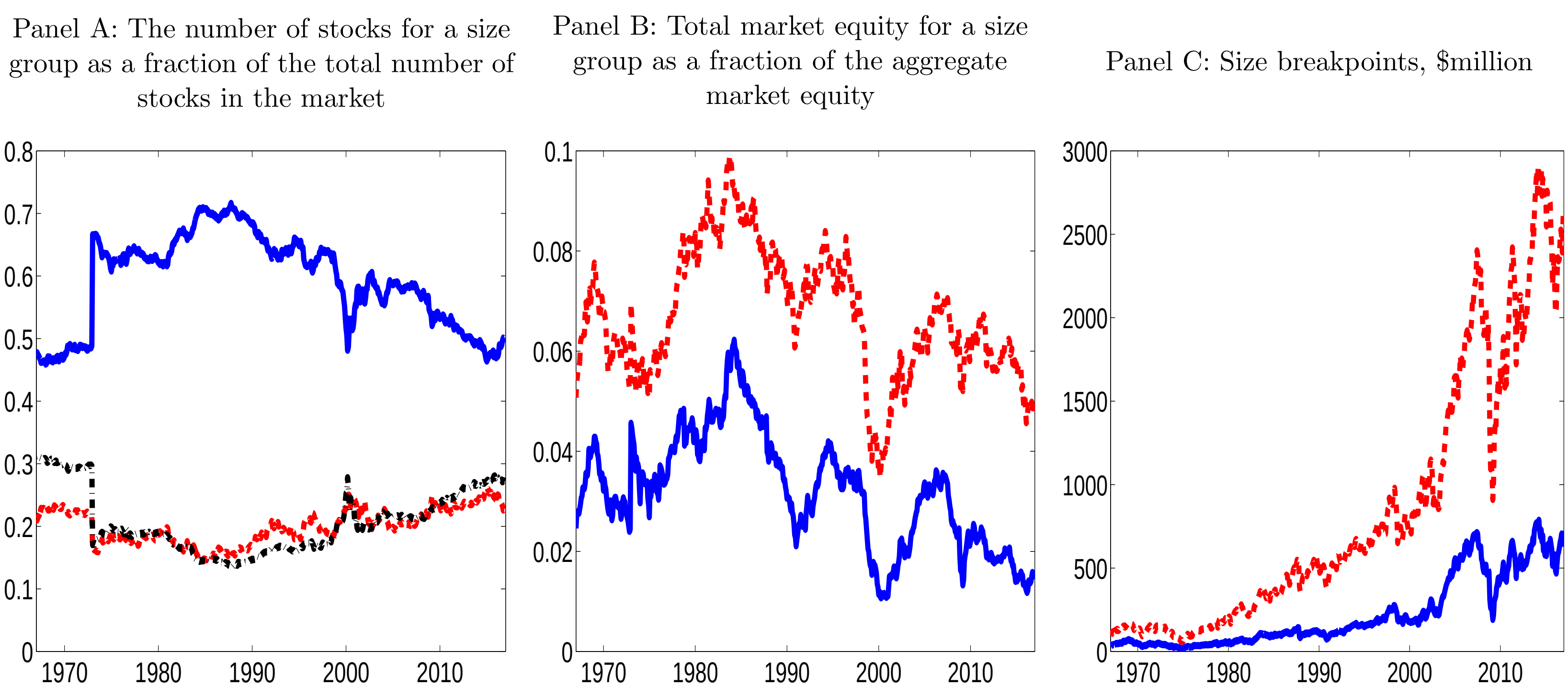
	Panel A: Average rank correlations, January 1967–December 2016, 600 Months						Panel B: Average H−L return correlations, January 1967–December 2016, 600 Months					
	Mom	VvG	Inv	Prof	Intan	Fric	Mom	VvG	Inv	Prof	Intan	Fric
Mom	0.20	−0.02	0.02	0.12	0.00	−0.01	0.39	−0.17	0.03	0.21	−0.02	0.01
VvG		0.44	0.10	−0.03	0.12	0.04		0.60	0.18	−0.15	0.10	0.09
Inv			0.32	−0.01	0.06	0.03			0.26	0.03	0.05	0.04
Prof				0.36	0.02	−0.04				0.40	0.00	−0.06
Intan					0.11	0.03					0.07	0.05
Fric						0.16						0.10

Panel C: The proportion (in %) of variance explained by each principle component, July 1976–December 2016, 486 months

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
All	25.93	15.53	9.21	5.66	4.18	2.97	2.25	2.18	1.70	1.57
Mom	53.16	10.33	6.62	4.35	3.78	3.39	2.48	2.16	1.92	1.89
VvG	59.81	11.85	6.17	4.40	3.01	2.30	2.27	1.95	1.57	0.99
Inv	36.11	11.14	8.71	5.99	5.53	3.86	3.61	2.79	2.41	2.23
Prof	55.15	15.92	6.73	5.73	2.95	2.57	1.83	1.53	1.11	0.91
Intan	20.85	18.52	9.59	6.01	5.89	5.01	4.47	4.36	4.00	3.52
Fric	59.49	30.00	10.51							

Figure 1 : Time Series Properties of Microcaps, January 1967–December 2016, 600 Months

Microcaps are smaller than the 20th percentile of market equity for NYSE stocks, small stocks are bigger than the 20th percentile but smaller than the NYSE median, and big stocks are bigger than the NYSE median. Panel A shows the time series of the number of microcaps (blue solid line), small stocks (red dashed line), and big stocks (black dashdot line) as a fraction of the total number of stocks at NYSE, Amex, and NASDAQ. Panel B plots the time series of the total market capitalization of microcaps (blue solid line) and small stocks (red dashed line) as a percentage of the aggregate market cap. Finally, Panel C plots the breakpoints for the 20th percentile of NYSE market equity (blue solid line) and the NYSE median (red dashed line) in millions of dollars.



A Variable Definitions and Portfolio Construction

A.1 Momentum

A.1.1 Sue1, Sue6, and Sue12, Standardized Unexpected Earnings

Per Foster, Olsen, and Shevlin (1984), Sue denotes Standardized Unexpected Earnings, and is calculated as the change in split-adjusted quarterly earnings per share (Compustat quarterly item EPSPXQ divided by item AJEXQ) from its value 4 quarters ago divided by the standard deviation of this change in quarterly earnings over the prior 8 quarters (6 quarters minimum). At the beginning of each month t, we split all NYSE, Amex, and NASDAQ stocks into deciles based on their most recent past Sue. Before 1972, we use the most recent Sue computed with quarterly earnings from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use Sue computed with quarterly earnings from the most recent quarterly earnings announcement dates (Compustat quarterly item RDQ). For a firm to enter our portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Sue to be within 6 months prior to the portfolio formation. We do so to exclude stale information on earnings. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly portfolio returns are calculated, separately, for the current month t (Sue1), from month t to t+5 (Sue6), and from month t to t+11 (Sue12). The holding period that is longer than 1 month as in, for instance, Sue6, means that for a given decile in each month there exist 6 sub-deciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the sub-decile returns as the monthly return of the Sue6 decile.

A.1.2 Abr1, Abr6, and Abr12, Cumulative Abnormal Returns Around Earnings Announcement Dates

We calculate cumulative abnormal stock return (Abr) around the latest quarterly earnings announcement date (Compustat quarterly item RDQ) (Chan, Jegadeesh, and Lakonishok 1996):

$$\text{Abr}_i = \sum_{d=-2}^{+1} r_{id} - r_{md}, \tag{A1}$$

in which r_{id} is stock i's return on day d (with the earnings announced on day 0) and r_{md} is the value-weighted market index return. We cumulate returns until 1 (trading) day after the announcement date to account for the 1-day-delayed reaction to earnings news.

At the beginning of each month t, we split all stocks into deciles based on their most recent past Abr. For a firm to enter our portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Abr to be within 6 months prior to the portfolio formation. We do so to exclude stale information on earnings. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for the current month t (Abr1), and, separately, from month t to $t+5$ (Abr6) and from month t to $t+11$ (Abr12). The deciles are rebalanced monthly. The 6-month holding period for Abr6 means that for a given decile in each month there exist 6 sub-deciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the sub-decile returns as the monthly return of the Abr6 decile. Because quarterly earnings announcement dates are largely unavailable before 1972, the Abr portfolios start in January 1972.

A.1.3 Re1, Re6, and Re12, Revisions in Analyst Earnings Forecasts

Following Chan, Jegadeesh, and Lakonishok (1996), we measure earnings surprise as the revisions in analysts' forecasts of earnings obtained from the Institutional Brokers' Estimate System (IBES). Because analysts' forecasts are not necessarily revised each month, we construct a 6-month moving average of past changes in analysts' forecasts:

$$\text{RE}_{it} = \sum_{\tau=1}^{6} \frac{f_{it-\tau} - f_{it-\tau-1}}{p_{it-\tau-1}}, \tag{A2}$$

in which $f_{it-\tau}$ is the consensus mean forecast (IBES unadjusted file, item MEANEST) issued in month $t-\tau$ for firm i's current fiscal year earnings (fiscal period indicator = 1), and $p_{it-\tau-1}$ is the prior month's share price (unadjusted file, item PRICE). We require both earnings forecasts and share prices to be denominated in US dollars (currency code = USD). We also adjust for any stock splits and require a minimum of 4 monthly forecast changes when constructing Re. At the beginning of each month t, we split all stocks into deciles based on their Re. Monthly decile returns are calculated for the current month t (Re1), and, separately, from month t to $t+5$ (Re6) and from month t to $t+11$ (Re12). The deciles are rebalanced monthly. The 6-month holding period for Re6 means that for a given decile in each month there exist 6 sub-deciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the sub-decile returns as the monthly return of the Re6 decile. Because analyst forecast data start in January 1976, the Re portfolios start in July 1976.

A.1.4 $R^6 1$, $R^6 6$, and $R^6 12$, Prior Six-month Returns

At the beginning of each month t, we split all stocks into deciles based on their prior 6-month returns from month $t-7$ to $t-2$. Skipping month $t-1$, we calculate monthly decile returns, separately, for month t ($R^6 1$), from month t to $t+5$ ($R^6 6$), and from month t to $t+11$ ($R^6 12$). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, $R^6 6$, means that for a given decile in each month there exist 6 sub-deciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the sub-deciles returns as the monthly return of the $R^6 6$ decile. We do not impose a price screen to exclude stocks with prices per share below $5 per Jegadeesh and Titman (1993).

A.1.5 $R^{11} 1$, $R^{11} 6$, and $R^{11} 12$, Prior 11-month Returns

We split all stocks into deciles at the beginning of each month t based on their prior 11-month returns from month $t-12$ to $t-2$. Skipping month $t-1$, we calculate monthly decile returns for month t ($R^{11} 1$), from month t to $t+5$ ($R^{11} 6$), and from month t to $t+11$ ($R^{11} 12$). All the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, $R^{11} 6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $R^{11} 6$ decile. Because we exclude financial firms, these decile returns are different from those posted on Kenneth French's Web site.

A.1.6 Im1, Im6, and Im12, Industry Momentum

We start with the Fama-French (1997) 49-industry classifications. Excluding financial firms from the sample leaves 45 industries. At the beginning of each month t, we sort industries based on their prior 6-month value-weighted returns from $t-6$ to $t-1$. Following Moskowitz and Grinblatt (1999), we do not skip month $t-1$. We form nine portfolios ($9 \times 5 = 45$), each of which contains 5 different industries. We define the return of a given portfolio as the simple average of the 5 industry returns within the portfolio. We calculate portfolio returns for the 9 portfolios for the current month t (Im1), from month t to $t+5$ (Im6), and from month t to $t+11$ (Im12). The portfolios are rebalanced at the beginning of $t+1$. The holding period that is longer than 1 month as in, for instance, Im6, means that for a given portfolio in each month there exist 6 subportfolios, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subportfolio returns as the monthly return of the Im6 portfolio.

A.1.7 Rs1, Rs6, and Rs12, Revenue Surprises

Following Jegadeesh and Livnat (2006), we measure revenue surprises (Rs) as changes in revenue per share (Compustat quarterly item SALEQ/(item CSHPRQ times item AJEXQ)) from its value 4 quarters ago divided by the standard deviation of this change in quarterly revenue per share over the prior 8 quarters (six quarters minimum). At the beginning of each month t, we split stocks into deciles based on their most recent past Rs. Before 1972, we use the most recent Rs computed with quarterly revenue from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use Rs computed with quarterly revenue from the most recent quarterly earnings announcement dates (Compustat quarterly item RDQ). Jegadeesh and Livnat report that quarterly revenue data are generally available when earnings are announced. For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Rs to be within 6 months prior to the portfolio formation. This restriction is imposed to exclude stale revenue information. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly deciles returns are calculated for the current month t (Rs1), from month t to $t+5$ (Rs6), and from month t to $t+11$ (Rs12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Rs6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the Rs6 decile.

A.1.8 Tes1, Tes6, and Tes12, Tax Expense Surprises

Following Thomas and Zhang (2011), we measure tax expense surprises (Tes) as changes in tax expense, which is tax expense per share (Compustat quarterly item TXTQ/(item CSHPRQ times item AJEXQ)) in quarter q minus tax expense per share in quarter $q-4$, scaled by assets per share (item ATQ/(item CSHPRQ times item AJEXQ)) in quarter $q-4$. At the beginning of each month t, we sort stocks into deciles based on their Tes calculated with Compustat quarterly data items from at least 4 months ago. We exclude firms with zero Tes (most of these firms pay no taxes). We calculate decile returns the current month t (Tes1), from month t to $t+5$ (Tes6), and from month t to $t+11$ (Tes12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Tes6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period.

We take the simple average of the subdeciles returns as the monthly return of the Tes6 decile. For sufficient data coverage, we start the sample in January 1976.

A.1.9 dEf1, dEf6, and dEf12, Changes in Analyst Earnings Forecasts

Following Hawkins, Chamberlin, and Daniel (1984), we define dEf $\equiv (f_{it-1} - f_{it-2})/(0.5\,|f_{it-1}| + 0.5\,|f_{it-2}|)$, in which f_{it-1} is the consensus mean forecast (IBES unadjusted file, item MEANEST) issued in month $t-1$ for firm i's current fiscal year earnings (fiscal period indicator = 1). We require earnings forecasts to be denominated in US dollars (currency code = USD). We also adjust for any stock splits between months $t-2$ and $t-1$ when constructing dEf. At the beginning of each month t, we sort stocks into deciles on the prior month dEf, and calculate returns for the current month t (dEf1), from month t to $t+5$ (dEf6), and from month t to $t+11$ (dEf12). The deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, dEf6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the dEf6 decile. Because analyst forecast data start in January 1976, the dEf portfolios start in March 1976.

A.1.10 Nei1, Nei6, and Nei12, The Number of Quarters with Consecutive Earnings Increase

We follow Barth, Elliott, and Finn (1999) and Green, Hand, and Zhang (2013) in measuring Nei as the number of consecutive quarters (up to 8 quarters) with an increase in earnings (Compustat quarterly item IBQ) over the same quarter in the prior year. At the beginning of each month t, we sort stocks into nine portfolios (with Nei $= 0, 1, 2, \ldots, 7$, and 8, respectively) based on their most recent past Nei. Before 1972, we use Nei computed with quarterly earnings from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use Nei computed with earnings from the most recent quarterly earnings announcement dates (Compustat quarterly item RDQ). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Nei to be within 6 months prior to the portfolio formation. This restriction is imposed to exclude stale earnings information. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. We calculate monthly portfolio returns for the current month t (Nei1), from month t to $t+5$ (Nei6), and from month t to $t+11$ (Nei12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Nei6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the Nei6 decile. For sufficient data coverage, the Nei portfolios start in January 1969.

A.1.11 52w1, 52w6, and 52w12, 52-week High

At the beginning of each month t, we split stocks into deciles based on 52w, which is the ratio of its split-adjusted price per share at the end of month $t-1$ to its highest (daily) split-adjusted price per share during the 12-month period ending on the last day of month $t-1$. Monthly decile returns are calculated for the current month t (52w1), from month t to $t+5$ (52w6), and from month t to $t+11$ (52w12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in 52w6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the 52w6 decile. Because a disproportionately large number of stocks can reach the 52-week high at the same time and have 52w equal to 1, we use only 52w smaller than one to form the portfolio breakpoints. Doing so helps avoid missing portfolio observations.

A.1.12 $\epsilon^6$1, $\epsilon^6$6, and $\epsilon^6$12, Six-month Residual Momentum

We split all stocks into deciles at the beginning of each month t based on their prior 6-month average residual returns from month $t-7$ to $t-2$ scaled by their standard deviation over the same period. Skipping month $t-1$, we calculate monthly decile returns for month t ($\epsilon^6 1$), from month t to $t+5$ ($\epsilon^6 6$), and from month t to $t+11$ ($\epsilon^6 12$). Residual returns are estimated each month for all stocks over the prior 36 months from month $t-36$ to month $t-1$ from regressing stock excess returns on the Fama-French (1993) 3 factors. To reduce the noisiness of the estimation, we require returns to be available for all prior 36 months. All the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in $\epsilon^6 6$ means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $\epsilon^6 6$ decile.

A.1.13 ϵ^{11}1, ϵ^{11}6, and ϵ^{11}12, 11-month Residual Momentum

We split all stocks into deciles at the beginning of each month t based on their prior 11-month residual returns from month $t-12$ to $t-2$ scaled by their standard deviation over the same period. Skipping month $t-1$, we calculate monthly decile returns for month t ($\epsilon^{11} 1$), from month t to $t+5$ ($\epsilon^{11} 6$), and from month t to $t+11$ ($\epsilon^{11} 12$). Residual returns are estimated each month for all stocks over the prior 36 months from month $t-36$ to month $t-1$ from regressing stock excess returns on the Fama-French (1993) 3 factors. To reduce the noisiness of the estimation, we require returns to be available for all prior 36 months. All the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in $\epsilon^{11} 6$ means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $\epsilon^{11} 6$ decile.

A.1.14 Sm1, Sm6, and Sm12, Segment Momentum

Following Cohen and Lou (2012), we extract firms' segment accounting and financial information from Compustat segment files. Industries are based on two-digit SIC codes. Standalone firms are those that operate in only 1 industry with segment sales, reported in Compustat segment files, accounting for more than 80% of total sales reported in Compustat annual files. Conglomerate firms are those that operating in more than 1 industry with aggregate sales from all reported segments accounting for more than 80% of total sales.

At the end of June of each year, we form a pseudo-conglomerate for each conglomerate firm. The pseudo-conglomerate is a portfolio of the conglomerate's industry segments constructed with solely the standalone firms in each industry. The segment portfolios (value-weighted across standalone firms) are then weighted by the percentage of sales contributed by each industry segment within the conglomerate. At the beginning of each month t (starting in July), using segment information form the previous fiscal year, we sort all conglomerate firms into deciles based on the returns of their pseudo-conglomerate portfolios in month $t-1$. Monthly deciles are calculated for month t (Sm1), from month t to $t+5$ (Sm6), and from month t to $t+11$ (Sm12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Sm6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Sm6 decile. Because the segment data start in 1976, the Sm portfolios start in July 1977.

A.1.15 Ilr1, Ilr6, Ilr12, Ile1, Ile6, Ile12, Industry Lead-lag Effect in Prior Returns (Earnings Surprises)

We start with the Fama-French (1997) 49-industry classifications. Excluding financial firms from the sample leaves 45 industries. At the beginning of each month t, we sort industries based on the month $t-1$ value-weighted return of the portfolio consisting of the 30% biggest (market equity) firms within a given industry. We form 9 portfolios ($9 \times 5 = 45$), each of which contains 5 different industries. We define the return of a given portfolio as the simple average of the 5 value-weighted industry returns within the portfolio. The 9 portfolio returns are calculated for the current month t (Ilr1), from month t to $t+5$ (Ilr6), and from month t to $t+11$ (Ilr12), and the portfolios are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Ilr6, means that for a given portfolio in each month there exist 6 subportfolios, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subportfolio returns as the monthly return of the Ilr6 portfolio.

We calculate Standardized Unexpected Earnings, Sue, as the change in split-adjusted quarterly earnings per share (Compustat quarterly item EPSPXQ divided by item AJEXQ) from its value 4 quarters ago divided by the standard deviation of this change in quarterly earnings over the prior 8 quarters (6 quarters minimum). At the beginning of each month t, we sort industries based on their most recent Sue averaged across the 30% biggest firms within a given industry.[14] To mitigate the impact of outliers, we winsorize Sue at the 1st and 99th percentiles of its distribution each month. We form 9 portfolios ($9 \times 5 = 45$), each of which contains 5 different industries. We define the return of a given portfolio as the simple average of the 5 value-weighted industry returns within the portfolio. The 9 portfolio returns are calculated for the current month t (Ile1), from month t to $t+5$ (Ile6), and from month t to $t+11$ (Ile12), and the portfolios are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Ile6, means that for a given portfolio in each month there exist 6 subportfolios, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subportfolio returns as the monthly return of the Ile6 portfolio.

A.1.16 Cm1, Cm6, and Cm12, Customer Momentum

Following Cohen and Frazzini (2008), we extract firms' principal customers from Compustat segment files. For each firm we determine whether the customer is another company listed on the CRSP/Compustat tape, and we assign it the corresponding CRSP permno number. At the end of June of each year t, we form a customer portfolio for each firm with identifiable firm-customer relations for the fiscal year ending in calendar year $t-1$. For firms with multiple customer firms, we form equal-weighted customer portfolios. The customer portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June.

[14]Before 1972, we use the most recent Sue with earnings from fiscal quarters ending at least 4 months prior to the portfolio month. Starting from 1972, we use Sue with earnings from the most recent quarterly earnings announcement dates (Compustat quarterly item RDQ). For a firm to enter our portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Sue to be within 6 months prior to the portfolio month. We also require the earnings announcement date to be after the corresponding fiscal quarter end.

At the beginning of each month t, we sort all stocks into quintiles based on their customer portfolio returns, Cm, in month $t-1$. We do not form deciles because a disproportionate number of firms can have the same Cm, which leads to fewer than 10 portfolios in some months. Monthly quintile returns are calculated for month t (Cm1), from month t to $t+5$ (Cm6), and from month t to $t+11$ (Cm12), and the quintiles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in Cm6 means that for a given quintile in each month there exist 6 subquintiles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subquintile returns as the monthly return of the Cm6 quintile. For sufficient data coverage, we start the Cm portfolios in July 1979.

A.1.17 Sim1, Sim6, Sim12, Cim1, Cim6, and Cim12, Supplier (Customer) industries Momentum

Following Menzly and Ozbas (2010), we use Benchmark Input-Output Accounts at the Bureau of Economic Analysis (BEA) to identify supplier and customer industries for a given industry. BEA Surveys are conducted roughly once every five years in 1958, 1963, 1967, 1972, 1977, 1982, 1987, 1992, 1997, 2002, and 2007. We delay the use of any data from a given survey until the end of the year in which the survey is publicly released during 1964, 1969, 1974, 1979, 1984, 1991, 1994, 1997, 2002, 2007, and 2013, respectively. The BEA industry classifications are based on SIC codes in the surveys from 1958 to 1992 and based on NAICS codes afterwards. In the surveys from 1997 to 2007, we merge three separate industry accounts, 2301, 2302, and 2303 into a single account. We also merge "Housing" (HS) and "Other Real Estate" (ORE) in the 2007 Survey. In the surveys from 1958 to 1992, we merge industry account pairs 1–2, 5–6, 9–10, 11–12, 20–21, and 33–34. We also merge industry account pairs 22–23 and 44–45 in the 1987 and 1992 surveys. We drop miscellaneous industry accounts related to government, import, and inventory adjustments.

At the end of June of each year t, we assign each stock to an BEA industry (at the summary level) based on its reported SIC or NAICS code in Compustat (fiscal year ending in t-1) or CRSP (June of t). Monthly value-weighted industry returns are calculated from July of year t to June of $t+1$, and the industry portfolios are rebalanced in June of $t+1$. For each industry, we further form 2 separate portfolios, the suppliers portfolio and the customers portfolios. The share of an industry's total purchases from other industries is used to calculate the supplier industries portfolio returns, and the share of the industry's total sales to other industries is used to calculate the customer industries portfolio returns. The cross-industry flows of goods and services are from the Use Table and based on producers' prices.

At the beginning of each month t, we split industries into deciles based on the supplier portfolio returns, Sim, and separately, on the customer portfolio returns, Cim, in month $t-1$. We then assign the decile rankings of each industry to its member stocks. Monthly decile returns are calculated for month t (Sim1 and Cim1), from month t to $t+5$ (Sim6 and Cim6), and from month t to $t+11$ (Sim12 and Cim12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in Sim6 means that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Sim6 decile.

A.2 Value-versus-growth

A.2.1 Bm, Book-to-market Equity

At the end of June of each year t, we split stocks into deciles based on Bm, which is the book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than one share class, we merge the market equity for all share classes before computing Bm. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

A.2.2 Bmj, Book-to-June-end Market Equity

Following Asness and Frazzini (2013), at the end of June of each year t, we sort stocks into deciles based on Bmj, which is book equity per share for the fiscal year ending in calendar year $t-1$ divided by share price (from CRSP) at the end of June of t. We adjust for any stock splits between the fiscal year end and the end of June. Book equity per share is book equity divided by the number of shares outstanding (Compustat annual item CSHO). Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.3 $\text{Bm}^{\text{q}}1$, $\text{Bm}^{\text{q}}6$, and $\text{Bm}^{\text{q}}12$, Quarterly Book-to-market Equity

At the beginning of each month t, we split stocks into deciles based on Bm^{q}, which is the book equity for the latest fiscal quarter ending at least 4 months ago divided by the market equity (from CRSP) at the end of month $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Bm^{q}. We calculate decile returns for the current month t ($\text{Bm}^{\text{q}}1$), from month t to $t+5$ ($\text{Bm}^{\text{q}}6$), and from month t to $t+11$ ($\text{Bm}^{\text{q}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Bm}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Bm}^{\text{q}}6$ decile. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (Compustat quarterly item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity.

Before 1972, the sample coverage is limited for quarterly book equity in Compustat quarterly files. We expand the coverage by using book equity from Compustat annual files as well as by imputing quarterly book equity with clean surplus accounting. Specifically, whenever available we first use quarterly book equity from Compustat quarterly files. We then supplement the coverage for fiscal quarter 4 with annual book equity from Compustat annual files. Following Davis, Fama, and French (2000), we measure annual book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if available. If not, stockholders' equity is the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

If both approaches are unavailable, we apply the clean surplus relation to impute the book equity. Specifically, we impute the book equity for quarter t forward based on book equity from prior quarters. Let BEQ_{t-j}, $1 \leq j \leq 4$ denote the latest available quarterly book equity as of quarter t, and $\text{IBQ}_{t-j+1,t}$ and $\text{DVQ}_{t-j+1,t}$ be the sum of quarterly earnings and quarterly dividends from quarter $t-j+1$ to t, respectively. BEQ_t can then be imputed as $\text{BEQ}_{t-j} + \text{IBQ}_{t-j+1,t} - \text{DVQ}_{t-j+1,t}$. We do not use prior book equity from more than 4 quarters ago (i.e., $1 \leq j \leq 4$) to reduce imputation errors. Quarterly earnings are income before extraordinary items (Compustat quarterly item IBQ). Quarterly dividends are zero if dividends per share (item DVPSXQ) are zero. Otherwise, total dividends are dividends per share times beginning-of-quarter shares outstanding adjusted for stock splits during the quarter. Shares outstanding are from Compustat (quarterly item CSHOQ supplemented with annual item CSHO for fiscal quarter 4) or CRSP (item SHROUT), and the share adjustment factor is from Compustat (quarterly item AJEXQ supplemented with annual item AJEX for fiscal quarter 4) or CRSP (item CFACSHR). Because we use quarterly book equity at least 4 months after the fiscal quarter end, all the Compustat data used in the imputation are at least 4-month lagged prior to the portfolio formation. In addition, we do not impute quarterly book equity backward using future earnings and book equity information to avoid look-ahead bias.

A.2.4 Dm, Debt-to-market

At the end of June of each year t, we split stocks into deciles based on debt-to-market, Dm, which is total debt (Compustat annual item DLC plus DLTT) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Dm. Firms with no debt are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.5 $\text{Dm}^{\text{q}}1$, $\text{Dm}^{\text{q}}6$, and $\text{Dm}^{\text{q}}12$, Quarterly Debt-to-market

At the beginning of each month t, we split stocks into deciles based on quarterly debt-to-market, Dm^{q}, which is total debt (Compustat quarterly item DLCQ plus item DLTTQ) for the latest fiscal quarter ending at least 4 months ago divided by the market equity (from CRSP) at the end of month $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Dm^{q}. Firms with no debt are excluded. We calculate decile returns for the current month t ($\text{Dm}^{\text{q}}1$), from month t to $t+5$ ($\text{Dm}^{\text{q}}6$), and from month t to $t+11$ ($\text{Dm}^{\text{q}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Dm^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Dm^q6 decile. For sufficient data coverage, the Dm^q portfolios start in January 1972.

A.2.6 Am, Assets-to-market

At the end of June of each year t, we split stocks into deciles based on asset-to-market, Am, which is total assets (Compustat annual item AT) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Am. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.7 Am^q1, Am^q6, and Am^q12, Quarterly assets-to-market

At the beginning of each month t, we split stocks into deciles based on quarterly asset-to-market, Am^q, which is total assets (Compustat quarterly item ATQ) for the latest fiscal quarter ending at least 4 months ago divided by the market equity (from CRSP) at the end of month $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Am^q. We calculate decile returns for the current month t (Am^q1), from month t to $t+5$ (Am^q6), and from month t to $t+11$ (Am^q12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Am^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Am^q6 decile. For sufficient data coverage, the Am^q portfolios start in January 1972.

A.2.8 Rev1, Rev6, and Rev12, Reversal

To capture the De Bondt and Thaler (1985) long-term reversal (Rev) effect, at the beginning of each month t, we split stocks into deciles based on the prior returns from month $t-60$ to $t-13$. Monthly decile returns are computed for the current month t (Rev1), from month t to $t+5$ (Rev6), and from month t to $t+11$ (Rev12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Rev6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Rev6 decile. To be included in a portfolio for month t, a stock must have a valid price at the end of $t-61$ and a valid return for $t-13$. In addition, any missing returns from month $t-60$ to $t-14$ must be -99.0, which is the CRSP code for a missing ending price.

A.2.9 Ep, Earnings-to-price

At the end of June of each year t, we split stocks into deciles based on earnings-to-price, Ep, which is income before extraordinary items (Compustat annual item IB) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Ep. Firms with non-positive earnings are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.10 Ep^{q}1, Ep^{q}6, and Ep^{q}12, Quarterly Earnings-to-price

At the beginning of each month t, we split stocks into deciles based on quarterly earnings-to-price, Ep^q, which is income before extraordinary items (Compustat quarterly item IBQ) divided by the market equity (from CRSP) at the end of month $t-1$. Before 1972, we use quarterly earnings from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use quarterly earnings from the most recent quarterly earnings announcement dates (item RDQ). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent quarterly earnings to be within 6 months prior to the portfolio formation. This restriction is imposed to exclude stale earnings information. To avoid potentially err1ous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Firms with non-positive earnings are excluded. For firms with more than 1 share class, we merge the market equity for all share classes before computing Ep^q. We calculate decile returns for the current month t (Ep^{q}1), from month t to $t+5$ (Ep^{q}6), and from month t to $t+11$ (Ep^{q}12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Ep^{q}6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ep^{q}6 decile.

A.2.11 Efp1, Efp6, and Efp12, Earnings Forecast-to-price

Following Elgers, Lo, and Pfeiffer (2001), we define analysts' earnings forecast-to-price, Efp, as the consensus median forecasts (IBES unadjusted file, item MEDEST) for the current fiscal year (fiscal period indicator = 1) divided by share price (unadjusted file, item PRICE). We require earnings forecasts to be denominated in US dollars (currency code = USD). At the beginning of each month t, we sort stocks into deciles based on Efp estimated with forecasts in month $t-1$. Firms with non-positive forecasts are excluded. Monthly decile returns are calculated for the current month t (Efp1), from month t to $t+5$ (Efp6), and from month t to $t+11$ (Efp12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Efp6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Efp6 decile. Because the earnings forecast data start in January 1976, the Efp deciles start in February 1976.

A.2.12 Cp, Cash Flow-to-price

At the end of June of each year t, we split stocks into deciles based on cash flow-to-price, Cf, which is cash flows for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. Cash flows are income before extraordinary items (Compustat annual item IB) plus depreciation (item DP)). For firms with more than 1 share class, we merge the market equity for all share classes before computing Cp. Firms with non-positive cash flows are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.13 Cp^{q}1, Cp^{q}6, and Cp^{q}12, Quarterly Cash Flow-to-price

At the beginning of each month t, we split stocks into deciles based on quarterly cash flow-to-price, Cp^q, which is cash flows for the latest fiscal quarter ending at least 4 months ago divided by the market equity (from CRSP) at the end of month $t-1$. Quarterly cash flows are income before extraordinary items (Compustat quarterly item IBQ) plus depreciation (item DPQ). For firms with more than 1 share class, we merge the market equity for all share classes before computing Cp^q. Firms with non-positive cash flows are excluded. We calculate decile returns for the current month t ($\text{Cp}^\text{q}1$), from month t to $t+5$ ($\text{Cp}^\text{q}6$), and from month t to $t+11$ ($\text{Cp}^\text{q}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Cp}^\text{q}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Ep}^\text{q}6$ decile.

A.2.14 Dp, Dividend Yield

At the end of June of each year t, we sort stocks into deciles based on dividend yield, Dp, which is the total dividends paid out from July of year $t-1$ to June of t divided by the market equity (from CRSP) at the end of June of t. We calculate monthly dividends as the begin-of-month market equity times the difference between returns with and without dividends. Monthly dividends are then accumulated from July of $t-1$ to June of t. We exclude firms that do not pay dividends. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.15 $\text{Dp}^\text{q}1$, $\text{Dp}^\text{q}6$, and $\text{Dp}^\text{q}12$, Quarterly Dividend Yield

At the beginning of each month t, we split stocks into deciles on quarterly dividend yield, Dp^q, which is the total dividends paid out from months $t-3$ to $t-1$ divided by the market equity (from CRSP) at the end of month $t-1$. We calculate monthly dividends as the begin-of-month market equity times the difference between returns with and without dividends. Monthly dividends are then accumulated from month $t-3$ to $t-1$. We exclude firms that do not pay dividends. We calculate monthly decile returns for the current month t ($\text{Dp}^\text{q}1$), from month t to $t+5$ ($\text{Dp}^\text{q}6$), and from month t to $t+11$ ($\text{Dp}^\text{q}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Dp}^\text{q}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Dp}^\text{q}6$ decile.

A.2.16 Op and Nop, (Net) Payout Yield

Per Boudoukh, Michaely, Richardson, and Roberts (2007), total payouts are dividends on common stock (Compustat annual item DVC) plus repurchases. Repurchases are the total expenditure on the purchase of common and preferred stocks (item PRSTKC) plus any reduction (negative change over the prior year) in the value of the net number of preferred stocks outstanding (item PSTKRV). Net payouts equal total payouts minus equity issuances, which are the sale of common and preferred stock (item SSTK) minus any increase (positive change over the prior year) in the value of the net number of preferred stocks outstanding (item PSTKRV). At the end of June of each year t, we sort stocks into deciles based on total payouts (net payouts) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$ (Op and Nop, respectively). For firms with more than 1 share class, we merge the market equity for all share classes before computing Op and Nop. Firms with non-positive total payouts (zero net payouts) are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t + 1$. Because the data on total expenditure and the sale of common and preferred stocks start in 1971, the Op and Nop portfolios start in July 1972.

A.2.17 Op^{q}1, Op^{q}6, Op^{q}12, Nop^{q}1, Nop^{q}6, and Nop^{q}12, Quarterly (Net) Payout Yield

Quarterly total payouts are dividends plus repurchases from the latest fiscal quarter. Quarterly dividends are zero if dividends per share (Compustat quarterly item DVPSXQ) are zero. Otherwise, quarterly dividends are dividends per share times beginning-of-quarter shares outstanding (item CSHOQ) adjusted for stock splits during the quarter (item AJEXQ for the adjustment factor). Quarterly repurchases are the quarterly change in year-to-date expenditure on the purchase of common and preferred stocks (item PRSTKCY) plus any reduction (negative change in the prior quarter) in the book value of preferred stocks (item PSTKQ). Quarterly net payouts equal total payouts minus equity issuances, which are the quarterly change in year-to-date sale of common and preferred stock (item SSTKY) minus any increase (positive change over the prior quarter) in the book value of preferred stocks (item PSTKQ). At the beginning of month t, we split stocks into deciles based on quarterly payouts (net payouts) for the latest fiscal quarter ending at least 4 months ago, divided by the market equity at the end of month $t-1$ (Op^q and Nop^q, respectively). For firms with more than 1 share class, we merge the market equity for all share classes before computing Op^q and Nop^q. Firms with non-positive total payouts (zero net payouts) are excluded. We calculate monthly decile returns for the current month t (Op^{q}1 and Nop^{q}1), from month t to $t+5$ (Op^{q}6 and Nop^{q}6), and from month t to t+11 (Op^{q}12 and Nop^{q}12), and the deciles are rebalanced at the beginning of month t+1. The holding period longer than 1 month as in, for instance, Op^{q}6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Op^{q}6 decile. For sufficient data coverage, the Op^q and Nop^q portfolios start in January 1985.

A.2.18 Sr, 5-year Sales Growth Rank

Following Lakonishok, Shleifer, and Vishny (1994), we measure 5-year sales growth rank, Sr, in June of year t as the weighted average of the annual sales growth ranks for the prior 5 years: $\sum_{j=1}^{5}(6-j)\times \text{Rank}(t-j)$. The sales growth for year $t-j$ is the growth rate in sales (Compustat annual item SALE) from the fiscal year ending in $t-j-1$ to the fiscal year ending in $t-j$. Only firms with data for all five prior years are used to determine the annual sales growth ranks, and we exclude firms with non-positive sales. For each year from $t-5$ to $t-1$, we rank stocks into deciles based on their annual sales growth, and then assign rank i ($i = 1, \ldots, 10$) to a firm if its annual sales growth falls into the i^{th} decile. At the end of June of each year t, we assign stocks into deciles based on Sr. Monthly decile returns are calculated from July of year t to June of $t + 1$, and the deciles are rebalanced at the end of June in year $t + 1$.

A.2.19 Sg, Sales Growth

At the end of June of each year t, we assign stocks into deciles based on Sg, which is the growth in annual sales (Compustat annual item SALE) from the fiscal year ending in calendar year $t-2$ to the fiscal year ending in $t-1$. Firms with non-positive sales are excluded. Monthly decile returns are calculated from July of year t to June of t+1, and the deciles are rebalanced at the end of June in year t+1.

A.2.20 Em, Enterprise Multiple

Enterprise multiple, Em, is enterprise value divided by operating income before depreciation (Compustat annual item OIBDP). Enterprise value is the market equity plus the total debt (item DLC plus item DLTT) plus the book value of preferred stocks (item PSTKRV) minus cash and short-term investments (item CHE). At the end of June of each year t, we split stocks into deciles based on Em for the fiscal year ending in calendar year $t-1$. The Market equity (from CRSP) is measured at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Em. Firms with non-positive enterprise value or operating income before depreciation are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.21 $\text{Em}^{\text{q}}1$, $\text{Em}^{\text{q}}6$, and $\text{Em}^{\text{q}}12$, Quarterly Enterprise Multiple

Em^{q}, is enterprise value scaled by operating income before depreciation (Compustat quarterly item OIBDPQ). Enterprise value is the market equity plus total debt (item DLCQ plus item DLTTQ) plus the book value of preferred stocks (item PSTKQ) minus cash and short-term investments (item CHEQ). At the beginning of each month t, we split stocks into deciles on Em^{q} for the latest fiscal quarter ending at least 4 months ago. The Market equity (from CRSP) is measured at the end of month $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Em^{q}. Firms with non-positive enterprise value or operating income before depreciation are excluded. Monthly decile returns are calculated for the current month t ($\text{Em}^{\text{q}}1$), from month t to $t+5$ ($\text{Em}^{\text{q}}6$), and from month t to $t+11$ ($\text{Em}^{\text{q}}12$), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in $\text{Em}^{\text{q}}6$ means that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Em}^{\text{q}}6$ decile. For sufficient data coverage, the EM^{q} portfolios start in January 1976.

A.2.22 Sp, Sales-to-price

At the end of June of each year t, we sort stocks into deciles based on sales-to-price, Sp, which is sales (Compustat annual item SALE) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Sp. Firms with non-positive sales are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.23 $\text{Sp}^{\text{q}}1$, $\text{Sp}^{\text{q}}6$, and $\text{Sp}^{\text{q}}12$, Quarterly Sales-to-price

At the beginning of each month t, we sort stocks into deciles based on quarterly sales-to-price, Sp^{q}, which is sales (Compustat quarterly item SALEQ) divided by the market equity at the end of month $t-1$. Before 1972, we use quarterly sales from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use quarterly sales from the most recent quarterly earnings announcement dates (item RDQ). Sales are generally announced with earnings during quarterly earnings announcements (Jegadeesh and Livnat 2006). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent quarterly sales to be within 6 months prior to the portfolio formation. This restriction is imposed to exclude stale earnings information. To avoid potentially err1ous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Firms with non-positive sales are excluded. For firms with more than 1 share class, we merge the market equity for all share classes before computing Sp^q. Monthly decile returns are calculated for the current month t (Sp^q1), from month t to $t+5$ (Sp^q6), and from month t to $t+11$ (Sp^q12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in Sp^q6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Sp^q6 decile.

A.2.24 Ocp, Operating Cash Flow-to-price

At the end of June of each year t, we sort stocks into deciles based on operating cash flows-to-price, Ocp, which is operating cash flows for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. Operating cash flows are measured as funds from operation (Compustat annual item FOPT) minus change in working capital (item WCAP) prior to 1988, and then as net cash flows from operating activities (item OANCF) stating from 1988. For firms with more than 1 share class, we merge the market equity for all share classes before computing Ocp. Firms with non-positive operating cash flows are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the data on funds from operation start in 1971, the Ocp portfolios start in July 1972.

A.2.25 Ocp^q1, Ocp^q6, and Ocp^q12, Quarterly Operating Cash Flow-to-price

At the beginning of each month t, we split stocks on quarterly operating cash flow-to-price, Ocp^q, which is operating cash flows for the latest fiscal quarter ending at least 4 months ago divided by the market equity at the end of month $t-1$. Operating cash flows are measured as the quarterly change in year-to-date funds from operation (Compustat quarterly item FOPTY) minus change in quarterly working capital (item WCAPQ) prior to 1988, and then as the quarterly change in year-to-date net cash flows from operating activities (item OANCFY) stating from 1988. For firms with more than 1 share class, we merge the market equity for all share classes before computing Ocp^q. Firms with non-positive operating cash flows are excluded. Monthly decile returns are calculated for the current month t (Ocp^q1), from month t to $t+5$ (Ocp^q6), and from month t to $t+11$ (Ocp^q12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Ocp^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ocp^q6 decile. Because the data on year-to-date funds from operation start in 1984, the Ocp^q portfolios start in January 1985.

A.2.26 Ir, Intangible Return

At the end of June of each year t, we perform the cross-sectional regression of each firm's past 5-year log stock return on its 5-year-lagged log book-to-market and 5-year log book return:

$$r(t-5,t) = \gamma_0 + \gamma_1 bm_{t-5} + \gamma_2 r^B(t-5,t) + u_t \tag{A3}$$

in which $r(t-5,t)$ is the past 5-year log stock return from the end of year $t-6$ to the end of $t-1$, bm_{t-5} is the 5-year-lagged log book-to-market, and $r^B(t-5,t)$ is the 5-year log book return. The 5-year-lagged log book-to-market is computed as $bm_{t-5} = \log(B_{t-5}/M_{t-5})$, in which B_{t-5} is the book equity for the fiscal year ending in calendar year $t-6$ and M_{t-5} is the market equity (from

CRSP) at the end of December of $t-6$. For firms with more than 1 share class, we merge the market equity for all share classes before computing bm_{t-5}. The 5-year log book return is computed as $r^B(t-5,t) = \log(B_t/B_{t-5}) + \sum_{s=t-5}^{t-1}(r_s - \log(P_s/P_{s-1}))$, in which B_t is the book equity for the fiscal year ending in calendar year $t-1$, r_s is the stock return from the end of year $s-1$ to the end of year s, and P_s is the stock price per share at the end of year s. Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

A firm's intangible return, Ir, is defined as its residual from the annual cross-sectional regression. At the end of June of each year t, we sort stocks based on Ir for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of year $t+1$.

A.2.27 Vhp and Vfp, (Analyst-based) Intrinsic Value-to-market

Following Frankel and Lee (1998), at the end of June of each year t, we implement the residual income model to estimate the intrinsic value:

$$\mathrm{Vh}_t = \mathrm{B}_t + \frac{(E_t[\mathrm{Roe}_{t+1}] - r)}{(1+r)}\mathrm{B}_t + \frac{(E_t[\mathrm{Roe}_{t+2}] - r)}{(1+r)r}\mathrm{B}_{t+1} \tag{A4}$$

$$\mathrm{Vf}_t = \mathrm{B}_t + \frac{(E_t[\mathrm{Roe}_{t+1}] - r)}{(1+r)}\mathrm{B}_t + \frac{(E_t[\mathrm{Roe}_{t+2}] - r)}{(1+r)^2}\mathrm{B}_{t+1} + \frac{(E_t[\mathrm{Roe}_{t+3}] - r)}{(1+r)^2 r}\mathrm{B}_{t+2} \tag{A5}$$

in which Vh_t is the historical Roe-based intrinsic value and Vf_t is the analysts earnings forecast-based intrinsic value. B_t is the book equity (Compustat annual item CEQ) for the fiscal year ending in calendar year $t-1$. Future book equity is computed using the clean surplus accounting: $\mathrm{B}_{t+1} = (1+(1-k)E_t[\mathrm{Roe}_{t+1}])\mathrm{B}_t$, and $\mathrm{B}_{t+2} = (1+(1-k)E_t[\mathrm{Roe}_{t+2}])\mathrm{B}_{t+1}$. $E_t[\mathrm{Roe}_{t+1}]$ and $E_t[\mathrm{Roe}_{t+2}]$ are the return on equity expected for the current and next fiscal years. k is the dividend payout ratio, measured as common stock dividends (item DVC) divided by earnings (item IBCOM) for the fiscal year ending in calendar year $t-1$. For firms with negative earnings, we divide dividends by 6% of average total assets (item AT). r is a constant discount rate of 12%. When estimating Vh_t, we replace all Roe expectations with most recent Roe_t: $\mathrm{Roe}_t = \mathrm{Ni}_t/[(\mathrm{B}_t + \mathrm{B}_{t-1})/2]$, in which Ni_t is earnings for the fiscal year ending in $t-1$, and B_t and B_{t-1} are the book equity from the fiscal years ending in $t-1$ and $t-2$.

When estimating Vf_t, we use analyst earnings forecasts from IBES to construct Roe expectations. Let Fy1 and Fy2 be the 1-year-ahead and two-year-ahead consensus mean forecasts (IBES unadjusted file, item MEANEST; fiscal period indicator = 1 and 2) reported in June of year t. Let s be the number of shares outstanding from IBES (unadjusted file, item SHOUT). When IBES shares are not available, we use shares from CRSP (daily item SHROUT) on the IBES pricing date (item PRDAYS) that corresponds to the IBES report. Then $E_t[\mathrm{Roe}_{t+1}] = s\mathrm{Fy1}/[(\mathrm{B}_{t+1} + \mathrm{B}_t)/2]$, in which $\mathrm{B}_{t+1} = (1 + s(1-k)\mathrm{Fy1})\mathrm{B}_t$. Analogously, $E_t[\mathrm{Roe}_{t+2}] = s\mathrm{Fy2}/[(\mathrm{B}_{t+2} + \mathrm{B}_{t+1})/2]$, in which $\mathrm{B}_{t+2} = (1+s(1-k)\mathrm{Fy2})\mathrm{B}_{t+1}$. Let Ltg denote the long-term earnings growth rate forecast from IBES (item MEANEST; fiscal period indicator = 0). Then $E_t[\mathrm{Roe}_{t+3}] = s\mathrm{Fy2}(1+\mathrm{Ltg})/[(\mathrm{B}_{t+3}+\mathrm{B}_{t+2})/2]$, in which $B_{t+3} = (1+s(1-k)\text{Fy2}(1+\text{Ltg}))B_{t+2}$. If Ltg is missing, we set $E_t[\text{Roe}_{t+3}]$ to be $E_t[\text{Roe}_{t+2}]$. Firms are excluded if their expected Roe or dividend payout ratio is higher than 100%. We also exclude firms with negative book equity.

At the end of June of each year t, we sort stocks into deciles on the ratios of Vh and Vf scaled by the market equity (from CRSP) at the end of December of $t-1$, denoted Vhp and Vfp, respectively. For firms with more than 1 share class, we merge the market equity for all share classes before computing intrinsic value-to-market. Firms with non-positive intrinsic value are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because analyst forecast data start in 1976, the Vfp deciles start in July 1976.

A.2.28 Ebp, Enterprise Book-to-price, and Ndp, Net Debt-to-price

Following Penman, Richardson, and Tuna (2007), we measure enterprise book-to-price, Ebp, as the ratio of the book value of net operating assets (net debt plus book equity) to the market value of net operating assets (net debt plus market equity). Net Debt-to-price, Ndp, is the ratio of net debt to the market equity. Net debt is financial liabilities minus financial assets. We measure financial liabilities as the sum of long-term debt (Compustat annual item DLTT), debt in current liabilities (item DLC), carrying value of preferred stock (item PSTK), and preferred dividends in arrears (item DVPA, zero if missing), less preferred treasury stock (item TSTKP, zero if missing). We measure financial assets as cash and short-term investments (item CHE). Book equity is common equity (item CEQ) plus any preferred treasury stock (item TSTKP, zero if missing) less any preferred dividends in arrears (item DVPA, zero if missing). Market equity is the number of common shares outstanding times share price (from CRSP).

At the end of June of each year t, we sort stocks into deciles based on Ebp, and separately, on Ndp, for the fiscal year ending in calendar year $t-1$. Market equity is measured at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Ebp and Ndp. When forming the Ebp portfolios, we exclude firms with non-positive book or market value of net operating assets. For the Ndp portfolios, we exclude firms with non-positive net debt. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.29 Ebp^q1, Ebp^q6, Ebp^q12, Ndp^q1, Ndp^q6, and Ndp^q12, Quarterly Enterprise Book-to-price, Quarterly Net Debt-to-price

We measure quarterly enterprise book-to-price, Ebp^q, as the ratio of the book value of net operating assets (net debt plus book equity) to the market value of net operating assets (net debt plus market equity). Quarterly net debt-to-price, Ndp^q, is the ratio of net debt to market equity. Net debt is financial liabilities minus financial assets. Financial liabilities are the sum of long-term debt (Compustat quarterly item DLTTQ), debt in current liabilities (item DLCQ), and the carrying value of preferred stock (item PSTKQ). Financial assets are cash and short-term investments (item CHEQ). Book equity is common equity (item CEQQ). Market equity is the number of common shares outstanding times share price (from CRSP).

At the beginning of each month t, we split stocks into deciles based on Ebp^q, and separately, on Ndp^q, for the latest fiscal quarter ending at least 4 months ago. Market equity is measured at the end of month $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Ebp^q and Ndp^q. When forming the Ebp^q portfolios, we exclude firms with non-positive book or market value of net operating assets. For the Ndp^q portfolios, we exclude firms with non-positive net debt. Monthly decile returns are calculated for the current month t (Ebp^q1 and Ndp^q1), from month t to $t+5$ (Ebp^q6 and Ndp^q6), and from month t to $t+11$ (Ebp^q12 and Ndp^q12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Ebp^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ebp^q6 decile. For sufficient data coverage, the Ebp^q and Ndp^q portfolios start in January 1976.

A.2.30 Dur, Equity Duration

Following Dechow, Sloan, and Soliman (2004), we calculate firm-level equity duration, Dur, as:

$$\text{Dur} = \frac{\sum_{t=1}^{T} t \times \text{CD}_t/(1+r)^t}{\text{Me}} + \left(T + \frac{1+r}{r}\right)\frac{\text{ME} - \sum_{t=1}^{T}\text{CD}_t/(1+r)^t}{\text{Me}}, \tag{A6}$$

in which CD_t is the net cash distribution in year t, Me is market equity, T is the length of forecasting period, and r is the cost of equity. Market equity is price per share times shares outstanding (Compustat annual item PRCC_F times item CSHO). Net cash distribution, $\text{CD}_t = \text{B}_{t-1}(\text{Roe}_t - g_t)$, in which B_{t-1} is the book equity at the end of year $t-1$, Roe_t is return on equity in year t, and g_t is the book equity growth in t. Following Dechow et al., we use autoregressive processes to forecast Roe and book equity growth in future years. We model Roe as a first-order autoregressive process with an autocorrelation coefficient of 0.57 and a long-run mean of 0.12, and the growth in book equity as a first-order autoregressive process with an autocorrelation coefficient of 0.24 and a long-run mean of 0.06. For the starting year ($t = 0$), we measure Roe as income before extraordinary items (item IB) divided by 1-year lagged book equity (item CEQ), and the book equity growth rate as the annual change in sales (item SALE). Nissim and Penman (2001) show that past sales growth is a better indicator of future book equity growth than past book equity growth. Finally, we use a forecasting period of $T = 10$ years and a cost of equity of $r = 0.12$. Firms are excluded if book equity ever becomes negative during the forecasting period. We also exclude firms with non-positive Dur. At the end of June of each year t, we sort stocks into deciles based on Dur constructed with data from the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.2.31 Ltg, Ltg1, Ltg6, and Ltg12, Long-term Growth Forecasts

The long-term growth forecast, Ltg, is measured as the consensus median forecast of the long-term earnings growth rate from IBES (item MEDEST, fiscal period indictor = 0). At the end of June of each year t, we assign stocks into deciles based on Ltg reported in December of $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June in year $t+1$. In addition, at the beginning of each month t, we sort stocks into deciles based on Ltg reported in $t-1$. Monthly decile returns are calculated for the current month t (Ltg1), from month t to $t+5$ (Ltg6), and from month t to $t+11$ (Ltg12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Ltg6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ltg6 decile. Because the long-term growth forecasts data start in December 1981, the deciles start in January 1982.

A.3 Investment

A.3.1 Aci, Abnormal Corporate Investment

At the end of June of year t, we measure abnormal corporate investment, Aci, as $\text{Ce}_{t-1}/[(\text{Ce}_{t-2} + \text{Ce}_{t-3} + \text{Ce}_{t-4})/3] - 1$, in which Ce_{t-j} is capital expenditure (Compustat annual item CAPX) scaled by sales (item SALE) for the fiscal year ending in calendar year $t - j$. The last 3-year average capital expenditure is designed to project the benchmark investment in the portfolio formation year. We exclude firms with sales less than 10 million dollars. At the end of June of each year t, we sort stocks into deciles based on Aci. Monthly decile returns are computed from July of year t to June of $t + 1$, and the deciles are rebalanced in June of $t + 1$.

A.3.2 I/A, Investment-to-assets

At the end of June of each year t, we sort stocks into deciles based on investment-to-assets, I/A, which is measured as total assets (Compustat annual item AT) for the fiscal year ending in calendar year $t - 1$ divided by total assets for the fiscal year ending in $t - 2$ minus 1. Monthly decile returns are computed from July of year t to June of $t + 1$, and the deciles are rebalanced in June of $t + 1$.

A.3.3 $\text{Ia}^{\text{q}}1$, $\text{Ia}^{\text{q}}6$, and $\text{Ia}^{\text{q}}12$, Quarterly Investment-to-assets

Quarterly investment-to-assets, Ia^{q}, is defined as quarterly total assets (Compustat quarterly item ATQ) divided by 4-quarter-lagged total assets minus 1. At the beginning of each month t, we sort stocks into deciles based on Ia^{q} for the latest fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for the current month t ($\text{Ia}^{\text{q}}1$), from month t to $t + 5$ ($\text{Ia}^{\text{q}}6$), and from month t to $t + 11$ ($\text{Ia}^{\text{q}}12$), and the deciles are rebalanced at the beginning of month $t + 1$. The holding period longer than 1 month as in, for instance, $\text{Ia}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Ia}^{\text{q}}6$ decile. For sufficient coverage of quarterly assets data, the Ia^{q} portfolios start in January 1973.

A.3.4 dPia, Changes in PPE and Inventory-to-assets

Changes in PPE and Inventory-to-assets, dPia, is defined as the annual change in gross property, plant, and equipment (Compustat annual item PPEGT) plus the annual change in inventory (item INVT) scaled by 1-year-lagged total assets (item AT). At the end of June of each year t, we sort stocks into deciles based on dPia for the fiscal year ending in calendar year $t-1$. Monthly decile returns are computed from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.5 Noa and dNoa, (Changes in) Net Operating Assets

We measure net operating assets as operating assets minus operating liabilities. Operating assets are total assets (Compustat annual item AT) minus cash and short-term investment (item CHE). Operating liabilities are total assets minus debt included in current liabilities (item DLC, zero if missing), minus long-term debt (item DLTT, zero if missing), minus minority interests (item MIB, zero if missing), minus preferred stocks (item PSTK, zero if missing), and minus common equity (item CEQ). Noa is net operating assets scalded by 1-year-lagged total assets. Changes in net operating assets, dNoa, is the annual change in net operating assets scaled by 1-year-lagged total assets. At the end of June of each year t, we sort stocks into deciles based on Noa, and separately, on dNOA, for the fiscal year ending in calendar year $t-1$. Monthly decile returns are computed from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.6 dLno, Changes in Long-term Net Operating Assets

We measure changes in long-term net operating assets as the annual change in net property, plant, and equipment (Compustat item PPENT) plus the change in intangibles (item INTAN) plus the change in other long-term assets (item AO) minus the change in other long-term liabilities (item LO) and plus depreciation and amortization expense (item DP). dLno is the change in long-term net operating assets scaled by the average of total assets (item AT) from the current and prior years. At the end of June of each year t, we sort stocks into deciles based on dLno for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.7 Ig, Investment Growth

At the end of June of each year t, we sort stocks into deciles based on investment growth, Ig, which is the growth rate in capital expenditure (Compustat annual item CAPX) from the fiscal year ending in calendar year $t-2$ to the fiscal year ending in $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.8 2Ig, 2-year Investment Growth

At the end of June of each year t, we sort stocks into deciles based on 2-year investment growth, 2Ig, which is the growth rate in capital expenditure (Compustat annual item CAPX) from the fiscal year ending in calendar year $t-3$ to the fiscal year ending in $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.9 3Ig, 3-year Investment Growth

At the end of June of each year t, we sort stocks into deciles based on 3-year investment growth, 3Ig, which is the growth rate in capital expenditure (Compustat annual item CAPX) from the fiscal year ending in calendar year $t-4$ to the fiscal year ending in $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.10 Nsi, Net Stock Issues

At the end of June of year t, we measure net stock issues, Nsi, as the natural log of the ratio of the split-adjusted shares outstanding at the fiscal year ending in calendar year $t-1$ to the split-adjusted shares outstanding at the fiscal year ending in $t-2$. The split-adjusted shares outstanding is shares outstanding (Compustat annual item CSHO) times the adjustment factor (item AJEX). At the end of June of each year t, we sort stocks with negative Nsi into two portfolios (1 and 2), stocks with zero Nsi into 1 portfolio (3), and stocks with positive Nsi into seven portfolios (4 to 10). Monthly decile returns are from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.11 dIi, % Change in Investment - % Change in Industry Investment

Following Abarbanell and Bushee (1998), we define the %d(·) operator as the percentage change in the variable in the parentheses from its average over the prior 2 years, e.g., %d(Investment) =

[Investment(t) − E[Investment(t)]]/E[Investment(t)], in which E[Investment(t)] = [Investment($t-1$) + Investment($t-2$)]/2. dIi is defined as %d(Investment) − %d(Industry investment), in which investment is capital expenditure in property, plant, and equipment (Compustat annual item CAPXV). Industry investment is the aggregate investment across all firms with the same 2-digit SIC code. Firms with non-positive E[Investment(t)] are excluded and we require at least 2 firms in each industry. At the end of June of each year t, we sort stocks into deciles based on dIi for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.12 Cei, Composite Equity Issuance

At the end of June of each year t, we sort stocks into deciles based on composite equity issuance, Cei, which is the log growth rate in the market equity not attributable to stock return, $\log(\mathrm{Me_t}/\mathrm{Me_{t-5}}) - r(t-5,t)$. $r(t-5,t)$ is the cumulative log stock return from the last trading day of June in year $t-5$ to the last trading day of June in year t, and Me_t is the market equity (from CRSP) on the last trading day of June in year t. Monthly decile returns are from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.13 Cdi, Composite Debt Issuance

At the end of June of each year t, we sort stocks into deciles based on composite debt issuance, Cdi, which is the log growth rate of the book value of debt (Compustat annual item DLC plus item DLTT) from the fiscal year ending in calendar year $t-6$ to the fiscal year ending in year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of year $t+1$.

A.3.14 Ivg, Inventory Growth

At the end of June of each year t, we sort stocks into deciles based on inventory growth, Ivg, which is the annual growth rate in inventory (Compustat annual item INVT) from the fiscal year ending in calendar year $t-2$ to the fiscal year ending in $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.15 Ivc, Inventory Changes

At the end of June of each year t, we sort stocks into deciles based on inventory changes, Ivc, which is the annual change in inventory (Compustat annual item INVT) scaled by the average of total assets (item AT) for the fiscal years ending in $t-2$ and $t-1$. We exclude firms that carry no inventory for the past 2 fiscal years. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.16 Oa, Operating Accruals

Prior to 1988, we use the balance sheet approach in Sloan (1996) to measure operating accruals, Oa, as changes in noncash working capital minus depreciation, in which the noncash working capital is changes in noncash current assets minus changes in current liabilities less short-term debt and taxes payable. In particular, Oa = (dCA − dCASH) − (dCL − dSTD − dTP) − DP, in which dCA is the change in current assets (Compustat annual item ACT), dCASH is the change in cash or cash equivalents (item CHE), dCL is the change in current liabilities (item LCT), dSTD is the change in debt included in current liabilities (item DLC), dTP is the change in income taxes payable (item TXP), and DP is depreciation and amortization (item DP). Missing changes in income taxes payable are set to zero. Starting from 1988, we follow Hribar and Collins (2002) to measure Oa using the statement of cash flows as net income (item NI) minus net cash flow from operations (item OANCF). Doing so helps mitigate measurement errors that can arise from nonoperating activities such as acquisitions and divestitures. Data from the statement of cash flows are only available since 1988. At the end of June of each year t, we sort stocks into deciles on Oa for the fiscal year ending in calendar year $t-1$ scaled by total assets (item AT) for the fiscal year ending in $t-2$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.17 Ta, Total Accruals

Prior to 1988, we use the balance sheet approach in Richardson, Sloan, Soliman, and Tuna (2005) to measure total accruals, Ta = dWc + dNco + dFin. dWc is the change in net non-cash working capital. Net non-cash working capital is current operating asset (Coa) minus current operating liabilities (Col), with Coa = current assets (Compustat annual item ACT) − cash and short-term investments (item CHE) and Col = current liabilities (item LCT) − debt in current liabilities (item DLC). dNco is the change in net non-current operating assets. Net non-current operating assets are non-current operating assets (Nca) minus non-current operating liabilities (Ncl), with Nca = total assets (item AT) − current assets − long-term investments (item IVAO), and Ncl = total liabilities (item LT) − current liabilities − long-term debt (item DLTT). dFin is the change in net financial assets. Net financial assets are financial assets (Fna) minus financial liabilities (Fnl), with Fna = short-term investments (item IVST) + long-term investments, and Fnl = long-term debt + debt in current liabilities + preferred stocks (item PSTK). Missing changes in debt in current liabilities, long-term investments, long-term debt, short-term investments, and preferred stocks are set to zero.

Starting from 1988, we use the cash flow approach to measure Ta as net income (item NI) minus total operating, investing, and financing cash flows (items OANCF, IVNCF, and FINCF) plus sales of stocks (item SSTK, zero if missing) minus stock repurchases and dividends (items PRSTKC and DV, zero if missing). Data from the statement of cash flows are only available since 1988. At the end of June of each year t, we sort stocks into deciles based on Ta for the fiscal year ending in calendar year $t-1$ scaled by total assets for the fiscal year ending in $t-2$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.18 dWc, dCoa, and dCol, Changes in Net Non-cash Working Capital, in Current Operating Assets, and in Current Operating Liabilities

dWc is the change in net non-cash working capital. Net non-cash working capital is current operating assets (Coa) minus current operating liabilities (Col), with Coa = current assets (Compustat annual item ACT) − cash and short term investments (item CHE) and Col = current liabilities (item LCT) − debt in current liabilities (item DLC). dCoa is the change in current operating assets, and dCol is the change in current operating liabilities. Missing changes in debt in current liabilities are set to zero. At the end of June of each year t, we sort stocks into deciles based, separately, on dWc, dCoa, and dCol for the fiscal year ending in calendar year $t-1$, all scaled by total assets (item AT) for the fiscal year ending in calendar year $t-2$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.19 dNco, dNca, and dNcl, Changes in Net Non-current Operating Assets, in Non-current Operating Assets, and in Non-current Operating Liabilities

dNco is the change in net non-current operating assets. Net non-current operating assets are non-current operating assets (Nca) minus non-current operating liabilities (Ncl), with Nca = total assets (Compustat annual item AT) − current assets (item ACT) − long-term investments (item IVAO), and Ncl = total liabilities (item LT) − current liabilities (item LCT) − long-term debt (item DLTT). dNca is the change in non-current operating assets, and dNcl is the change in non-current operating liabilities. Missing changes in long-term investments and long-term debt are set to zero. At the end of June of each year t, we sort stocks into deciles based, separately, on dNco, dNca, and dNcl for the fiscal year ending in calendar year $t-1$, all scaled by total assets for the fiscal year ending in calendar year $t-2$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.20 dFin, dSti, dLti, dFnl, and dBe, Changes in Net Financial Assets, in Short-term Investments, in Long-term Investments, in Financial Liabilities, and in Book Equity

dFin is the change in net financial assets. Net financial assets are financial assets (Fna) minus financial liabilities (Fnl), with Fna = short-term investments (Compustat annual item IVST) + long-term investments (item IVAO), and Fnl = long-term debt (item DLTT) + debt in current liabilities (item DLC) + preferred stock (item PSTK). dSti is the change in short-term investments, dLti is the change in long-term investments, and dFnl is the change in financial liabilities. dBe is the change in book equity (item CEQ). Missing changes in debt in current liabilities, long-term investments, long-term debt, short-term investments, and preferred stocks are set to zero (at least 1 change must be non-missing). When constructing dSti (dLti), we exclude firms that do not have short-term (long-term) investments in the past 2 fiscal years. At the end of June of each year t, we sort stocks into deciles based, separately, on dFin, dSti, dLti, dFnl, and dBe for the fiscal year ending in calendar year $t-1$, all scaled by total assets (item AT) for the fiscal year ending in calendar year $t-2$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. For sufficient data coverage, the dSti portfolios start in July 1971.

A.3.21 Dac, Discretionary Accruals

We measure discretionary accruals, Dac, per Dechow, Sloan, and Sweeney (1995):

$$\frac{\text{Oa}_{it}}{\text{A}_{it-1}} = \alpha_1 \frac{1}{\text{A}_{it-1}} + \alpha_2 \frac{\text{dSALE}_{it} - \text{dREC}_{it}}{\text{A}_{it-1}} + \alpha_3 \frac{\text{PPE}_{it}}{\text{A}_{it-1}} + e_{it}, \tag{A7}$$

in which Oa_{it} is operating accruals for firm i (see Appendix A.3.16), A_{it-1} is total assets (Compustat annual item AT) at the end of year $t-1$, dSALE_{it} is the annual change in sales (item SALE) from year $t-1$ to t, dREC_{it} is the annual change in net receivables (item RECT) from year $t-1$ to t, and PPE_{it} is gross property, plant, and equipment (item PPEGT) at the end of year t. We winsorize the variables at the right hand side of equation (A7) at the 1st and 99th percentiles of their distributions each year. We estimate the cross-sectional regression (A7) for each 2-digit SIC industry and year combination, formed separately for NYSE/AMEX firms and for NASDAQ firms. We require at least 6 firms for each regression. The discretionary accrual for stock i is defined as the residual from the regression, e_{it}. At the end of June of each year t, we sort stocks into deciles based on Dac for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.22 Poa, Percent Operating Accruals

Accruals are traditionally scaled by total assets. Hafzalla, Lundholm, and Van Winkle (2011) show that scaling accruals by the absolute value of earnings (percent accruals) is more effective in selecting firms for which the differences between sophisticated and naive forecasts of earnings are the most extreme. To construct the percent operating accruals (Poa) deciles, at the end of June of each year t, we sort stocks into deciles based on operating accruals scaled by the absolute value of net income (Compustat annual item NI) for the fiscal year ending in calendar year $t-1$. See Appendix A.3.16 for the measurement of operating accruals. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.23 Pta, Percent Total Accruals

At the end of June of each year t, we sort stocks into deciles on percent total accruals, Pta, calculated as total accruals scaled by the absolute value of net income (Compustat annual item NI) for the fiscal year ending in calendar year $t-1$. See Appendix A.3.17 for the measurement of total accruals. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of year $t+1$.

A.3.24 Pda, Percent Discretionary Accruals

At the end of June of each year t, we split stocks into deciles based on percent discretionary accruals, Pda, calculated as the discretionary accruals, Dac, for the fiscal year ending in calendar year $t-1$ multiplied with total assets (Compustat annual item AT) for the fiscal year ending in $t-2$ scaled by the absolute value of net income (item NI) for the fiscal year ending in $t-1$. See Appendix A.3.21 for the measurement of discretionary accruals. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.3.25 Nxf, Nef, and Ndf, Net External, Equity, and Debt Financing

Net external financing, Nxf, is the sum of net equity financing, Nef, and net debt financing, Ndf. Nef is the proceeds from the sale of common and preferred stocks (Compustat annual item SSTK) less cash payments for the repurchases of common and preferred stocks (item PRSTKC) less cash payments for dividends (item DV). Ndf is the cash proceeds from the issuance of long-term debt (item DLTIS) less cash payments for long-term debt reductions (item DLTR) plus the net changes in current debt (item DLCCH, zero if missing). At the end of June of each year t, we sort stocks into deciles based on Nxf, and, separately, on Nef and Ndf, for the fiscal year ending in calendar year $t-1$ scaled by the average of total assets for fiscal years ending in $t-2$ and $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the data on financing activities start in 1971, the portfolios start in July 1972.

A.4 Profitability

A.4.1 Roe1, Roe6, and Roe12, Return on Equity

Return on equity, Roe, is income before extraordinary items (Compustat quarterly item IBQ) divided by 1-quarter-lagged book equity (Hou, Xue, and Zhang 2015). Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity.

Before 1972, the sample coverage is limited for quarterly book equity in Compustat quarterly files. We expand the coverage by using book equity from Compustat annual files as well as by imputing quarterly book equity with clean surplus accounting. Specifically, whenever available we first use quarterly book equity from Compustat quarterly files. We then supplement the coverage for fiscal quarter 4 with annual book equity from Compustat annual files. Following Davis, Fama, and French (2000), we measure annual book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if available. If not, stockholders' equity is the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

If both approaches are unavailable, we apply the clean surplus relation to impute the book equity. First, if available, we backward impute the beginning-of-quarter book equity as the end-of-quarter book equity minus quarterly earnings plus quarterly dividends. Quarterly earnings are income before extraordinary items (Compustat quarterly item IBQ). Quarterly dividends are zero if dividends per share (item DVPSXQ) are zero. Otherwise, total dividends are dividends per share times beginning-of-quarter shares outstanding adjusted for stock splits during the quarter. Shares outstanding are from Compustat (quarterly item CSHOQ supplemented with annual item CSHO for fiscal quarter 4) or CRSP (item SHROUT), and the share adjustment factor is from Compustat (quarterly item AJEXQ supplemented with annual item AJEX for fiscal quarter 4) or CRSP (item CFACSHR). Because we impose a 4-month lag between earnings and the holding period month (and the book equity in the denominator of Roe is 1-quarter-lagged relative to earnings), all the Compustat data in the backward imputation are at least 4-month lagged prior to the portfolio formation. If data are unavailable for the backward imputation, we impute the book equity for quarter t forward based on book equity from prior quarters. Let BEQ_{t-j}, $1 \leq j \leq 4$ denote the latest available quarterly book equity as of quarter t, and $\text{IBQ}_{t-j+1,t}$ and $\text{DVQ}_{t-j+1,t}$ be the sum of quarterly earnings and quarterly dividends from quarter $t-j+1$ to t, respectively. BEQ_t can then be imputed as $\text{BEQ}_{t-j} + \text{IBQ}_{t-j+1,t} - \text{DVQ}_{t-j+1,t}$. We do not use prior book equity from more than 4 quarters ago (i.e., $1 \leq j \leq 4$) to reduce imputation errors.

At the beginning of each month t, we sort all stocks into deciles based on their most recent past Roe. Before 1972, we use the most recent Roe computed with quarterly earnings from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use Roe computed with quarterly earnings from the most recent quarterly earnings announcements (Compustat quarterly item RDQ). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Roe to be within 6 months prior to the portfolio formation. This restriction is imposed to exclude stale earnings information. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for the current month t (Roe1), from month t to $t+5$ (Roe6), and from month t to $t+11$ (Roe12). The deciles are rebalanced monthly. The holding period that is longer than 1 month as in, for instance, Roe6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the Roe6 decile.

A.4.2 dRoe1, dRoe6, and dRoe12, Changes in Return on Equity

Change in return on equity, dRoe, is return on equity minus its value from 4 quarters ago. See Appendix A.4.1 for the Roe measurement. At the beginning of each month t, we sort all stocks into deciles on their most recent past dRoe. Before 1972, we use the most recent dRoe with quarterly earnings from fiscal quarters ending at least 4 months ago. Starting from 1972, we use dRoe computed with quarterly earnings from the most recent quarterly earnings announcement dates (Compustat quarterly item RDQ). We require a firm's end of the fiscal quarter that corresponds to its most recent dRoe to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for the current month t (dRoe1), from month t to $t+5$ (dRoe6), and from month t to $t+11$ (dRoe12). The deciles are rebalanced monthly. The holding period that is longer than 1 month as in, for instance, dRoe6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the dRoe6 decile.

A.4.3 Roa1, Roa6, and Roa12, Return on Assets

Return on assets, Roa, is income before extraordinary items (Compustat quarterly item IBQ) divided by 1-quarter-lagged total assets (item ATQ). At the beginning of each month t, we sort all stocks into deciles based on Roa computed with quarterly earnings from the most recent earnings announcement dates (item RDQ). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Roa to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for month t (Roa1), from month t to $t+5$ (Roe6), and from month t to $t+11$ (Roe12). The deciles are rebalanced at the beginning of $t+1$. The holding period that is longer than 1 month as in, for instance, Roa6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the Roa6 decile. For sufficient data coverage, the Roa portfolios start in January 1972.

A.4.4 dRoa1, dRoa6, and dRoa12, Changes in Return on Assets

Change in return on assets, dRoa, is return on assets minus its value from 4 quarters ago. See Appendix A.4.3 for the measurement of return on assets. At the beginning of each month t, we sort all stocks into deciles based on dRoa computed with quarterly earnings from the most recent earnings announcement dates (Compustat quarterly item RDQ). We require a firm's end of the fiscal quarter that corresponds to its most recent dRoa to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for month t (dRoa1), from month t to $t+5$ (dRoa6), and from month t to $t+11$ (dRoa12). The deciles are rebalanced at the beginning of

$t+1$. The holding period that is longer than 1 month as in, for instance, dRoa6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the dRoa6 decile. For sufficient data coverage, the dRoa portfolios start in January 1973.

A.4.5 Rna, Pm, and Ato, Return on Net Operating Assets, Profit Margin, Asset Turnover

Soliman (2008) uses DuPont analysis to decompose Roe = Rna + FLEV × SPREAD, in which Roe is return on equity, Rna is return on net operating assets, FLEV is financial leverage, and SPREAD is the difference between return on net operating assets and borrowing costs. We can further decompose Rna as Pm × Ato, in which Pm is profit margin and Ato is asset turnover.

We use annual sorts to form Rna, Pm, and Ato deciles. At the end of June of year t, we measure Rna as operating income after depreciation (Compustat annual item OIADP) for the fiscal year ending in calendar year $t-1$ divided by net operating assets (Noa) for the fiscal year ending in $t-2$. Noa is operating assets minus operating liabilities. Operating assets are total assets (item AT) minus cash and short-term investment (item CHE), and minus other investment and advances (item IVAO, zero if missing). Operating liabilities are total assets minus debt in current liabilities (item DLC, zero if missing), minus long-term debt (item DLTT, zero if missing), minus minority interests (item MIB, zero if missing), minus preferred stocks (item PSTK, zero if missing), and minus common equity (item CEQ). Pm is operating income after depreciation divided by sales (item SALE) for the fiscal year ending in calendar year $t-1$. Ato is sales for the fiscal year ending in calendar year $t-1$ divided by Noa for the fiscal year ending in $t-2$.

At the end of June of each year t, we sort stocks into three sets of deciles based on Rna, Pm, and Ato. We exclude firms with non-positive Noa for the fiscal year ending in calendar year $t-2$ when forming the Rna and the Ato portfolios. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.6 Cto, Capital Turnover

At the end of June of each year t, we split stocks into deciles based on capital turnover, Cto, measured as sales (Compustat annual item SALE) for the fiscal year ending in calendar year $t-1$ divided by total assets (item AT) for the fiscal year ending in $t-2$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.7 Rna^{q}1, Rna^{q}6, Rna^{q}12, Pm^{q}1, Pm^{q}6, Pm^{q}12, Ato^{q}1, Ato^{q}6, and Ato^{q}12, Quarterly Return on Net Operating Assets, Quarterly Profit Margin, Quarterly Asset Turnover

Quarterly return on net operating assets, Rna^q, is quarterly operating income after depreciation (Compustat quarterly item OIADPQ) divided by 1-quarter-lagged net operating assets (Noa). Noa is operating assets minus operating liabilities. Operating assets are total assets (item ATQ) minus cash and short-term investments (item CHEQ), and minus other investment and advances (item IVAOQ, zero if missing). Operating liabilities are total assets minus debt in current liabilities (item DLCQ, zero if missing), minus long-term debt (item DLTTQ, zero if missing), minus minority interests (item MIBQ, zero if missing), minus preferred stocks (item PSTKQ, zero if missing), and minus common equity (item CEQQ). Quarterly profit margin, Pm^q, is quarterly operating income after depreciation divided by quarterly sales (item SALEQ). Quarterly asset turnover, Ato^q, is quarterly sales divided by 1-quarter-lagged Noa.

At the beginning of each month t, we sort stocks into deciles based on Rna^q or Pm^q for the latest fiscal quarter ending at least 4 months ago. Separately, we sort stocks into deciles based on Ato^q computed with quarterly sales from the most recent earnings announcement dates (item RDQ). Sales are generally announced with earnings during quarterly earnings announcements (Jegadeesh and Livnat 2006). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Ato^q to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for month t (Rna^q1, Pm^q1, and Ato^q1), from month t to $t+5$ (Rna^q6, Pm^q6, and Ato^q6), and from month t to $t+11$ (Rna^q12, Pm^q12, and Ato^q12). The deciles are rebalanced at the beginning of $t+1$. The holding period that is longer than 1 month as in, for instance, Ato^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Atoq6 decile. For sufficient data coverage, the Rna^q portfolios start in January 1976 and the Ato^q portfolios start in January 1972.

A.4.8 Cto^q1, Cto^q6, and Cto^q12, Quarterly Capital Turnover

Quarterly capital turnover, Cto^q, is quarterly sales (Compustat quarterly item SALEQ) scaled by 1-quarter-lagged total assets (item ATQ). At the beginning of each month t, we sort stocks into deciles based on Cto^q computed with quarterly sales from the most recent earnings announcement dates (item RDQ). Sales are generally announced with earnings during quarterly earnings announcements (Jegadeesh and Livnat 2006). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Ato^q to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for month t (Cto^q1), from month t to $t+5$ (Cto^q6), and from month t to $t+11$ (Cto^q12). The deciles are rebalanced at the beginning of $t+1$. The holding period that is longer than 1 month as in, for instance, Cto^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Cto^q6 decile. For sufficient data coverage, the Cto^q portfolios start in January 1972.

A.4.9 Gpa, Gross Profits-to-assets

We measure gross profits-to-assets, Gpa, as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS) divided by total assets (item AT, the denominator is current, not lagged, total assets). At the end of June of each year t, we sort stocks into deciles based on Gpa for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.10 Gla, Gross Profits-to-lagged assets

Gross profits-to-lagged assets, Gla, is total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS) divided by 1-year-lagged total assets (item AT). At the end of June of each year t, we sort stocks into deciles based on Gla for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.11 $\text{Gla}^{\text{q}}1$, $\text{Gla}^{\text{q}}6$, and $\text{Gla}^{\text{q}}12$, Quarterly Gross Profits-to-lagged Assets

Gla^{q}, is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ) divided by 1-quarter-lagged total assets (item ATQ). At the beginning of each month t, we sort stocks into deciles based on Gla^{q} for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for month t ($\text{Gla}^{\text{q}}1$), from month t to $t+5$ ($\text{Gla}^{\text{q}}6$), and from month t to $t+11$ ($\text{Gla}^{\text{q}}12$). The deciles are rebalanced at the beginning of $t+1$. The holding period that is longer than 1 month as in, for instance, $\text{Gla}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $\text{Gla}^{\text{q}}6$ decile. For sufficient data coverage, the Gla^{q} portfolios start in January 1976.

A.4.12 Ope, Operating Profits to Equity

Following Fama and French (2015), we measure operating profitability to equity, Ope, as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS, zero if missing), minus selling, general, and administrative expenses (item XSGA, zero if missing), and minus interest expense (item XINT, zero if missing), scaled by book equity (the denominator is current, not lagged, book equity). We require at least 1 of the three expense items (COGS, XSGA, and XINT) to be non-missing. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. At the end of June of each year t, we sort stocks into deciles based on Ope for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.13 Ole, Operating profits-to-lagged Equity

Ole is total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS, zero if missing), minus selling, general, and administrative expenses (item XSGA, zero if missing), and minus interest expense (item XINT, zero if missing), scaled by 1-year-lagged book equity. We require at least 1 of the three expense items (COGS, XSGA, and XINT) to be non-missing. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. At the end of June of each year t, we sort stocks into deciles on Ole for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.14 Ole^{q}1, Ole^{q}6, and Ole^{q}12, Quarterly Operating Profits-to-lagged Equity

Quarterly operating profits-to-lagged equity, Ole^q, is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ, zero if missing), minus selling, general, and administrative expenses (item XSGAQ, zero if missing), and minus interest expense (item XINTQ, zero if missing), scaled by 1-quarter-lagged book equity. We require at least 1 of the three expense items (COGSQ, XSGAQ, and XINTQ) to be non-missing. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity.

At the beginning of each month t, we split stocks on Ole^q for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for month t (Ole^{q}1), from month t to $t+5$ (Ole^{q}6), and from month t to $t+11$ (Ole^{q}12). The deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in Ole^{q}6 means that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ole^{q}6 decile. For sufficient data coverage, the Ole^q portfolios start in January 1972.

A.4.15 Opa, Operating Profits-to-assets

Following Ball, Gerakos, Linnainmaa, and Nikolaev (2015), we measure operating profits-to-assets, Opa, as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), and plus research and development expenditures (item XRD, zero if missing), scaled by book assets (item AT, the denominator is current, not lagged, total assets). At the end of June of each year t, we sort stocks into deciles based on Opa for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.16 Ola, Operating Profits-to-lagged Assets

Operating profits-to-lagged assets, Ola, is total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), and plus research and development expenditures (item XRD, zero if missing), scaled by 1-year-lagged book assets (item AT). At the end of June of each year t, we sort stocks into deciles based on Ola for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.17 Ola^{q}1, Ola^{q}6, and Ola^{q}12, Quarterly Operating Profits-to-lagged Assets

Quarterly operating profits-to-lagged assets, Ola^q, is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ), minus selling, general, and administrative expenses (item XSGAQ), plus research and development expenditures (item XRDQ, zero if missing), scaled by 1-quarter-lagged book assets (item ATQ). At the beginning of each month t, we sort stocks into deciles based on Ola^q for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for month t (Ola^{q}1), from month t to $t+5$ (Ola^{q}6), and from month t to $t+11$ (Ola^{q}12). The deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in Ola^{q}6 means that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Ola}^{q}6$ decile. For sufficient data coverage, the Ola^{q} portfolios start in January 1976.

A.4.18 Cop, Cash-based Operating Profitability

Following Ball, Gerakos, Linnainmaa, and Nikolaev (2016), we measure cash-based operating profitability, Cop, as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), plus research and development expenditures (item XRD, zero if missing), minus change in accounts receivable (item RECT), minus change in inventory (item INVT), minus change in prepaid expenses (item XPP), plus change in deferred revenue (item DRC plus item DRLT), plus change in trade accounts payable (item AP), and plus change in accrued expenses (item XACC), all scaled by book assets (item AT, the denominator is current, not lagged, total assets). All changes are annual changes in balance sheet items and we set missing changes to zero. At the end of June of each year t, we sort stocks into deciles based on Cop for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.19 Cla, Cash-based Operating Profits-to-lagged Assets

Cash-based operating profits-to-lagged assets, Cla, is total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), plus research and development expenditures (item XRD, zero if missing), minus change in accounts receivable (item RECT), minus change in inventory (item INVT), minus change in prepaid expenses (item XPP), plus change in deferred revenue (item DRC plus item DRLT), plus change in trade accounts payable (item AP), and plus change in accrued expenses (item XACC), all scaled by 1-year-lagged book assets (item AT). All changes are annual changes in balance sheet items and we set missing changes to zero. At the end of June of each year t, we sort stocks into deciles based on Cla for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.20 $\text{Cla}^{q}1$, $\text{Cla}^{q}6$, and $\text{Cla}^{q}12$, Quarterly Cash-based Operating Profits-to-lagged Assets

Quarterly cash-based operating profits-to-lagged assets, Cla, is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ), minus selling, general, and administrative expenses (item XSGAQ), plus research and development expenditures (item XRDQ, zero if missing), minus change in accounts receivable (item RECTQ), minus change in inventory (item INVTQ), plus change in deferred revenue (item DRCQ plus item DRLTQ), and plus change in trade accounts payable (item APQ), all scaled by 1-quarter-lagged book assets (item ATQ). All changes are quarterly changes in balance sheet items and we set missing changes to zero. At the beginning of each month t, we split stocks on Cla^{q} for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for month t ($\text{Cla}^{q}1$), from month t to $t+5$ ($\text{Cla}^{q}6$), and from month t to $t+11$ ($\text{Cla}^{q}12$). The deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in $\text{Cla}^{q}6$ means that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Cla}^{q}6$ decile. For sufficient data coverage, the Cla^{q} portfolios start in January 1976.

A.4.21 F, Fundamental Score

Piotroski (2000) classifies each fundamental signal as either good or bad depending on the signal's implication for future stock prices and profitability. An indicator variable for a particular signal is 1 if its realization is good and zero if it is bad. The aggregate signal, denoted F, is the sum of the 9 binary signals. F is designed to measure the overall quality, or strength, of the firm's financial position. The 9 fundamental signals are chosen to measure 3 areas of a firm's financial condition, profitability, liquidity, and operating efficiency.

There are 4 variables selected to measure profitability: (i) Roa is income before extraordinary items (Compustat annual item IB) scaled by 1-year-lagged total assets (item AT). If the firm's Roa is positive, the indicator variable $\mathrm{F_{Roa}}$ equals 1 and zero otherwise. (ii) Cf/A is cash flow from operation scaled by 1-year-lagged total assets. Cash flow from operation is net cash flow from operating activities (item OANCF) if available, or funds from operation (item FOPT) minus the annual change in working capital (item WCAP). If the firm's Cf/A is positive, the indicator variable $\mathrm{F_{Cf/A}}$ equals 1 and zero otherwise. (iii) dRoa is the current year's Roa less the prior year's Roa. If dRoa is positive, the indicator variable $\mathrm{F_{dROA}}$ is 1 and zero otherwise. Finally, (iv) the indicator $\mathrm{F_{Acc}}$ equals 1 if Cf/A $>$ Roa and zero otherwise.

There are 3 variables selected to measure changes in capital structure and a firm's ability to meet future debt obligations. Piotroski (2000) assumes that an increase in leverage, a deterioration of liquidity, or the use of external financing is a bad signal about financial risk. (i) dLever is the change in the ratio of total long-term debt (Compustat annual item DLTT) to the average of current and 1-year-lagged total assets. $\mathrm{F_{dLever}}$ is 1 if the firm's leverage ratio falls, i.e., dLever < 0, and zero otherwise. (ii) dLiquid measures the change in a firm's current ratio from the prior year, in which the current ratio is the ratio of current assets (item ACT) to current liabilities (item LCT). An improvement in liquidity (ΔdLiquid > 0) is a good signal about the firm's ability to service current debt obligations. The indicator $\mathrm{F_{dLiquid}}$ equals 1 if the firm's liquidity improves and zero otherwise. (iii) The indicator, Eq, equals 1 if the firm does not issue common equity during the current year and zero otherwise. The issuance of common equity is sales of common and preferred stocks (item SSTK) minus any increase in preferred stocks (item PSTK). Issuing equity is interpreted as a bad signal (inability to generate sufficient internal funds to service future obligations).

The remaining 2 signals are designed to measure changes in the efficiency of the firm's operations that reflect 2 key constructs underlying the decomposition of return on assets. (i) dMargin is the firm's current gross margin ratio, measured as gross margin (Compustat annual item SALE minus item COGS) scaled by sales (item SALE), less the prior year's gross margin ratio. An improvement in margins signifies a potential improvement in factor costs, a reduction in inventory costs, or a rise in the price of the firm's product. The indictor $\mathrm{F_{dMargin}}$ equals 1 if dMargin > 0 and zero otherwise. (ii) dTurn is the firm's current year asset turnover ratio, measured as total sales scaled by 1-year-lagged total assets (item AT), minus the prior year's asset turnover ratio. An improvement in asset turnover ratio signifies greater productivity from the asset base. The indicator, $\mathrm{F_{dTurn}}$, equals 1 if dTurn > 0 and zero otherwise.

Piotroski (2000) forms a composite score, F, as the sum of the individual binary signals:

$$\mathrm{F} \equiv \mathrm{F_{Roa}} + \mathrm{F_{dRoa}} + \mathrm{F_{Cf/A}} + \mathrm{F_{Acc}} + \mathrm{F_{dMargin}} + \mathrm{F_{dTurn}} + \mathrm{F_{dLever}} + \mathrm{F_{dLiquid}} + \mathrm{Eq}. \tag{A8}$$

At the end of June of each year t, we sort stocks based on F for the fiscal year ending in calender year $t-1$ to form seven portfolios: low (F = 0,1,2), 3, 4, 5, 6, 7, and high (F = 8, 9). Because extreme F scores are rare, we combine scores 0, 1, and 2 into the low portfolio and scores 8 and 9 into the high portfolio. Monthly portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June of $t+1$. For sufficient data coverage, the F portfolio returns start in July 1972.

A.4.22 F^q1, F^q6, and F^q12, Quarterly Fundamental Score

To construct quarterly F-score, F^q, we use quarterly accounting data and the same 9 binary signals from Piotroski (2000). Among the 4 signals related to profitability: (i) Roa is quarterly income before extraordinary items (Compustat quarterly item IBQ) scaled by 1-quarter-lagged total assets (item ATQ). If the firm's Roa is positive, the indicator variable F_{Roa} equals 1 and zero otherwise. (ii) Cf/A is quarterly cash flow from operation scaled by 1-quarter-lagged total assets. Cash flow from operation is the quarterly change in year-to-date net cash flow from operating activities (item OANCFY) if available, or the quarterly change in year-to-date funds from operation (item FOPTY) minus the quarterly change in working capital (item WCAPQ). If the firm's Cf/A is positive, the indicator variable $F_{\text{Cf/A}}$ equals 1 and zero otherwise. (iii) dRoa is the current quarter's Roa less the Roa from 4 quarters ago. If dRoa is positive, the indicator variable F_{dROA} is 1 and zero otherwise. Finally, (iv) the indicator F_{Acc} equals 1 if Cf/A $>$ Roa and zero otherwise.

Among the 3 signals related changes in capital structure and a firm's ability to meet future debt obligations: (i) dLever is the change in the ratio of total long-term debt (Compustat quarterly item DLTTQ) to the average of current and 1-quarter-lagged total assets. F_{dLever} is 1 if the firm's leverage ratio falls, i.e., dLever < 0, relative to its value 4 quarters ago, and zero otherwise. (ii) dLiquid measures the change in a firm's current ratio between the current quarter and 4 quarters ago, in which the current ratio is the ratio of current assets (item ACTQ) to current liabilities (item LCTQ). An improvement in liquidity (dLiquid > 0) is a good signal about the firm's ability to service current debt obligations. The indicator F_{dLiquid} equals 1 if the firm's liquidity improves and zero otherwise. (iii) The indicator, Eq, equals 1 if the firm does not issue common equity during the past 4 quarters and zero otherwise. The issuance of common equity is sales of common and preferred stocks minus any increase in preferred stocks (item PSTKQ). To measure sales of common and preferred stocks, we first compute the quarterly change in year-to-date sales of common and preferred stocks (item SSTKY) and then take the total change for the past 4 quarters. Issuing equity is interpreted as a bad signal (inability to generate sufficient internal funds to service future obligations). For the remaining 2 signals, (i) dMargin is the firm's current gross margin ratio, measured as gross margin (item SALEQ minus item COGSQ) scaled by sales (item SALEQ), less the gross margin ratio from 4 quarters ago. The indictor F_{dMargin} equals 1 if dMargin > 0 and zero otherwise. (ii) dTurn is the firm's current asset turnover ratio, measured as (item SALEQ) scaled by 1-quarter-lagged total assets (item ATQ), minus the asset turnover ratio from 4 quarters ago. The indicator, F_{dTurn}, equals 1 if dTurn > 0 and zero otherwise.

The composite score, F^q, is the sum of the individual binary signals:

$$F^q \equiv F_{\text{Roa}} + F_{\text{dRoa}} + F_{\text{Cf/A}} + F_{\text{Acc}} + F_{\text{dMargin}} + F_{\text{dTurn}} + F_{\text{dLever}} + F_{\text{dLiquid}} + \text{Eq}. \tag{A9}$$

At the beginning of each month t, we sort stocks based on Fq for the fiscal quarter ending at least 4 quarters ago to form seven portfolios: low (F^q = 0,1,2), 3, 4, 5, 6, 7, and high (F^q = 8, 9). Monthly portfolio returns are calculated for month t (F^q1), from month t to $t+5$ (F^q6), and from month t to $t+11$ (F^q12), and the portfolios are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, F^q6, means that for a given portfolio in each month there exist 6 subportfolios, each of which is initiated in a different month in prior 6 months. We take the simple average of the subportfolio returns as the monthly return of the $\mathrm{F^q6}$ portfolio. For sufficient data coverage, the $\mathrm{F^q}$ portfolios start in January 1985.

A.4.23 Fp, Fp$^{\mathrm{q}}$1, Fp$^{\mathrm{q}}$6, and Fp$^{\mathrm{q}}$12, Failure Probability

Failure probability (Fp) is from Campbell, Hilscher, and Szilagyi (2008, Table IV, Column 3):

$$\begin{aligned}\mathrm{Fp}_t \equiv & -9.164 - 20.264\mathrm{NIMTAAVG}_t + 1.416\mathrm{TLMTA}_t - 7.129\mathrm{EXRETAVG}_t \\ & + 1.411\mathrm{SIGMA}_t - 0.045\mathrm{RSIZE}_t - 2.132\mathrm{CASHMTA}_t + 0.075\mathrm{MB}_t - 0.058\mathrm{PRICE}_t \qquad \text{(A10)}\end{aligned}$$

in which

$$\mathrm{NIMTAAVG}_{t-1,t-12} \equiv \frac{1-\phi^3}{1-\phi^{12}}\left(\mathrm{NIMTA}_{t-1,t-3} + \cdots + \phi^9\mathrm{NIMTA}_{t-10,t-12}\right) \qquad \text{(A11)}$$

$$\mathrm{EXRETAVG}_{t-1,t-12} \equiv \frac{1-\phi}{1-\phi^{12}}\left(\mathrm{EXRET}_{t-1} + \cdots + \phi^{11}\mathrm{EXRET}_{t-12}\right), \qquad \text{(A12)}$$

and $\phi = 2^{-1/3}$. NIMTA is net income (Compustat quarterly item NIQ) divided by the sum of market equity (share price times the number of shares outstanding from CRSP) and total liabilities (item LTQ). The moving average NIMTAAVG captures the idea that a long history of losses is a better predictor of bankruptcy than 1 large quarterly loss in a single month. $\mathrm{EXRET} \equiv \log(1+R_{it})-\log(1+R_{\mathrm{S\&P500},t})$ is the monthly log excess return on each firm's equity relative to the S&P 500 index. The moving average EXRETAVG captures the idea that a sustained decline in stock market value is a better predictor of bankruptcy than a sudden stock price decline in a single month.

TLMTA is total liabilities divided by the sum of market equity and total liabilities. SIGMA is the annualized 3-month rolling sample standard deviation: $\sqrt{\frac{252}{N-1}\sum_{k\in\{t-1,t-2,t-3\}} r_k^2}$, in which k is the index of trading days in months $t-1, t-2$, and $t-3$, r_k is the firm-level daily return, and N is the total number of trading days in the 3-month period. SIGMA is treated as missing if there are less than 5 nonzero observations over the 3 months in the rolling window. RSIZE is the relative size of each firm measured as the log ratio of its market equity to that of the S&P 500 index. CASHMTA, aimed to capture the liquidity position of the firm, is cash and short-term investments (Compustat quarterly item CHEQ) divided by the sum of market equity and total liabilities (item LTQ). MB is the market-to-book equity, in which we add 10% of the difference between the market equity and the book equity to the book equity to alleviate measurement issues for extremely small book equity values (Campbell, Hilscher, and Szilagyi 2008). For firm-month observations that still have negative book equity after this adjustment, we replace these negative values with $1 to ensure that the market-to-book ratios for these firms are in the right tail of the distribution. PRICE is each firm's log price per share, truncated above at $15. We further eliminate stocks with prices less than $1 at the portfolio formation date. We winsorize the variables on the right-hand side of equation (A10) at the 1th and 99th percentiles of their distributions each month.

To form the Fp deciles, we sort stocks at the end of June of year t based on Fp calculated with accounting data from the fiscal quarter ending at least 4 months ago. Because unlike earnings, other quarterly data items in the definition of Fp might not be available upon earnings announcement, we impose a 4-month gap between the fiscal quarter end and portfolio formation to guard against look-ahead bias. We calculate decile returns from July of year t to June of year $t+1$, and the deciles are rebalanced in June. For sufficient data coverage, the Fp deciles start in July 1976.

At the beginning of each month t, we split stocks into deciles based on Fp calculated with accounting data from the fiscal quarter ending at least 4 months ago. We calculate decile returns for the current month t ($\text{Fp}^{\text{q}}1$), from month t to $t+5$ ($\text{Fp}^{\text{q}}6$), and from month t to $t+11$ ($\text{Fp}^{\text{q}}12$). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, $\text{Fp}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the $\text{Fp}^{\text{q}}6$ decile. For sufficient data coverage, the quarterly Fp deciles start in January 1976.

A.4.24 O, Ohlson's O-score

We follow Ohlson (1980, Model 1 in Table 4) to construct O-score (Dichev 1998):

$$\begin{aligned} \text{O} \;\equiv\;& -1.32 - 0.407\log(\text{TA}) + 6.03\text{TLTA} - 1.43\text{WCTA} + 0.076\text{CLCA} \\ & - 1.72\text{OENEG} - 2.37\text{NITA} - 1.83\text{FUTL} + 0.285\text{IN2} - 0.521\text{CHIN}, \end{aligned} \tag{A13}$$

in which TA is total assets (Compustat annual item AT). TLTA is the leverage ratio defined as total debt (item DLC plus item DLTT) divided by total assets. WCTA is working capital (item ACT minus item LCT) divided by total assets. CLCA is current liability (item LCT) divided by current assets (item ACT). OENEG is 1 if total liabilities (item LT) exceeds total assets and zero otherwise. NITA is net income (item NI) divided by total assets. FUTL is the fund provided by operations (item PI plus item DP) divided by total liabilities. IN2 is equal to 1 if net income is negative for the last 2 years and zero otherwise. CHIN is $(\text{NI}_s - \text{NI}_{s-1})/(|\text{NI}_s| + |\text{NI}_{s-1}|)$, in which NI_s and NI_{s-1} are the net income for the current and prior years. We winsorize all non-dummy variables on the right-hand side of equation (A13) at the 1th and 99th percentiles of their distributions each year. At the end of June of each year t, we sort stocks into deciles based on O-score for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.25 $\text{O}^{\text{q}}1$, $\text{O}^{\text{q}}6$, and $\text{O}^{\text{q}}12$, Quarterly O-score

We use quarterly accounting data to construct the quarterly O-score as:

$$\begin{aligned} \text{O}^{\text{q}} \;\equiv\;& -1.32 - 0.407\log(\text{TA}^{\text{q}}) + 6.03\text{TLTA}^{\text{q}} - 1.43\text{WCTA}^{\text{q}} + 0.076\text{CLCA}^{\text{q}} \\ & - 1.72\text{OENEG}^{\text{q}} - 2.37\text{NITA}^{\text{q}} - 1.83\text{FUTL}^{\text{q}} + 0.285\text{IN2}^{\text{q}} - 0.521\text{CHIN}^{\text{q}}, \end{aligned} \tag{A14}$$

in which TA^{q} is total assets (Compustat quarterly item ATQ). TLTA^{q} is the leverage ratio defined as total debt (item DLCQ plus item DLTTQ) divided by total assets. WCTA^{q} is working capital (item ACTQ minus item LCT) divided by total assets. CLCA^{q} is current liability (item LCTQ) divided by current assets (item ACTQ). OENEG^{q} is 1 if total liabilities (item LTQ) exceeds total assets and zero otherwise. NITA^{q} is the sum of net income (item NIQ) for the trailing 4 quarters divided by total assets at the end of the current quarter. FUTL^{q} is the the sum of funds provided by operations (item PIQ plus item DPQ) for the trailing 4 quarters divided by total liabilities at the end of the current quarter. IN2^{q} is equal to 1 if net income is negative for the current quarter and 4 quarters ago, and zero otherwise. CHIN^{q} is $(\text{NIQ}_s - \text{NIQ}_{s-4})/(|\text{NIQ}_s| + |\text{NIQ}_{s-4}|)$, in which NIQ_s and NIQ_{s-4} are the net income for the current quarter and 4 quarters ago. We winsorize all non-dummy variables on the right-hand side of equation (A14) at the 1th and 99th percentiles of their distributions each month.

At the beginning of each month t, we sort stocks into deciles based on O^q calculated with accounting data from the fiscal quarter ending at least 4 months ago. We calculate decile returns for the current month t (O^q1), from month t to $t+5$ (O^q6), and from month t to $t+11$ (O^q12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, O^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the O^q6 decile. For sufficient data coverage, the O^q portfolios start in January 1976.

A.4.26 Z, Altman's Z-score

We follow Altman (1968) to construct the Z-score (Dichev 1998):

$$Z \equiv 1.2\text{WCTA} + 1.4\text{RETA} + 3.3\text{EBITTA} + 0.6\text{METL} + \text{SALETA}, \qquad \text{(A15)}$$

in which WCTA is working capital (Compustat annual item ACT minus item LCT) divided by total assets (item AT), RETA is retained earnings (item RE) divided by total assets, EBITTA is earnings before interest and taxes (item OIADP) divided by total assets, METL is the market equity (from CRSP, at fiscal year end) divided by total liabilities (item LT), and SALETA is sales (item SALE) divided by total assets. For firms with more than 1 share class, we merge the market equity for all share classes before computing Z. We winsorize all non-dummy variables on the right-hand side of equation (A15) at the 1th and 99th percentiles of their distributions each year. At the end of June of each year t, we split stocks into deciles based on Z-score for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.27 Z^q1, Z^q6, and Z^q12, Quarterly Z-score

We use quarterly accounting data to construct the quarterly Z-score as:

$$Z^q \equiv 1.2\text{WCTA}^q + 1.4\text{RETA}^q + 3.3\text{EBITTA}^q + 0.6\text{METL}^q + \text{SALETA}^q, \qquad \text{(A16)}$$

in which WCTA^q is working capital (Compustat quarterly item ACTQ minus item LCTQ) divided by total assets (item ATQ), RETA^q is retained earnings (item REQ) divided by total assets, EBITTA^q is the sum of earnings before interest and taxes (item OIADPQ) for the trailing 4 quarters divided by total assets at the end of the current quarter, METL^q is the market equity (from CRSP, at fiscal quarter end) divided by total liabilities (item LTQ), and SALETA^q is the sum of sales (item SALEQ) for the trailing 4 quarters divided by total assets at the end of the current quarter. For firms with more than 1 share class, we merge the market equity for all share classes before computing Z^q. We winsorize all non-dummy variables on the right-hand side of equation (A16) at the 1th and 99th percentiles of their distributions each month.

At the beginning of each month t, we split stocks into deciles based on Z^q calculated with accounting data from the fiscal quarter ending at least 4 months ago. We calculate decile returns for the current month t (Z^q1), from month t to $t+5$ (Z^q6), and from month t to $t+11$ (Z^q12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Z^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Z^q6 decile. For sufficient data coverage, the Z^q portfolios start in January 1976.

A.4.28 G, Growth Score

Following Mohanram (2005), we construct the G-score as the sum of eight binary signals: $G \equiv G_1 + \ldots + G_8$. G_1 equals 1 if a firm's return on assets (Roa) is greater than the median Roa in the same industry (2-digit SIC code), and zero otherwise. Roa is net income before extraordinary items (Compustat annual item IB) scaled by the average of total assets (item AT) from the current and prior years. We also calculate an alternative measure of Roa using cash flow from operations instead of net income. Cash flow from operation is net cash flow from operating activities (item OANCF) if available, or funds from operation (item FOPT) minus the annual change in working capital (item WCAP). G_2 equals 1 if a firm's cash flow Roa exceeds the industry median, and zero otherwise. G_3 equals 1 if a firm's cash flow from operations exceeds net income, and zero otherwise.

G_4 equals 1 if a firm's earnings variability is less than the industry median. Earnings variability is the variance of a firm's quarterly Roa during the past 16 quarters (6 quarters minimum). Quarterly Roa is quarterly net income before extraordinary items (Compustat quarterly item IBQ) scaled by 1-quarter-lagged total assets (item ATQ). G_5 equals 1 if a firm's sales growth variability is less the industry median, and zero otherwise. Sales growth variability is the variance of a firm's quarterly sales growth during the past 16 quarters (6 quarters minimum). Quarterly sales growth is the growth in quarterly sales (item SALEQ) from its value 4 quarters ago.

G_6 equals 1 if a firm's R&D (Compustat annual item XRD) deflated by 1-year-lagged total assets is greater than the industry median, and zero otherwise. G_7 equals 1 if a firm's capital expenditure (item CAPX) deflated by 1-year-lagged total assets is greater than the industry median, and zero otherwise. G_8 equals 1 if a firm's advertising expenses (item XAD) deflated by 1-year-lagged total assets is greater than the industry median, and zero otherwise.

At the end of June of each year t, we sort stocks on G for the fiscal year ending in calender year $t-1$ to form seven portfolios: low (F = 0,1), 2, 3, 4, 5, 6, and high (F = 7,8). Because extreme G scores are rare, we combine scores 0, and 1 into the low portfolio and scores 7 and 8 into the high portfolio. Monthly portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June of $t+1$. For sufficient data coverage, the G portfolio returns start in July 1976.

A.4.29 Cr1, Cr6, and Cr12, Credit Ratings

Following Avramov, Chordia, Jostova, and Philipov (2009), we measure credit ratings, Cr, by transforming S&P ratings into numerical scores as follows: AAA=1, AA+=2, AA=3, AA−=4, A+=5, A=6, A−=7, BBB+=8, BBB=9, BBB−=10, BB+=11, BB=12, BB−=13, B+=14, B=15, B−=16, CCC+=17, CCC=18, CCC−=19, CC=20, C=21, and D=22. At the beginning of each month t, we sort stocks into quintiles based on Cr at the end of $t-1$. We do not form deciles because a disproportional number of firms can have the same rating, which leads to fewer than ten portfolios. We calculate quintile returns for the current month t (Cr1), from month t to $t+5$ (Cr6), and from month t to $t+11$ (Cr12). The quintiles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Cr6, means that for a given quintile in each month there exist 6 subquintiles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subquintiles returns as the monthly return of the Cr6 quintile. For sufficient data coverage, the Cr portfolios start in January 1986.

A.4.30 Tbi, Taxable Income-to-book Income

Following Green, Hand, and Zhang (2013), we measure taxable income-to-book income, Tbi, as pretax income (Compustat annual item PI) divided by net income (item NI). At the end of June of each year t, we sort stocks into deciles based on Tbi for the fiscal year ending in calendar year $t-1$. We exclude firms with non-positive pretax income or net income. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.31 Tbi^{q}1, Tbi^{q}6, and Tbi^{q}12, Quarterly Taxable Income-to-book Income

Quarterly taxable income-to-book income, Tbi^q, is quarterly pretax income (Compustat quarterly item PIQ) divided by net income (NIQ). At the beginning of each month t, we split stocks into deciles based on Tbi^q calculated with accounting data from the fiscal quarter ending at least 4 months ago. We exclude firms with non-positive pretax income or net income. We calculate monthly decile returns for the current month t (Tbi^{q}1), from month t to $t+5$ (Tbi^{q}6), and from month t to $t+11$ (Tbi^{q}12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Tbi^{q}6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Tbi^{q}6 decile.

A.4.32 Bl, Book Leverage

Following Fama and French (1992), we measure book leverage, Bl, as total assets (Compustat annual item AT) divided by book equity. Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. At the end of June of each year t, we sort stocks into deciles based on Bl for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.4.33 Bl^{q}1, Bl^{q}6, and Bl^{q}12, Quarterly Book Leverage

Quarterly book leverage, Bl^q, is total assets (Compustat quarterly item ATQ) divided by book equity. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity. At the beginning of each month t, we split stocks into deciles on Bl^q for the fiscal quarter ending at least 4 months ago. We calculate monthly decile returns for the current month t (Bl^{q}1), from month t to $t+5$ (Bl^{q}6), and from month t to $t+11$ (Bl^{q}12). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Bl^{q}6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $\text{Bl}^{\text{q}}6$ decile. For sufficient data coverage, the Bl^{q} portfolios start in January 1972.

A.4.34 $\text{Sg}^{\text{q}}1$, $\text{Sg}^{\text{q}}6$, and $\text{Sg}^{\text{q}}12$, Quarterly Sales Growth

Quarterly sales growth, Sg^{q}, is quarterly sales (Compustat quarterly item SALEQ) divided by its value 4 quarters ago. At the beginning of each month t, we sort stocks into deciles based on the latest Sg^{q}. Before 1972, we use the most recent Sg^{q} from fiscal quarters ending at least 4 months ago. Starting from 1972, we use Sg^{q} from the most recent quarterly earnings announcement dates (item RDQ). Sales are generally announced with earnings during quarterly earnings announcements (Jegadeesh and Livnat 2006). We require a firm's fiscal quarter end that corresponds to its most recent Sg^{q} to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. We calculate monthly decile returns for the current month t ($\text{Sg}^{\text{q}}1$), from month t to $t+5$ ($\text{Sg}^{\text{q}}6$), and from month t to $t+11$ ($\text{Sg}^{\text{q}}12$). The deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, $\text{Sg}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $\text{Sg}^{\text{q}}6$ decile.

A.5 Intangibles

A.5.1 Oca and Ioca, (Industry-adjusted) Organizational Capital-to-assets

Following Eisfeldt and Papanikolaou (2013), we construct the stock of organization capital, Oc, using the perpetual inventory method:

$$\text{Oc}_{it} = (1-\delta)\text{Oc}_{it-1} + \text{SG\&A}_{it}/\text{CPI}_t, \quad \text{(A17)}$$

in which Oc_{it} is the organization capital of firm i at the end of year t, $\text{SG\&A}_{it}$ is selling, general, and administrative (SG&A) expenses (Compustat annual item XSGA) in t, CPI_t is the average consumer price index during year t, and δ is the annual depreciation rate of Oc. The initial stock of Oc is $\text{Oc}_{i0} = \text{SG\&A}_{i0}/(g+\delta)$, in which $\text{SG\&A}_{i0}$ is the first valid SG&A observation (zero or positive) for firm i and g is the long-term growth rate of SG&A. We assume a depreciation rate of 15% for Oc and a long-term growth rate of 10% for SG&A. Missing SG&A values after the starting date are treated as zero. For portfolio formation at the end of June of year t, we require SG&A to be non-missing for the fiscal year ending in calendar year $t-1$ because this SG&A value receives the highest weight in Oc. In addition, we exclude firms with zero Oc. Organizational Capital-to-assets, Oca, is Oc scaled by total assets (item AT). We industry-standardize Oca with the Fama-French (1997) 17-industry classification. To calculate the industry-adjusted Oca, Ioca, we demean a firm's Oca by its industry mean and then divide the demeaned Oca by the standard deviation of Oca within its industry. To alleviate the impact of outliers, we winsorize Oca at the 1 and 99 percentiles of all firms each year before the industry standardization. At the end of June of each year t, we sort stocks into deciles based on Oca, and separately, on Ioca, for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.2 Adm, Advertising Expense-to-market

At the end of June of each year t, we sort stocks into deciles based on advertising expenses-to-market, Adm, which is advertising expenses (Compustat annual item XAD) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Adm. We keep only firms with positive advertising expenses. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because sufficient XAD data start in 1972, the Adm portfolios start in July 1973.

A.5.3 gAd, Growth in Advertising Expense

At the end of June of each year t, we sort stocks into deciles based on growth in advertising expenses, gAd, which is the growth rate of advertising expenses (Compustat annual item XAD) from the fiscal year ending in calendar year $t-2$ to the fiscal year ending in calendar year $t-1$. Following Lou (2014), we keep only firms with advertising expenses of at least 0.1 million dollars. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because sufficient XAD data start in 1972, the gAd portfolios start in July 1974.

A.5.4 Rdm, R&D Expense-to-market

At the end of June of each year t, we sort stocks into deciles based on R&D-to-market, Rdm, which is R&D expenses (Compustat annual item XRD) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the end of December of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Rdm. We keep only firms with positive R&D expenses. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the accounting treatment of R&D expenses was standardized in 1975, the Rdm portfolios start in July 1976.

A.5.5 Rdm^{q}1, Rdm^{q}6, and Rdm^{q}12, Quarterly R&D Expense-to-market

At the beginning of each month t, we split stocks into deciles based on quarterly R&D-to-market, Rdm^q, which is quarterly R&D expense (Compustat quarterly item XRDQ) for the fiscal quarter ending at least 4 months ago scaled by the market equity (from CRSP) at the end of $t-1$. For firms with more than 1 share class, we merge the market equity for all share classes before computing Rdm^q. We keep only firms with positive R&D expenses. We calculate decile returns for the current month t (Rdm^{q}1), from month t to $t+5$ (Rdm^{q}6), and from month t to $t+11$ (Rdm^{q}12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Rdm^{q}6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Rdm^{q}6 decile. Because the quarterly R&D data start in late 1989, the Rdm^q portfolios start in January 1990.

A.5.6 Rds, R&D Expenses-to-sales

At the end of June of each year t, we sort stocks into deciles based on R&D-to-sales, Rds, which is R&D expenses (Compustat annual item XRD) divided by sales (item SALE) for the fiscal year ending in calendar year $t-1$. We keep only firms with positive R&D expenses. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the accounting treatment of R&D expenses was standardized in 1975, the Rds portfolios start in July 1976.

A.5.7 $\text{Rds}^{\text{q}}1$, $\text{Rds}^{\text{q}}6$, and $\text{Rds}^{\text{q}}12$, Quarterly R&D Expense-to-sales

At the beginning of each month t, we split stocks into deciles based on quarterly R&D-to-sales, Rds^{q}, which is quarterly R&D expense (Compustat quarterly item XRDQ) scaled by sales (item SALEQ) for the fiscal quarter ending at least 4 months ago. We keep only firms with positive R&D expenses. We calculate decile returns for the current month t ($\text{Rds}^{\text{q}}1$), from month t to $t+5$ ($\text{Rds}^{\text{q}}6$), and from month t to $t+11$ ($\text{Rds}^{\text{q}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Rds}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Rds}^{\text{q}}6$ decile. Because the quarterly R&D data start in late 1989, the Rds^{q} portfolios start in January 1990.

A.5.8 Ol, Operating Leverage

Operating leverage, Ol, is operating costs scaled by total assets (Compustat annual item AT, the denominator is current, not lagged, total assets). Operating costs are cost of goods sold (item COGS) plus selling, general, and administrative expenses (item XSGA). At the end of June of year t, we sort stocks into deciles based on Ol for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.9 $\text{Ol}^{\text{q}}1$, $\text{Ol}^{\text{q}}6$, and $\text{Ol}^{\text{q}}12$, Quarterly Operating Leverage

At the beginning of each month t, we split stocks into deciles based on quarterly operating leverage, Ol^{q}, which is quarterly operating costs divided by assets (Compustat quarterly item ATQ) for the fiscal quarter ending at least 4 months ago. Operating costs are the cost of goods sold (item COGSQ) plus selling, general, and administrative expenses (item XSGAQ). We calculate decile returns for the current month t ($\text{Ol}^{\text{q}}1$), from month t to $t+5$ ($\text{Ol}^{\text{q}}6$), and from month t to $t+11$ ($\text{Ol}^{\text{q}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Ol}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Ol}^{\text{q}}6$ decile. For sufficient data coverage, the Ol^{q} portfolios start in January 1973.

A.5.10 Hn, Hiring Rate

Following Belo, Lin, and Bazdresch (2014), at the end of June of year t, we measure the hiring rate (Hn) as $(N_{t-1}-N_{t-2})/(0.5N_{t-1}+0.5N_{t-2})$, in which N_{t-j} is the number of employees (Compustat annual item EMP) from the fiscal year ending in calendar year $t-j$. At the end of June of year t, we sort stocks into deciles based on Hn. We exclude firms with zero Hn (these observations are often due to stale information on firm employment). Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.11 Rca, R&D Capital-to-assets

Following Li (2011), we measure R&D capital, Rc, by accumulating annual R&D expenses over the past 5 years with a linear depreciation rate of 20%:

$$\text{Rc}_{it} = \text{XRD}_{it} + 0.8\,\text{XRD}_{it-1} + 0.6\,\text{XRD}_{it-2} + 0.4\,\text{XRD}_{it-3} + 0.2\,\text{XRD}_{it-4}, \tag{A18}$$

in which XRD_{it-j} is firm i's R&D expenses (Compustat annual item XRD) in year $t-j$. R&D capital-to-assets, Rca, is Rc scaled by total assets (item AT). At the end of June of each year t, we sort stocks into deciles based on Rca for the fiscal year ending in calendar year $t-1$. We keep only firms with positive Rc. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. For the portfolio formation at the end of June of year t, we require R&D expenses to be non-missing for the fiscal year ending in calendar year $t-1$, because this value of R&D expenses receives the highest weight in Rc. Because Rc requires past 5 years of R&D expenses data and the accounting treatment of R&D expenses was standardized in 1975, the Rca portfolios start in July 1980.

A.5.12 Bca, Brand Capital-to-assets

Following Belo, Lin, and Vitorino (2014), we construct brand capital, Bc, by accumulating advertising expenses with the perpetual inventory method:

$$\text{Bc}_{it} = (1-\delta)\text{Bc}_{it-1} + \text{XAD}_{it}. \tag{A19}$$

in which Bc_{it} is the brand capital for firm i at the end of year t, XAD_{it} is the advertising expenses (Compustat annual item XAD) in t, and δ is the annual depreciation rate of Bc. The initial stock of Bc is $\text{Bc}_{i0} = \text{XAD}_{i0}/(g+\delta)$, in which XAD_{i0} is first valid XAD (zero or positive) for firm i and g is the long-term growth rate of XAD. Following Belo et al., we assume a depreciation rate of 50% for Bc and a long-term growth rate of 10% for XAD. Missing values of XAD after the starting date are treated as zero. For the portfolio formation at the end of June of year t, we exclude firms with zero Bc and require XAD to be non-missing for the fiscal year ending in calendar year $t-1$. Brand capital-to-assets, Bca, is Bc scaled by total assets (item AT). At the end of June of each year t, we sort stocks into deciles based on Bca for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because sufficient XAD data start in 1972, the Bc portfolios start in July 1973.

A.5.13 Aop, Analysts Optimism

Following Frankel and Lee (1998), we measure analysts optimism, Aop, as (Vf−Vh)/|Vh|, in which Vf is the analysts forecast-based intrinsic value, and Vh is the historical Roe-based intrinsic value. See section A.2.27 for the construction of intrinsic values. At the end of June of each year t, we sort stocks into deciles based on Aop. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because analyst forecast data start in 1976, the Aop deciles start in July 1976.

A.5.14 Pafe, Predicted Analysts Forecast Error

Following Frankel and Lee (1998), we define analysts forecast errors for year t as the actual realized Roe in year $t+3$ minus the predicted Roe for $t+3$ based on analyst forecasts. See Section A.2.27 for the measurement of realized and predicted Roe. To calculate predicted analysts forecast errors, Pafe, for the portfolio formation at the end of June of year t, we estimate the intercept and slopes of the annual cross-sectional regressions of $\text{Roe}_{t-1} - E_{t-4}[\text{Roe}_{t-1}]$ on 4 firm characteristics for the fiscal year ending in calendar year $t-4$, including prior 5-year sales growth, book-to-market, long-term earnings growth forecast, and analysts optimism. Prior 5-year sale growth is the growth rate in sales (Compustat annual item SALE) from the fiscal year ending in calendar year $t-9$ to the fiscal year ending in $t-4$. Book-to-market is book equity (item CEQ) for the fiscal year ending in calendar year $t-4$ divided by the market equity (form CRSP) at the end of June in $t-3$. Long-term earnings growth forecast is from IBES (unadjusted file, item MEANEST; fiscal period indicator = 0), reported in June of $t-3$. See Section A.5.13 for the construction of analyst optimism. We winsorize the regressors at the 1st and 99th percentiles of their respective pooled distributions each year, and standardize all the regressors (by subtracting mean and dividing by standard deviation). Pafe for the portfolio formation year t is then obtained by applying the estimated intercept and slopes on the winsorized and standardized regressors for the fiscal year ending in calendar year $t-1$. At the end of June of each year t, we sort stocks into deciles based on Pafe. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the long-term earnings growth forecast data start in 1981, the Pafe portfolios start in July 1985.

A.5.15 Parc, Patent-to-R&D Capital

Following Hirshleifer, Hsu, and Li (2013), we measure patent-to-R&D capital, Parc, as the ratio of firm i's patents granted in year t, Patents_{it}, scaled by its R&D capital for the fiscal year ending in calendar year $t-2$, $\text{Patents}_{it}/(\text{XRD}_{it-2}+0.8\,\text{XRD}_{it-3}+0.6\,\text{XRD}_{it-4}+0.4\,\text{XRD}_{it-5}+0.2\,\text{XRD}_{it-6})$, in which XRD_{it-j} is R&D expenses (Compustat annual item XRD) for the fiscal year ending in calendar year $t-j$. We require non-missing R&D expenses for the fiscal year ending in $t-2$ but set missing values to zero for other years ($t-6$ to $t-3$). The patent data are from the NBER patent database and are available from 1976 to 2006. At the end of June of each year t, we use Parc for $t-1$ to form deciles. Stocks with zero Parc are grouped into 1 portfolio (1) and stocks with positive Parc are sorted into 9 portfolios (2 to 10). Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the accounting treatment of R&D expenses was standardized in 1975 and the NBER patent data stop in 2006, the Parc portfolios are available from July 1982 to June 2008.

A.5.16 Crd, Citations-to-R&D Expenses

Following Hirshleifer, Hsu, and Li (2013), we measure citations-to-R&D expenses, Crd, in year t as the adjusted number of citations occurring in year t to firm i's patents granted over the previous 5 years scaled by the sum of corresponding R&D expenses:

$$\text{Crd}_\text{t} = \frac{\sum_{s=1}^{5}\sum_{k=1}^{N_{t-s}} C_{ik}^{t-s}}{\sum_{s=1}^{5}\text{XRD}_{it-2-s}}, \qquad \text{(A20)}$$

in which C_{ik}^{t-s} is the number of citations received in year t by patent k, granted in year $t-s$ scaled by the average number of citations received in year t by all patents of the same subcategory granted in year $t-s$. N_{t-s} is the total number of patents granted in year $t-s$ to firm i. XRD_{it-2-s} is R&D expenses (Compustat annual item XRD) for the fiscal year ending in calendar year $t-2-s$. The patent citation data are from the NBER patent database. At the end of June of each year t, we use Crd for $t-1$ to form deciles. Stocks with zero Crd are grouped into 1 portfolio (1) and stocks with positive Crd are sorted into 9 portfolios (2 to 10). Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the NBER patent citation data are available from 1977 to 2006, the Crd portfolios are available from July 1983 to June 2008.

A.5.17 Hs, Ha, and He, Industry Concentration (Sales, Assets, Book Equity)

Following Hou and Robinson (2006), we measure a firm's industry concentration with the Herfindahl index, $\sum_{i=1}^{N_j} s_{ij}^2$, in which s_{ij} is the market share of firm i in industry j, and N_j is the total number of firms in the industry. We calculate the market share of a firm using sales (Compustat annual item SALE), total assets (item AT), or book equity. We measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. Industries are defined by 3-digit SIC codes. We exclude financial firms (SIC between 6000 and 6999) and firms in regulated industries. Following Barclay and Smith (1995), the regulated industries include: railroads (SIC=4011) through 1980, trucking (4210 and 4213) through 1980, airlines (4512) through 1978, telecommunication (4812 and 4813) through 1982, and gas and electric utilities (4900 to 4939). To improve the accuracy of the concentration measure, we exclude an industry if the market share data are available for fewer than 5 firms or 80% of all firms in the industry. We measure industry concentration as the average Herfindahl index during the past 3 years. Industry concentrations calculated with sales, assets, and book equity are denoted, Hs, Ha, and He, respectively. At the end of June of each year t, we sort stocks into deciles based on Hs, Ha, and He for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.18 Age1, Age6, and Age12, Firm Age

Following Jiang, Lee, and Zhang (2005), we measure firm age, Age, as the number of months between the portfolio formation date and the first month that a firm appears in Compustat or CRSP (item permco). At the beginning of each month t, we sort stocks into quintiles based on Age at the end of $t-1$. We do not form deciles because a disproportional number of firms can have the same Age (e.g., caused by the inception of NASDAQ coverage in 1973). Monthly quintile returns are calculated for the current month t (Age1), from month t to $t+5$ (Age6), and from month t to $t+11$ (Age12), and the quintiles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Age6, means that for a given quintile in each month there exist 6 subquintiles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subquintiles returns as the monthly return of the Age6 quintile.

A.5.19 D1, D2, and D3, Price Delay

At the end of June of each year, we regress each stock's weekly returns over the prior year on the contemporaneous and 4 weeks of lagged market returns:

$$r_{it} = \alpha_i + \beta_i R_{mt} + \sum_{n=1}^{4} \delta_i^{(-n)} R_{mt-n} + \epsilon_{it}, \tag{A21}$$

in which r_{it} is the return on stock j in week t, and R_{mt} is the return on the CRSP value-weighted market index. Weekly returns are measured from Wednesday market close to the next Wednesday market close. Following Hou and Moskowitz (2005), we calculate 3 price delay measures:

$$\text{D1}_i \equiv 1 - \frac{R^2_{\delta_i^{(-4)}=\delta_i^{(-3)}=\delta_i^{(-2)}=\delta_i^{(-1)}=0}}{R^2}, \tag{A22}$$

in which $R^2_{\delta_i^{(-4)}=\delta_i^{(-3)}=\delta_i^{(-2)}=\delta_i^{(-1)}=0}$ is the R^2 from regression equation (A21) with the restriction $\delta_i^{(-4)} = \delta_i^{(-3)} = \delta_i^{(-2)} = \delta_i^{(-1)} = 0$, and R^2 is without this restriction. In addition,

$$\text{D2}_i \equiv \frac{\sum_{n=1}^{4} n\delta_i^{(-n)}}{\beta_i + \sum_{n=1}^{4} \delta_i^{(-n)}} \tag{A23}$$

$$\text{D3}_i \equiv \frac{\sum_{n=1}^{4} \frac{n\delta_i^{(-n)}}{\text{se}\left(\delta_i^{(-n)}\right)}}{\frac{\beta_i}{\text{se}(\beta_i)} + \sum_{n=1}^{4} \frac{\delta_i^{(-n)}}{\text{se}\left(\delta_i^{(-n)}\right)}}, \tag{A24}$$

in which se$(\cdot)$ is the standard error of the point estimate in parentheses.

To improve precision of the price delay estimate, we sort firms into portfolios based on market equity and individual delay measure, compute the delay measure for the portfolio, and assign the portfolio delay measure to each firm in the portfolio. At the end of June of each year t, we sort stocks into size deciles based on the market equity (from CRSP) at the end of June in $t - j$ ($j = 1, 2, \ldots$). Within each size decile, we then sort stocks into deciles based on their first-stage individual delay measure, estimated using weekly return data from July of year $t - j - 1$ to June of year $t - j$. The equal-weighted weekly returns of the 100 size-delay portfolios are computed over the following year from July of year $t - j$ to June of $t - j + 1$. We then re-estimate the delay measure for each of the 100 portfolios using the entire past sample of weekly returns up to June of year t. The second-stage portfolio delay measure is then assigned to individual stocks within the 100 portfolios formed at end of June in year t. At the end of June of year t, we sort stocks into deciles based on D1, D2, and D3. Monthly decile returns are calculated from July of year t to June of $t + 1$, and the deciles are rebalanced in June of $t + 1$.

A.5.20 dSi, % Change in Sales Minus % Change in Inventory

Following Abarbanell and Bushee (1998), we define the %d$(\cdot)$ operator as the percentage change in the variable in the parentheses from its average over the prior 2 years, e.g., %d(Sales) = [Sales(t) − E[Sales(t)]]/E[Sales(t)], in which E[Sales(t)] = [Sales($t - 1$) + Sales($t - 2$)]/2. dSi is calculated as %d(Sales) − %d(Inventory), in which sales is net sales (Compustat annual item SALE), and inventory is finished goods inventories (item INVFG) if available, or total inventories (item INVT). Firms with non-positive average sales or inventory during the past 2 years are excluded. At the end of June of each year t, we sort stocks into deciles based on dSi for the fiscal year ending in calendar year $t - 1$. Monthly decile returns are calculated from July of year t to June of $t + 1$, and the deciles are rebalanced in June of $t + 1$.

A.5.21 dSa, % Change in Sales Minus % Change in Accounts Receivable

Following Abarbanell and Bushee (1998), we define the %d$(\cdot)$ operator as the percentage change in the variable in the parentheses from its average over the prior 2 years, e.g., %d(Sales) = [Sales(t) −

E[Sales(t)]]/E[Sales(t)], in which E[Sales(t)] = [Sales($t-1$) + Sales($t-2$)]/2. dSa is calculated as %d(Sales) − %d(Accounts receivable), in which sales is net sales (Compustat annual item SALE) and accounts receivable is total receivables (item RECT). Firms with non-positive average sales or receivables during the past 2 years are excluded. At the end of June of each year t, we sort stocks into deciles based on dSa for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.22 dGs, % Change in Gross Margin Minus % Change in Sales

Following Abarbanell and Bushee (1998), we define the %d(·) operator as the percentage change in the variable in the parentheses from its average over the prior 2 years, e.g., %d(Sales) = [Sales(t) − E[Sales(t)]]/E[Sales(t)], in which E[Sales(t)] = [Sales($t-1$) + Sales($t-2$)]/2. dGs is calculated as %d(Gross margin) − %d(Sales), in which sales is net sales (Compustat annual item SALE) and gross margin is sales minus cost of goods sold (item COGS). Firms with non-positive average gross margin or sales during the past 2 years are excluded. At the end of June of each year t, we sort stocks into deciles based on dGs for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.23 dSs, % Change in Sales Minus % Change in SG&A

Following Abarbanell and Bushee (1998), we define the %d(·) operator as the percentage change in the variable in the parentheses from its average over the prior 2 years, e.g., %d(Sales) = [Sales(t) − E[Sales(t)]]/E[Sales(t)], in which E[Sales(t)] = [Sales($t-1$) + Sales($t-2$)]/2. dSs is calculated as %d(Sales) − %d(SG&A), in which sales is net sales (Compustat annual item SALE) and SG&A is selling, general, and administrative expenses (item XSGA). Firms with non-positive average sales or SG&A during the past 2 years are excluded. At the end of June of each year t, we sort stocks into deciles based on dSs for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.24 Etr, Effective Tax Rate

Following Abarbanell and Bushee (1998), we measure effective tax rate, Etr, as:

$$\text{Etr}(t) = \left[\frac{\text{TaxExpense}(t)}{\text{EBT}(t)} - \frac{1}{3}\sum_{\tau=1}^{3}\frac{\text{TaxExpense}(t-\tau)}{\text{EBT}(t-\tau)}\right] \times \text{dEPS}(t), \tag{A25}$$

in which TaxExpense(t) is total income taxes (Compustat annual item TXT) paid in year t, EBT(t) is pretax income (item PI) plus amortization of intangibles (item AM), and dEPS is the change in split-adjusted earnings per share (item EPSPX divided by item AJEX) between years $t-1$ and t, deflated by stock price (item PRCC_F) at the end of $t-1$. At the end of June of each year t, we sort stocks into deciles based on Etr for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.25 Lfe, Labor Force Efficiency

Following Abarbanell and Bushee (1998), we measure labor force efficiency, Lfe, as:

$$\text{Lfe}(t) = \left[\frac{\text{Sales}(t)}{\text{Employees}(t)} - \frac{\text{Sales}(t-1)}{\text{Employees}(t-1)}\right] \Big/ \frac{\text{Sales}(t-1)}{\text{Employees}(t-1)}, \tag{A26}$$

in which Sales(t) is net sales (Compustat annual item SALE) in year t, and Employees(t) is the number of employees (item EMP). At the end of June of each year t, we sort stocks into deciles based on Lfe for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.26 Ana1, Ana6, and Ana12, Analysts Coverage

Following Elgers, Lo, and Pfeiffer (2001), we measure analysts coverage, Ana, as the number of analysts' earnings forecasts from IBES (item NUMEST) for the current fiscal year (fiscal period indicator = 1). We require earnings forecasts to be denominated in US dollars (currency code = USD). At the beginning of each month t, we sort stocks into quintiles on Ana from the IBES report in $t-1$. We do not form deciles because a disproportional number of firms can have the same Ana before 1980. Monthly quintile returns are calculated for the current month t (Ana1), from month t to $t+5$ (Ana6), and from month t to $t+11$ (Ana12). The quintiles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Ana6 means that for a given quintile in each month there exist 6 subquintiles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subquintile returns as the monthly return of the Ana6 quintile. Because the earnings forecast data start in January 1976, the Ana portfolios start in February 1976.

A.5.27 Tan, Tangibility

We measure tangibility, Tan, as cash holdings (Compustat annual item CHE) + 0.715 $\times$ accounts receivable (item RECT) + 0.547 $\times$ inventory (item INVT) + 0.535 $\times$ gross property, plant, and equipment (item PPEGT), all scaled by total assets (item AT). At the end of June of each year t, we sort stocks into deciles on Tan for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.28 Tan^q1, Tan^q6, and Tan^q12, Quarterly Tangibility

Tan^q is cash holdings (Compustat quarterly item CHEQ) + 0.715 $\times$ accounts receivable (item RECTQ) + 0.547 $\times$ inventory (item INVTQ) + 0.535 $\times$ gross property, plant, and equipment (item PPEGTQ), all scaled by total assets (item ATQ). At the beginning of each month t, we sort stocks into deciles based on Tan^q for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for the current month t (Tan^q1), from month t to $t+5$ (Tan^q6), and from month t to $t+11$ (Tan^q12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Tan^q6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Tan^q6 decile. For sufficient data coverage, the Tan^q portfolios start in January 1972.

A.5.29 Rer, Industry-adjusted Real Estate Ratio

Following Tuzel (2010), we measure the real estate ratio as the sum of buildings (Compustat annual item PPENB) and capital leases (item PPENLS) divided by net property, plant, and equipment (item PPENT) prior to 1983. From 1984 onward, the real estate ratio is the sum of buildings at cost (item FATB) and leases at cost (item FATL) divided by gross property, plant, and equipment (item PPEGT). Industry-adjusted real estate ratio, Rer, is the real estate ratio minus its industry average. Industries are defined by 2-digit SIC codes. To alleviate the impact of outliers, we winsorize the real estate ratio at the 1st and 99th percentiles of its distribution each year before computing Rer. Following Tuzel (2010), we exclude industries with fewer than 5 firms. At the end of June of each year t, we sort stocks into deciles based on Rer for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the real estate data start in 1969, the Rer portfolios start in July 1970.

A.5.30 Kz, Financial Constraints (the Kaplan-Zingales Index)

Following Lamont, Polk, and Saa-Requejo (2001), we construct the Kaplan-Zingales index, Kz_{it}, as:

$$-1.002\times\frac{\text{CF}_{it}}{\text{K}_{it-1}}+0.283\times\text{Q}_{it}+3.139\times\frac{\text{Debt}_{it}}{\text{Total Capital}_{it}}-39.368\times\frac{\text{Dividends}_{it}}{\text{K}_{it-1}}-1.315\times\frac{\text{Cash}_{it}}{\text{K}_{it-1}}, \quad \text{(A27)}$$

in which CF_{it} is firm i's cash flows in year t, measured as income before extraordinary items (Compustat annual item IB) plus depreciation and amortization (item DP). K_{it-1} is net property, plant, and equipment (item PPENT) at the end of year $t-1$. Q_{it} is Tobin's Q, measured as total assets (item AT) plus the December-end market equity (from CRSP), minus book equity (item CEQ), and minus deferred taxes (item TXDB), scaled by total assets. Debt_{it} is the sum of short-term debt (item DLC) and long-term debt (item DLTT). $\text{Total Capital}_{it}$ is the sum of total debt and stockholders' equity (item SEQ). Dividends_{it} is total dividends (item DVC plus item DVP). Cash_{it} is cash holdings (item CHE). At the end of June of each year t, we sort stocks into deciles based on Kz for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.31 $\text{Kz}^{\text{q}}1$, $\text{Kz}^{\text{q}}6$, and $\text{Kz}^{\text{q}}12$, Quarterly Kaplan-Zingales Index

We construct the quarterly Kaplan-Zingales index, Kz^{q}, as:

$$\text{Kz}^{\text{q}}_{it} \equiv -1.002\frac{\text{CF}^{\text{q}}_{it}}{\text{K}^{\text{q}}_{it-1}}+0.283\text{Q}^{\text{q}}_{it}+3.139\frac{\text{Debt}^{\text{q}}_{it}}{\text{Total Capital}^{\text{q}}_{it}}-39.368\frac{\text{Dividends}^{\text{q}}_{it}}{\text{K}^{\text{q}}_{it-1}}-1.315\frac{\text{Cash}^{\text{q}}_{it}}{\text{K}^{\text{q}}_{it-1}}, \quad \text{(A28)}$$

in which $\text{CF}^{\text{q}}_{it}$ is firm i's trailing 4-quarter total cash flows from quarter $t-3$ to t. Quarterly cash flows are measured as income before extraordinary items (Compustat quarterly item IBQ) plus depreciation and amortization (item DPQ). $\text{K}^{\text{q}}_{it-1}$ is net property, plant, and equipment (item PPENTQ) at the end of quarter $t-1$. Q^{q}_{it} is Tobin's Q, measured as total assets (item ATQ) plus the fiscal-quarter-end market equity (from CRSP), minus book equity (item CEQQ), and minus deferred taxes (item TXDBQ, zero if missing), scaled by total assets. $\text{Debt}^{\text{q}}_{it}$ is the sum of short-term debt (item DLCQ) and long-term debt (item DLTTQ). $\text{TotalCapital}^{\text{q}}_{it}$ is the sum of total debt and stockholders' equity (item SEQQ). $\text{Dividends}^{\text{q}}_{it}$ is the total dividends (item DVPSXQ times item CSHOQ), accumulated over the past 4 quarters from $t-3$ to t.

At the beginning of each month t, we sort stocks into deciles based on Kz^{q} for the fiscal quarter ending at least 4 months ago. Monthly decile returns are computed for the current month t ($\text{Kz}^{\text{q}}1$), from month t to $t+5$ ($\text{Kz}^{\text{q}}6$), and from month t to $t+11$ ($\text{Kz}^{\text{q}}12$). The deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Kz}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Kz}^{\text{q}}6$ decile. For sufficient data coverage, the Kz^{q} portfolios start in January 1977.

A.5.32 Ww, Financial Constraints (the Whited-Wu Index)

Following Whited and Wu (2006, Equation 13), we construct the Whited-Wu index, Ww_{it}, as:

$$-0.091\text{CF}_{it} - 0.062\text{DIVPOS}_{it} + 0.021\text{TLTD}_{it} - 0.044\text{LNTA}_{it} + 0.102\text{ISG}_{it} - 0.035\text{SG}_{it}, \quad \text{(A29)}$$

in which CF_{it} is the ratio of firm i's cash flows in year t scaled by total assets (Compustat annual item AT) at the end of t. Cash flows are measured as income before extraordinary items (item IB) plus depreciation and amortization (item DP). DIVPOS_{it} is an indicator that takes the value of 1 if the firm pays cash dividends (item DVPSX), and zero otherwise. TLTD_{it} is the ratio of the long-term debt (item DLTT) to total assets. LNTA_{it} is the natural log of total assets. ISG_{it} is the firm's industry sales growth, computed as the sum of current sales (item SALE) across all firms in the industry divided by the sum of 1-year-lagged sales minus 1. Industries are defined by 3-digit SIC codes. We exclude industries with fewer than 2 firms. SG_{it} is the firm's annual growth in sales. Because the coefficients in equation (A29) were estimated with quarterly accounting data in Whited and Wu (2006), we convert annual cash flow and sales growth rates into quarterly terms. Specifically, we divide CF_{it} by 4 and use the compounded quarterly growth for sales ($(1+\text{ISG}_{it})^{1/4}-1$ and $(1+\text{SG}_{it})^{1/4}-1$). At the end of June of each year t, we split stocks into deciles based on Ww for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.33 $\text{Ww}^{\text{q}}1$, $\text{Ww}^{\text{q}}6$, and $\text{Ww}^{\text{q}}12$, the Quarterly Whited-Wu Index

We construct the quarterly Whited-Wu index, $\text{Ww}^{\text{q}}_{it}$, as:

$$-0.091\text{CF}^{\text{q}}_{it} - 0.062\text{DIVPOS}^{\text{q}}_{it} + 0.021\text{TLTD}^{\text{q}}_{it} - 0.044\text{LNTA}^{\text{q}}_{it} + 0.102\text{ISG}^{\text{q}}_{it} - 0.035\text{SG}^{\text{q}}_{it}, \quad \text{(A30)}$$

in which $\text{CF}^{\text{q}}_{it}$ is the ratio of firm i's cash flows in quarter t scaled by total assets (Compustat quarterly item ATQ) at the end of t. Cash flows are measured as income before extraordinary items (item IBQ) plus depreciation and amortization (item DPQ). $\text{DIVPOS}^{\text{q}}_{it}$ is an indicator that takes the value of 1 if the firm pays cash dividends (item DVPSXQ), and zero otherwise. $\text{TLTD}^{\text{q}}_{it}$ is the ratio of the long-term debt (item DLTTQ) to total assets. $\text{LNTA}^{\text{q}}_{it}$ is the natural log of total assets. $\text{ISG}^{\text{q}}_{it}$ is the firm's industry sales growth, computed as the sum of current sales (item SALEQ) across all firms in the industry divided by the sum of 1-quarter-lagged sales minus 1. Industries are defined by 3-digit SIC codes and we exclude industries with fewer than 2 firms. $\text{SG}^{\text{q}}_{it}$ is the firm's quarterly growth in sales. At the beginning of each month t, we sort stocks into deciles based on Ww^{q} for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for the current month t ($\text{Ww}^{\text{q}}1$), from month t to $t+5$ ($\text{Ww}^{\text{q}}6$), and from month t to $t+11$ ($\text{Ww}^{\text{q}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, $\text{Ww}^{\text{q}}6$, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Ww}^{\text{q}}6$ decile. For sufficient data coverage, the Ww^{q} portfolios start in January 1972.

A.5.34 Sdd, Secured Debt-to-total Debt

Following Valta (2014), we measure secured debt-to-total debt, Sdd, as mortgages and other secured debt (Compustat annual item DM) divided by total debt. Total debt is debt in current liabilities (item DLC) plus long-term debt (item DLTT). At the end of June of each year t, we sort stocks into deciles based on Sdd for the fiscal year ending in calendar year $t-1$. Firms with no secured debt are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the data on secured debt start in 1981, the Sdd portfolios start in July 1982.

A.5.35 Cdd, Convertible Debt-to-total Debt

Following Valta (2014), we measure convertible debt-to-total debt, Cdd, as convertible debt (Compustat annual item DCVT) divided by total debt. Total debt is debt in current liabilities (item DLC) plus long-term debt (item DLTT). At the end of June of each year t, we sort stocks into deciles based on Cdd for the fiscal year ending in calendar year $t-1$. Firms with no convertible debt are excluded. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because a disproportionately large number of stocks can have Cdd equal to 1, we use only Cdd smaller than 1 to form portfolio breakpoints. Because the data on convertible debt start in 1969, the Sdd portfolios start in July 1970.

A.5.36 Vcf1, Vcf6, and Vcf12, Cash Flow Volatility

Cash flow volatility, Vcf, is the standard deviation of the ratio of operating cash flows to sales (Compustat quarterly item SALEQ) during the past 16 quarters (8 non-missing quarters minimum). Operating cash flows are income before extraordinary items (item IBQ) plus depreciation and amortization (item DPQ), and plus the change in working capital (item WCAPQ) from the last quarter. At the beginning of each month t, we sort stocks into deciles based on Vcf for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for the current month t (Vcf1), from month t to $t+5$ (Vcf6), and from month t to $t+11$ (Vcf12). The deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Vcf6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Vcf6 decile. For sufficient data coverage, the Vcf portfolios start in January 1978.

A.5.37 Cta1, Cta6, and Cta12, Cash-to-assets

Following Palazzo (2012), we measure cash-to-assets, Cta, as cash holdings (Compustat quarterly item CHEQ) scaled by total assets (item ATQ). At the beginning of each month t, we sort stocks into deciles based on Cta from the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for the current month t (Cta1), from month t to $t+5$ (Cta6), and from month t to $t+11$ (Cta12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Cta6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Cta6 decile. For sufficient data coverage, the Cta portfolios start in January 1972.

A.5.38 Gind, Corporate Governance

The data for the firm-level corporate governance index (Gind, from September 1990 to December 2006) are from Andrew Metrick's Web site. Following Gompers et al. (Table VI), we use the following breakpoints to form the Gind portfolios: Gind $\leq 5, 6, 7, 8, 9, 10, 11, 12, 13$, and ≥ 14. Firms with dual share classes are excluded. We rebalance the portfolios in the months immediately following each publication of Gind, and calculate monthly portfolio returns between 2 adjacent publication dates. The first months following the publication dates are September 1990, July 1993, July 1995, February 1998, November 1999, January 2002, January 2004, and January 2006.

A.5.39 Acq, Acq1, Acq6, Acq12, Accrual Quality

Following Francis, Lafond, Olsson, and Schipper (2005), we estimate accrual quality (Acq) with the following cross-sectional regression:

$$\text{TCA}_{it} = \phi_{0,i} + \phi_{1,i}\text{CFO}_{it-1} + \phi_{2,i}\text{CFO}_{it} + \phi_{3,i}\text{CFO}_{it+1} + \phi_{4,i}\text{dREV}_{it} + \phi_{5,i}\text{PPE}_{it} + v_{it}, \quad \text{(A31)}$$

in which TCA_{it} is firm i's total current accruals in year t, CFO_{it} is cash flow from operations, dREV_{it} is change in revenues (Compustat annual item SALE) from $t-1$ to t, and PPE_{it} is gross property, plant, and equipment (item PPEGT). $\text{TCA}_{it} = \text{dCA}_{it} - \text{dCL}_{it} - \text{dCASH}_{it} + \text{dSTDEBT}_{it}$, in which dCA_{it} is the change in current assets (item ACT) from year $t-1$ to t, dCL_{it} is the change in current liabilities (item LCT), dCASH_{it} is the change in cash (item CHE), and dSTDEBT_{it} is the change in debt in current liabilities (item DLC). $\text{CFO}_{it} = \text{NIBE}_{it} - (\text{dCA}_{it} - \text{dCL}_{it} - \text{dCASH}_{it} + \text{dSTDEBT}_{it} - \text{DEPN}_{it})$, in which NIBE_{it} is income before extraordinary items (item IB), and DEPN_{it} is depreciation and amortization expense (item DP). All variables are scaled by the average of total assets in t and $t-1$. We estimate annual cross-sectional regressions in equation (A31) for each of Fama-French (1997) 48 industries (excluding 4 financial industries) with at least 20 firms in year t. We winsorize both dependent and independent variables at the 1st and 99th percentiles of their distributions each year. The annual cross-sectional regressions yield firm- and year-specific residuals, v_{it}. We measure accrual quality of firm i, $\text{Acq}_i = \sigma(v_i)$, as the standard deviation of firm i's residuals during the past 5 years from $t-4$ to t. For a firm to be included in our portfolio, its residual has to be available for all 5 years.

At the end of June of each year t, we sort stocks into deciles based on Acq for the fiscal year ending in calendar year $t-2$. To avoid look-ahead bias, we do not sort on Acq for the fiscal year ending in $t-1$, because the regression in equation (A31) requires the next year's CFO. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. In addition, at the beginning of each month t, we sort stocks into deciles based on Acq calculated with data up to the fiscal year ending at least 4 months ago. Monthly decile returns are calculated for the current month t (Acq1), from month t to $t+5$ (Acq6), and from month t to $t+11$ (Acq12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Acq6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Acq6 decile.

A.5.40 Ob, Order backlog

At the end of June of each year t, we sort stocks into deciles based on order backlog, Ob (Compustat annual item OB) for the fiscal year ending in calendar year $t-1$, scaled by the average of total assets (item AT) from the fiscal years ending in $t-2$ and $t-1$. Firms with no order backlog are excluded (most of them never have any order backlog). Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the order backlog data start in 1970, the Ob portfolios start in July 1971.

A.5.41 Eper and Eprd, Earnings Persistence, Earnings Predictability

Following Francis, Lafond, Olsson, and Schipper (2004), we estimate earnings persistence, Eper, and earnings predictability, Eprd, from a first-order autoregressive model for annual split-adjusted earnings per share (Compustat annual item EPSPX divided by item AJEX). At the end of June of each year t, we estimate the autoregressive model in the ten-year rolling window up to the fiscal year ending in calendar year $t-1$. Only firms with a complete 10-year history are included. Eper is measured as the slope coefficient and Eprd is measured as the residual volatility. We sort stocks into deciles based on Eper, and separately, on Eper. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.42 Esm, Earnings Smoothness

Following Francis, Lafond, Olsson, and Schipper (2004), we measure earnings smoothness, Esm, as the ratio of the standard deviation of earnings (Compustat annual item IB) scaled by 1-year-lagged total assets (item AT) to the standard deviation of cash flow from operations scaled by 1-year-lagged total assets. Cash flow from operations is income before extraordinary items minus operating accruals. We measure operating accruals as the 1-year change in current assets (item ACT) minus the change in current liabilities (item LCT), minus the change in cash (item CHE), plus the change in debt in current liabilities (item DLC), and minus depreciation and amortization (item DP). At the end of June of each year t, we sort stocks into deciles based on Esm, calculated over the 10-year rolling window up to the fiscal year ending in calendar year $t-1$. Only firms with a complete ten-year history are included. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.43 Evr, Value Relevance of Earnings

Following Francis, Lafond, Olsson, and Schipper (2004), we measure value relevance of earnings, Evr, as the R^2 from the following rolling-window regression:

$$R_{it} = \delta_{i0} + \delta_{i1}\,\mathrm{EARN}_{it} + \delta_{i2}\,\mathrm{dEARN}_{it} + \epsilon_{it}, \tag{A32}$$

in which R_{it} is firm i's 15-month stock return ending 3 months after the end of fiscal year ending in calendar year t. EARN_{it} is earnings (Compustat annual item IB) for the fiscal year ending in t, scaled by the fiscal year-end market equity (from CRSP). dEARN_{it} is the 1-year change in earnings scaled by the market equity. For firms with more than 1 share class, we merge the market equity for all share classes. At the end of June of each year t, we split stocks into deciles on Evr, calculated over the ten-year rolling window up to the fiscal year ending in calendar year $t-1$. Only firms with a complete ten-year history are included. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.44 Etl and Ecs, Earnings Timeliness, Earnings Conservatism

Following Francis, Lafond, Olsson, and Schipper (2004), we measure earnings timeliness, Etl, and earnings conservatism, Ecs, from the following rolling-window regression:

$$\mathrm{EARN}_{it} = \alpha_{i0} + \alpha_{i1}\,\mathrm{NEG}_{it} + \beta_{i1} R_{it} + \beta_{i2}\mathrm{NEG}_{it} R_{it} + e_{it}, \tag{A33}$$

in which EARN_{it} is earnings (Compustat annual item IB) for the fiscal year ending in calendar year t, scaled by the fiscal year-end market equity. R_{it} is firm i's 15-month stock return ending 3 months after the end of fiscal year ending in calendar year t. NEG_{it} equals 1 if $R_{it} < 0$, and zero otherwise. For firms with more than 1 share class, we merge the market equity for all share classes. We measure Etl as the R^2 and Ecs as $(\beta_{i1} + \beta_{i2})/\beta_{i1}$ from the regression in (A33). At the end of June of each year t, we sort stocks into deciles based on Etl, and separately, on Ecs, both of which are calculated over the 10-year rolling window up to the fiscal year ending in calendar year $t-1$. Only firms with a complete 10-year history are included. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.45 Frm and Fra, Pension Plan Funding Rate

Following Franzoni and Martin (2006), we define market pension plan funding rates as (PA − PO)/Me (denoted Frm) and (PA − PO)/AT (denoted Fra), in which PA is the fair value of pension plan assets, PO is the projected benefit obligation, Me is the market equity, and AT is total assets (Compustat annual item AT). Between 1980 and 1997, PA is measured as the sum of overfunded pension plan assets (item PPLAO) and underfunded pension plan assets (item PPLAU), and PO is the sum of overfunded pension obligation (item PBPRO) and underfunded pension obligation (item PBPRU). When the above data are not available, we also measure PA as pension benefits (item PBNAA) and PO as the present value of vested benefits (item PBNVV) from 1980 to 1986. Starting from 1998, firms are not required to report separate items for overfunded and underfunded plans, and Compustat collapses PA and PO into corresponding items reserved previously for overfunded plans (item PPLAO and item PBPRO). Me is from CRSP measured at the end of December. For firms with more than 1 share class, we merge the market equity for all share classes.

At the end of June of each year t, we split stocks into deciles on Frm, and separately, on Fra, both of which are for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. Because the pension data start in 1980, the Frm and Fra portfolios start in July 1981.

A.5.46 Ala and Alm, Asset Liquidity

We measure asset liquidity as cash + 0.75 × noncash current assets + 0.50 × tangible fixed assets, cash as cash and short-term investments (Compustat annual item CHE), noncash current assets as current assets (item ACT) minus cash, and tangible fixed assets as total assets (item AT) minus current assets (item ACT), minus goodwill (item GDWL, zero if missing), and minus intangibles (item INTAN, zero if missing). Ala is asset liquidity scaled by 1-year-lagged total assets. Alm is asset liquidity scaled by 1-year-lagged market value of assets. The market value of assets is total assets plus market equity (item PRCC_F times item CSHO) minus book equity (item CEQ). At the end of June of each year t, we sort stocks into deciles based on Ala, and separately, on Alm, both of which are for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

A.5.47 Ala^{q}1, Ala^{q}6, Ala^{q}12, Alm^{q}1, Alm^{q}6, and Alm^{q}12, Quarterly Asset Liquidity

We measure quarterly asset liquidity as cash + 0.75 × noncash current assets + 0.50 × tangible fixed assets, cash as cash and short-term investments (Compustat quarterly item CHEQ), noncash current assets as current assets (item ACTQ) minus cash, and tangible fixed assets as total assets (item ATQ) minus current assets (item ACTQ), minus goodwill (item GDWLQ, zero if missing), and minus intangibles (item INTANQ, zero if missing). Ala^q is quarterly asset liquidity scaled by 1-quarter-lagged total assets. Alm^q is quarterly asset liquidity scaled by 1-quarter-lagged market value of assets. The market value of assets is total assets plus market equity (item PRCCQ times item CSHOQ) minus book equity (item CEQQ).

At the beginning of each month t, we sort stocks into deciles based on Ala^q, and separately, on Alm^q for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for the current month t (Ala^q1 and Alm^q1), from month t to $t+5$ (Ala^q6 and Alm^q6), and from month t to $t+11$ (Ala^q12 and Alm^q12). The deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Ala^q6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ala^q6 decile. For sufficient data coverage, the quarterly asset liquidity portfolios start in January 1976.

A.5.48 Dls1, Dls6, and Dls12, Disparity between Long- and Short-term Earnings Growth Forecasts

Following Da and Warachka (2011), we measure the implied short-term earnings growth forecast as $100 \times (A1_t - A0_t)/|A0_t|$, in which $A1_t$ is analysts' consensus median forecast (IBES unadjusted file, item MEDEST) for the current fiscal year (fiscal period indicator = 1), and $A0_t$ is the actual earnings per share for the latest reported fiscal year (item FY0A, measure indictor ='EPS'). We require both earnings forecasts and actual earnings to be denominated in US dollars (currency code = USD). The disparity between long- and short-term earnings growth forecasts, Dls, is analysts' consensus median forecast of the long-term earnings growth (item MEDEST, fiscal period indictor = 0) minus the implied short-term earnings growth forecast. At the beginning of each month t, we sort stocks into deciles based on Dls computed with analyst forecasts reported in $t-1$. Monthly decile returns are calculated for the current month t (Dls1), from month t to $t+5$ (Dls6), and from month t to $t+11$ (Dls12), and the deciles are rebalanced at the beginning of $t+1$. The holding period longer than 1 month as in, for instance, Dls6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Dls6 decile. Because the long-term growth forecast data start in December 1981, the deciles start in January 1982.

A.5.49 Dis1, Dis6, and Dis12, Dispersion in Analyst Forecasts

We measure dispersion in analyst earnings forecasts, Dis, as the ratio of the standard deviation of earnings forecasts (IBES unadjusted file, item STDEV) to the absolute value of the consensus mean forecast (unadjusted file, item MEANEST). We use the earnings forecasts for the current fiscal year (fiscal period indicator = 1) and we require them to be denominated in US dollars (currency code = USD). Stocks with a mean forecast of zero are assigned to the highest dispersion group. Firms with fewer than 2 forecasts are excluded. At the beginning of each month t, we sort stocks into deciles based on Dis computed with analyst forecasts reported in month $t-1$. Monthly decile returns are calculated for the current month t (Dis1), from month t to $t+5$ (Dis6), and from month t to $t+11$ (Dis12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Dis6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Dis6 decile. Because the analyst forecasts data start in January 1976, the Dis portfolios start in February 1976.

A.5.50 Dlg1, Dlg6, and Dlg12, Dispersion in Analyst Long-term Growth Forecasts

Following Anderson, Ghysels, and Juergens (2005), we measure dispersion in analyst long-term growth forecasts, Dlg, as the standard deviation of the long-term earnings growth rate forecasts from IBES (item STDEV, fiscal period indicator = 0). Firms with fewer than 2 forecasts are excluded. At the beginning of each month t, we sort stocks into deciles based on Dlg reported in month $t-1$. Monthly decile returns are calculated for the current month t (Dlg1), from month t to $t+5$ (Dlg6), and from month t to $t+11$ (Dlg12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Dlg6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Dlg6 decile. Because the long-term growth forecast data start in December 1981, the Dlg portfolios start in January 1982.

A.5.51 R^1_{a}, R^1_{n}, $R^{[2,5]}_{\mathrm{a}}$, $R^{[2,5]}_{\mathrm{n}}$, $R^{[6,10]}_{\mathrm{a}}$, $R^{[6,10]}_{\mathrm{n}}$, $R^{[11,15]}_{\mathrm{a}}$, $R^{[11,15]}_{\mathrm{n}}$, $R^{[16,20]}_{\mathrm{a}}$, and $R^{[16,20]}_{\mathrm{n}}$, Seasonality

Following Heston and Sadka (2008), at the beginning of each month t, we sort stocks into deciles based on various measures of past performance, including returns in month $t-12$ (R^1_{a}), average returns from month $t-11$ to $t-1$ (R^1_{n}), average returns across months $t-24, t-36, t-48$, and $t-60$ ($R^{[2,5]}_{\mathrm{a}}$), average returns from month $t-60$ to $t-13$ except for lags 24, 36, 48, and 60 ($R^{[2,5]}_{\mathrm{n}}$), average returns across months $t-72, t-84, t-96, t-108$, and $t-120$ ($R^{[6,10]}_{\mathrm{a}}$), average returns from month $t-120$ to $t-61$ except for lags 72, 84, 96, 108, and 120 ($R^{[6,10]}_{\mathrm{n}}$), average returns across months $t-132, t-144, t-156, t-168$, and $t-180$ ($R^{[11,15]}_{\mathrm{a}}$), average returns from month $t-180$ to $t-121$ except for lags 132, 144, 156, 168, and 180 ($R^{[11,15]}_{\mathrm{n}}$), average returns across months $t-192, t-204, t-216, t-228$, and $t-240$ ($R^{[16,20]}_{\mathrm{a}}$), average returns from month $t-240$ to $t-181$ except for lags 192, 204, 216, 228, and 240 ($R^{[16,20]}_{\mathrm{n}}$). Monthly decile returns are calculated for the current month t, and the deciles are rebalanced at the beginning of month $t+1$.

A.6 Trading frictions

A.6.1 Me, Market Equity

Market equity, Me, is price times shares outstanding from CRSP. At the end of June of each year t, we sort stocks into deciles based on the June-end Me. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. In the Fama-MacBeth cross-sectional regressions, we use the logarithm of Me as the regressor.

A.6.2 Iv, Idiosyncratic Volatility

At the end of June of each year t, we sort stocks into deciles based on idiosyncratic volatility, Iv, which is the residual volatility from regressing a stock's daily excess returns on the market excess return over the prior 1 year from July of year $t-1$ to June of t. We require a minimum of 100 daily returns when estimating Iv. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June of year $t+1$.

A.6.3 Ivff1, Ivff6, and Ivff12, Idiosyncratic Volatility per the FF 3-factor Model

We calculate idiosyncratic volatility relative to the Fama-French 3-factor model, Ivff, as the residual volatility from regressing a stock's excess returns on the Fama-French 3 factors. At the beginning of each month t, we sort stocks into deciles based on the Ivff estimated with daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Ivff1), from month t to $t+5$ (Ivff6), and from month t to $t+11$ (Ivff12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Ivff6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Ivff6 decile.

A.6.4 Ivc1, Ivc6, and Ivc12, Idiosyncratic Volatility per the CAPM

We calculate idiosyncratic volatility per the CAPM, Ivc, as the residual volatility from regressing a stock's excess returns on the value-weighted market excess return. At the beginning of each month t, we sort stocks into deciles based on the Ivc estimated with daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Ivc1), from month t to $t+5$ (Ivc6), and from month t to $t+11$ (Ivc12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Ivc6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Ivc6 decile.

A.6.5 Ivq1, Ivq6, and Ivq12, Idiosyncratic Volatility per the q-factor Model

We calculate idiosyncratic volatility per the Hou-Xue-Zhang (2015) q-factor model, Ivq, as the residual volatility from regressing a stock's excess returns on the q-factors. At the beginning of each month t, we sort stocks into deciles based on the Ivq estimated with daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Ivq1), from month t to $t+5$ (Ivq6), and from month t to $t+11$ (Ivq12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Ivq6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Ivq6 decile. Because the q-factors start in January 1967, the Ivq portfolios start in February 1967.

A.6.6 Tv1, Tv6, and Tv12, Total Volatility

At the beginning of each month t, we sort stocks into deciles based on total volatility, Tv, estimated as the volatility of a stock's daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t, (Tv1), from month t to $t+5$ (Tv6), and from month t to $t+11$ (Tv12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in, for instance, Tv6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdeciles returns as the monthly return of the Tv6 decile.

A.6.7 Sv1, Sv6, and Sv12, Systematic Volatility Risk

We measure systematic volatility risk, Sv, as β^i_{dVXO} from the bivariate regression:

$$r^i_d = \beta^i_0 + \beta^i_{\mathrm{MKT}}\mathrm{MKT}_d + \beta^i_{\mathrm{dVXO}}\mathrm{dVXO}_d + \epsilon^i_d, \tag{A34}$$

in which r^i_d is stock i's excess return on day d, MKT_d is the market factor return, and dVXO_d is the aggregate volatility shock measured as the daily change in the Chicago Board Options Exchange S&P 100 volatility index (VXO). At the beginning of each month t, we sort stocks into deciles based on β^i_{dVXO} estimated with the daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Sv1), from month t to $t+5$ (Sv6), and from month t to $t+11$ (Sv12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period that is longer than 1 month as in Sv6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the Sv6 decile. Because the VXO data start in January 1986, the Sv portfolios start in February 1986.

A.6.8 β1, β6, and β12, Market Beta

At the beginning of each month t, we sort stocks into deciles on their market beta, β, which is estimated with monthly returns from month $t-60$ to $t-1$. We require a minimum of 24 monthly returns. Monthly decile returns are calculated for the current month t (β1), from month t to $t+5$ (β6), and from month t to $t+11$ (β12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in β6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the β6 decile.

A.6.9 β^{FP}1, β^{FP}6, and β^{FP}12, The Frazzini-Pedersen Beta

We estimate the market beta for stock i, β^{FP}, as $\hat{\rho}\hat{\sigma}_i/\hat{\sigma}_m$, in which $\hat{\sigma}_i$ and $\hat{\sigma}_m$ are the estimated return volatilities for the stock and the market, and $\hat{\rho}$ is their return correlation. To estimate return volatilities, we compute the standard deviations of daily log returns over a 1-year rolling window (with at least 120 daily returns). To estimate return correlations, we use overlapping 3-day log returns, $r^{3d}_{it} = \sum_{k=0}^{2}\log(1+r^i_{t+k})$, over a 5-year rolling window (with at least 750 daily returns). At the beginning of each month t, we sort stocks into deciles based on β^{FP} estimated at the end of month $t-1$. Monthly decile returns are calculated for the current month t (β^{FP}1), from month t to $t+5$ (β^{FP}6), and from month t to $t+11$ (β^{FP}12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in β^{FP}6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the β^{FP}6 decile.

A.6.10 β^{D}1, β^{D}6, and β^{D}12, The Dimson Beta

We use the current as well as the lead and lag of the market return when estimating the market beta:

$$r_{id} - r_{fd} = \alpha_i + \beta_{i1}(r_{md-1} - r_{fd-1}) + \beta_{i2}(r_{md} - r_{fd}) + \beta_{i3}(r_{md+1} - r_{fd+1}) + \epsilon_{id}, \tag{A35}$$

in which r_{id} is stock i's return on day d, r_{md} is the market return, and r_{fd} is the risk-free rate. The Dimson beta of stock i, β^{D}, is calculated as $\hat{\beta}_{i1} + \hat{\beta}_{i2} + \hat{\beta}_{i3}$. At the beginning of each month t, we sort stocks into deciles based on β^{D} estimated with the daily returns from month $t-1$ (the lead market return is within month $t-1$ to avoid look-ahead bias). We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t ($\beta^{\mathrm{D}}1$), from month t to $t+5$ ($\beta^{\mathrm{D}}6$), and from month t to $t+11$ ($\beta^{\mathrm{D}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in $\beta^{\mathrm{D}}6$ means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6-month period. We take the simple average of the subdecile returns as the monthly return of the $\beta^{\mathrm{D}}6$ decile.

A.6.11 Tur1, Tur6, and Tur12, Share Turnover

A stock's share turnover, Tur, is its average daily share turnover over the prior 6 months. We require a minimum of 50 daily observations. Daily turnover is the number of shares traded on a given day divided by the number of shares outstanding on that day.[15] At the beginning of each month t, we sort stocks into deciles based on Tur over the prior 6 months from $t-6$ to $t-1$. Monthly decile returns are calculated for the current month t (Tur1), from month t to $t+5$ (Tur6), and from month t to $t+11$ (Tur12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Tur6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Tur6 decile.

A.6.12 Cvt1, Cvt6, and Cvt12, Coefficient of Variation of Share Turnover

We calculate a stock's coefficient of variation (the ratio of the standard deviation to the mean) for its daily share turnover, Cvt, over the prior 6 months. We require a minimum of 50 daily observations. Daily turnover is the number of shares traded on a given day divided by the number of shares outstanding on that day. We adjust the trading volume of NASDAQ stocks per Gao and Ritter (2010) (see footnote 15). At the beginning of each month t, we sort stocks into deciles based on Cvt over the prior 6 months from $t-6$ to $t-1$. Monthly decile returns are calculated for the current month t (Cvt1), from month t to $t+5$ (Cvt6), and from month t to $t+11$ (Cvt12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Cvt6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Cvt6 decile.

A.6.13 Dtv1, Dtv6, and Dtv12, Dollar Trading Volume

At the beginning of each month t, we sort stocks into deciles based on their average daily dollar trading volume, Dtv, over the prior 6 months from $t-6$ to $t-1$. We require a minimum of 50 daily observations. Dollar trading volume is share price times the number of shares traded. We adjust

[15] We adjust the NASDAQ trading volume to account for the institutional differences between NASDAQ and NYSE-Amex volumes (Gao and Ritter 2010). Prior to February 1, 2001, we divide NASDAQ volume by 2. This procedure adjusts for the practice of counting as trades both trades with market makers and trades among market makers. On February 1, 2001, according to the director of research of NASDAQ and Frank Hathaway (the chief economist of NASDAQ), a "riskless principal" rule goes into effect and results in a reduction of approximately 10% in reported volume. From February 1, 2001 to December 31, 2001, we thus divide NASDAQ volume by 1.8. During 2002, securities firms began to charge institutional investors commissions on NASDAQ trades, rather than the prior practice of marking up or down the net price. This practice results in a further reduction in reported volume of approximately 10%. For 2002 and 2003, we divide NASDAQ volume by 1.6. For 2004 and later years, in which the volume of NASDAQ (and NYSE) stocks has mostly been occurring on crossing ne2rks and other venues, we use a divisor of 1.0.

the trading volume of NASDAQ stocks per Gao and Ritter (2010) (see footnote 15). Monthly decile returns are calculated for the current month t (Dtv1), from month t to $t+5$ (Dtv6), and from month t to $t+11$ (Dtv12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Dtv6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Dtv6 decile.

A.6.14 Cvd1, Cvd6, and Cvd12, Coefficient of Variation of Dollar Trading Volume

We calculate a stock's coefficient of variation (the ratio of the standard deviation to the mean) for its daily dollar trading volume, Cvd, over the prior 6 months. We require a minimum of 50 daily observations. Dollar trading volume is share price times the number of shares. We adjust the trading volume of NASDAQ stocks per Gao and Ritter (2010) (see footnote 15). At the beginning of each month t, we sort stocks into deciles based on Cvd over the prior 6 months from $t-6$ to $t-1$. Monthly decile returns are calculated for the current month t (Cvd1), from month t to $t+5$ (Cvd6), and from month t to $t+11$ (Cvd12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Cvd6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Cvd6 decile.

A.6.15 Pps1, Pps6, and Pps12, Share Price

At the beginning of each month t, we sort stocks into deciles based on share price, Pps, at the end of month $t-1$. Monthly decile returns are calculated for the current month t (Pps1), from month t to $t+5$ (Pps6), and from month t to $t+11$ (Pps12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Pps6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Pps6 decile.

A.6.16 Ami1, Ami6, and Ami12, Absolute Return-to-volume

We calculate the Amihud (2002) illiquidity measure, Ami, as the ratio of absolute daily stock return to daily dollar trading volume, averaged over the prior 6 months. We require a minimum of 50 daily observations. Dollar trading volume is share price times the number of shares traded. We adjust the trading volume of NASDAQ stocks per Gao and Ritter (2010) (see footnote 15). At the beginning of each month t, we sort stocks into deciles based on Ami over the prior 6 months from $t-6$ to $t-1$. Monthly decile returns are calculated for the current month t (Ami1), from month t to $t+5$ (Ami6), and from month t to $t+11$ (Ami12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Ami6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Ami6 decile.

A.6.17 $\text{Lm}^1 1$, $\text{Lm}^1 6$, $\text{Lm}^1 12$, $\text{Lm}^6 1$, $\text{Lm}^6 6$, $\text{Lm}^6 12$, $\text{Lm}^{12} 1$, $\text{Lm}^{12} 6$, $\text{Lm}^{12} 12$, Turnover-adjusted Number of Zero Daily Volume

Following Liu (2006), we calculate the standardized turnover-adjusted number of zero daily trading volume over the prior x month, Lm^x, as follows:

$$\text{Lm}^x \equiv \left[\text{Number of zero daily volume in prior } x \text{ months} + \frac{1/(x\text{−month TO})}{\text{Deflator}}\right] \frac{21x}{\text{NoTD}}, \quad \text{(A36)}$$

in which x-month TO is the sum of daily turnover over the prior x months ($x = 1, 6$, and 12). Daily turnover is the number of shares traded on a given day divided by the number of shares outstanding on that day. We adjust the trading volume of NASDAQ stocks per Gao and Ritter (2010) (see footnote 15). NoTD is the total number of trading days over the prior x months. We set the deflator to $\max\{1/(x\text{−month TO})\} + 1$, in which the maximization is taken across all sample stocks each month. Our choice of the deflator ensures that $(1/(x\text{−month TO}))/\text{Deflator}$ is between zero and 1 for all stocks. We require a minimum of 15 daily turnover observations when estimating Lm^1, 50 for Lm^6, and 100 for Lm^{12}.

At the beginning of each month t, we sort stocks into deciles based on Lm^x, with $x = 1, 6$, and 12. We calculate decile returns for the current month t ($\text{Lm}^x 1$), from month t to $t+5$ ($\text{Lm}^x 6$), and from month t to $t+11$ ($\text{Lm}^x 12$). The deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in $\text{Lm}^x 6$ means that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\text{Lm}^x 6$ decile.

A.6.18 Mdr1, Mdr6, and Mdr12, Maximum Daily Return

At the beginning of each month t, we sort stocks into deciles based on maximal daily return, Mdr, in month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Mdr1), from month t to $t+5$ (Mdr6), and from month t to $t+11$ (Mdr12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in, for instance, Mdr6, means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdeciles returns as the monthly return of the Mdr6 decile.

A.6.19 Ts1, Ts6, and Ts12, Total Skewness

At the beginning of each month t, we sort stocks into deciles based on total skewness, Ts, calculated with daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Ts1), from month t to $t+5$ (Ts6), and from month t to $t+11$ (Ts12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Ts6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Ts6 decile.

A.6.20 Isc1, Isc6, and Isc12, Idiosyncratic Skewness per the CAPM

At the beginning of each month t, we sort stocks into deciles based on idiosyncratic skewness, Isc, calculated as the skewness of the residuals from regressing a stock's excess return on the market excess return using daily observations from month $t-1$. We require a minimum of 15 daily returns.

Monthly decile returns are calculated for the current month t (Isc1), from month t to $t+5$ (Isc6), and from month t to $t+11$ (Isc12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Isc6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Isc6 decile.

A.6.21 Isff1, Isff6, and Isff12, Idiosyncratic Skewness per the Fama-French 3-factor Model

At the beginning of each month t, we sort stocks into deciles based on idiosyncratic skewness, Isff, calculated as the skewness of the residuals from regressing a stock's excess return on the Fama-French 3 factors using daily observations from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Isff1), from month t to $t+5$ (Isff6), and from month t to $t+11$ (Isff12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Isff6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Isff6 decile.

A.6.22 Isq1, Isq6, and Isq12, Idiosyncratic Skewness per the q-factor Model

At the beginning of each month t, we sort stocks into deciles based on idiosyncratic skewness, Isq, calculated as the skewness of the residuals from regressing a stock's excess return on the q-factors using daily observations from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Isq1), from month t to $t+5$ (Isq6), and from month t to $t+11$ (Isq12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Isq6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Isq6 decile. Because the q-factors start in January 1967, the Ivq portfolios start in February 1967.

A.6.23 Cs1, Cs6, and Cs12, Coskewness

Following Harvey and Siddique (2000), we measure coskewness, Cs, as:

$$\text{Cs} = \frac{E[\epsilon_i \epsilon_m^2]}{\sqrt{E[\epsilon_i^2]}E[\epsilon_m^2]}, \tag{A37}$$

in which ϵ_i is the residual from regressing stock i's excess return on the market excess return, and ϵ_m is the demeaned market excess return. At the beginning of each month t, we sort stocks into deciles based on Cs calculated with daily returns from month $t-1$. We require a minimum of 15 daily returns. Monthly decile returns are calculated for the current month t (Cs1), from month t to $t+5$ (Cs6), and from month t to $t+11$ (Cs12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Cs6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Cs6 decile.

A.6.24 Srev, Short-term Reversal

At the beginning of each month t, we sort stocks into short-term reversal (Srev) deciles based on the return in month $t-1$. To be included in a decile in month t, a stock must have a valid price at the end of month $t-2$ and a valid return for month $t-1$. Monthly decile returns are calculated for the current month t, and the deciles are rebalanced at the beginning of month $t+1$.

A.6.25 $\beta^{-}1$, $\beta^{-}6$, and $\beta^{-}12$, Downside Beta

Following Ang, Chen, and Xing (2006), we define downside beta, β^{-}, as:

$$\beta^{-} = \frac{\text{Cov}(r_i, r_m | r_m < \mu_m)}{\text{Var}(r_m | r_m < \mu_m)}, \tag{A38}$$

in which r_i is stock i's excess return r_m is the market excess return, and μ_m is the average market excess return. At the beginning of each month t, we sort stocks into deciles based on β^{-}, which is estimated with daily returns from prior 12 months from $t-12$ to $t-1$ (we only use daily observations with $r_m < \mu_m$). We require a minimum of 50 daily returns. Monthly decile returns are calculated for the current month t ($\beta^{-}1$), from month t to $t+5$ ($\beta^{-}6$), and from month t to $t+11$ ($\beta^{-}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in $\beta^{-}6$ means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\beta^{-}6$ decile.

A.6.26 Tail1, Tail6, and Tail12, Tail Risk

Following Kelly and Jiang (2014), we estimate common tail risk, λ_t, by pooling daily returns for all stocks in month t, as follows:

$$\lambda_t = \frac{1}{K_t} \sum_{k=1}^{K_t} \log \frac{R_{kt}}{\mu_t}, \tag{A39}$$

in which μ_t is the fifth percentile of all daily returns in month t, R_{kt} is the kth daily return that is below μ_t, and K_t is the total number of daily returns that are below μ_t. At the beginning of each month t, we split stocks on tail risk, Tail, estimated as the slope from regressing a stock's excess returns on 1-month-lagged common tail risk over the most recent 120 months from $t-120$ to $t-1$. We require a minimum of least 36 monthly observations. Monthly decile returns are calculated for the current month t (Tail1), from month t to $t+5$ (Tail6), and from month t to $t+11$ (Tail12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Tail6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Tail6 decile.

A.6.27 $\beta^{\text{ret}}1$, $\beta^{\text{ret}}6$, $\beta^{\text{ret}}12$, $\beta^{\text{lcc}}1$, $\beta^{\text{lcc}}6$, $\beta^{\text{lcc}}12$, $\beta^{\text{lrc}}1$, $\beta^{\text{lrc}}6$, $\beta^{\text{lrc}}12$, $\beta^{\text{lcr}}1$, $\beta^{\text{lcr}}6$, $\beta^{\text{lcr}}12$, $\beta^{\text{net}}1$, $\beta^{\text{net}}6$, and $\beta^{\text{net}}12$, Liquidity Betas (Return-return, Illiquidity-illiquidity, Return-illiquidity, Illiquidity-return, and Net)

Following Acharya and Pedersen (2005), we measure illiquidity using the Amihud (2002) measure, Ami. For stock i in month t, Ami_t^i is the average ratio of absolute daily return to daily dollar trading volume. We require a minimum of 15 daily observations. Dollar trading volume is share price times the number of shares traded. We adjust the trading volume of NASDAQ stocks per Gao and Ritter (2010) (see footnote 15). The Market illiquidity, Ami_t^M, is the value-weighted average of $\min(\text{Ami}_t^i, (30-0.25)/(0.30P_{t-1}^M))$, in which P_{t-1}^M is the ratio of the total market capitalization of S&P 500 at the end of month $t-1$ to its value at the end of July 1962. We measure market illiquidity innovations, ϵ_{Mt}^c, as the residual from the regression below:

$$(0.25+0.30\text{Ami}_t^M P_{t-1}^M) = a_0 + a_1(0.25+0.30\text{Ami}_{t-1}^M P_{t-1}^M) + a_2(0.25+0.30\text{Ami}_{t-2}^M P_{t-1}^M) + \epsilon_{Mt}^c \quad \text{(A40)}$$

Innovations to individual stocks' illiquidity, ϵ_{it}^c, are measured analogously by replacing Ami^M with $\min(\text{Ami}_t^i, (30-0.25)/(0.30P_{t-1}^M))$ in equation (A40). Finally, innovations to the market return are measured as the residual, ϵ_{Mt}^r, from the second-order autoregression of the market return. Following Acharya and Pedersen, we define 5 measures of liquidity betas:

$$\text{Return}-\text{return}: \quad \beta_i^{\text{ret}} \equiv \frac{\text{Cov}(r_{it}, \epsilon_{Mt}^r)}{\text{var}(\epsilon_{Mt}^r - \epsilon_{Mt}^c)} \quad \text{(A41)}$$

$$\text{Illiquidity}-\text{illiquidity}: \quad \beta_i^{\text{lcc}} \equiv \frac{\text{Cov}(\epsilon_{it}^c, \epsilon_{Mt}^c)}{\text{var}(\epsilon_{Mt}^r - \epsilon_{Mt}^c)} \quad \text{(A42)}$$

$$\text{Return}-\text{illiquidity}: \quad \beta_i^{\text{lrc}} \equiv \frac{\text{Cov}(r_{it}, \epsilon_{Mt}^c)}{\text{var}(\epsilon_{Mt}^r - \epsilon_{Mt}^c)} \quad \text{(A43)}$$

$$\text{Illiquidity}-\text{return}: \quad \beta_i^{\text{lcr}} \equiv \frac{\text{Cov}(\epsilon_{it}^c, \epsilon_{Mt}^r)}{\text{var}(\epsilon_{Mt}^r - \epsilon_{Mt}^c)} \quad \text{(A44)}$$

$$\text{Net}: \quad \beta_i^{\text{net}} \equiv \beta_i^{\text{ret}} + \beta_i^{\text{lcc}} - \beta_i^{\text{lrc}} - \beta_i^{\text{lcr}} \quad \text{(A45)}$$

At the beginning of each month t, we sort stocks, separately, on β^{ret}, β^{lcc}, β^{lrc}, β^{lcr}, and β^{net}, estimated with the past 60 months (at least 24 months) from $t-60$ to $t-1$. Monthly decile returns are calculated for the current month t ($\beta^{\text{ret}}1$, $\beta^{\text{lcc}}1$, $\beta^{\text{lrc}}1$, $\beta^{\text{lcr}}1$, and $\beta^{\text{net}}1$), from month t to $t+5$ ($\beta^{\text{ret}}6$, $\beta^{\text{lcc}}6$, $\beta^{\text{lrc}}6$, $\beta^{\text{lcr}}6$, and $\beta^{\text{net}}6$), and from month t to $t+11$ ($\beta^{\text{ret}}12$, $\beta^{\text{lcc}}12$, $\beta^{\text{lrc}}12$, $\beta^{\text{lcr}}12$, and $\beta^{\text{net}}12$), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in $\beta^{\text{lcc}}6$ means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the $\beta^{\text{lcc}}6$ decile.

A.6.28 Shl1, Shl6, and Shl12, The high-low Bid-ask Spread

The monthly Corwin and Shultz (2012) stock-level high-low bid-ask spread, Shl, are generated using codes from Shane Corwin's Web site. At the beginning of each month t, we sort stocks into deciles based on Shl for month $t-1$. Monthly decile returns are calculated for the current month t (Shl1), from month t to $t+5$ (Shl6), and from month t to $t+11$ (Shl12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Shl6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Shl6 decile.

A.6.29 Sba1, Sba6, and Sba12, The Bid-ask Spread

The monthly Hou and Loh (2015) stock-level bid-ask spread, Sba, are provided by Roger Loh for the sample period from 1984 to 2014 (excluding 1986 due to missing data). At the beginning of each month t, we sort stocks into deciles based on Sba for month $t-1$. Monthly decile returns are calculated for the current month t (Sba1), from month t to $t+5$ (Sba6), and from month t to $t+11$ (Sba12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in Sba6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the Sba6 decile. The sample period for the Sba portfolios is from February 1984 to January 2015 (excluding February 1986 to January 1987).

A.6.30 β^{lev}1, β^{lev}6, and β^{lev}12, The Financial Intermediary Leverage Beta

At the beginning of each quarter, we estimate a stock's financial intermediary leverage beta, β^{Lev}, from regressing its quarterly returns in excess of the 3-month Treasury bill rate on the quarterly non-traded leverage factor during the past 40 quarters (20 quarters minimum). We construct the leverage of financial intermediary using quarterly aggregate data on total financial assets and liabilities of security broker-dealers from Table L.130 of the Federal Reserve Flow of Funds. To be consistent with the original data, we combine the repurchase agreement (repo) liabilities and the reverse repo assets into net repo liabilities. The financial intermediary leverage is measured as total financial assets/(total financial assets − total financial liabilities). The non-traded leverage factor is the seasonally adjusted log change in the level of leverage. The log changes are seasonally adjusted using quarterly seasonal dummies in expanding window regressions. Following Adrian, Etula, and Muir (2014), we start using the security broker-dealer data in the first quarter of 1968. The 3-month Treasury bill rate data are from the Federal Reserve Bank database.

At the beginning of each month t, we sort stocks into deciles based on β^{lev} estimated at the beginning of the current quarter. Monthly decile returns are calculated for the current month t (β^{lev}1), from month t to $t+5$ (β^{lev}6), and from month t to $t+11$ (β^{lev}12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in β^{lev}6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the β^{lev}6 decile. Because the financial intermediary leverage data start in 1968 and we need at least 20 quarters to estimate β^{lev}, the sample starts in January 1973.

A.6.31 β^{PS}1, β^{PS}6, and β^{PS}12, The Pastor-Stambaugh Beta

We estimate the liquidity risk beta, β^{PS}, as the sensitivity to innovations in aggregated liquidity:

$$r_{it} - r_{ft} = \beta_i^0 + \beta_i^{\text{PS}}\text{L}_t + \beta_i^{\text{M}}\text{MKT}_t + \beta_i^{\text{S}}\text{SMB}_t + \beta_i^{\text{H}}\text{HML}_t + \epsilon_{it}, \tag{A46}$$

in which r_{it} is stock i's return in month t, r_{ft} is the risk-free rate, L_t is the innovation in aggregated liquidity, and MKT_t, SMB_t, and HML_t are the Fama-French 3 factors. Data for innovations in aggregated liquidity are from Robert Stambaugh's Web site.

At the beginning of each month t, we sort stocks into deciles on their β^{PS}, which is estimated with monthly returns from month $t-60$ to $t-1$. We require a minimum of 24 monthly returns. Monthly decile returns are calculated for the current month t (β^{PS}1), from month t to $t+5$ (β^{PS}6), and from month t to $t+11$ (β^{PS}12), and the deciles are rebalanced at the beginning of month $t+1$. The holding period longer than 1 month as in β^{PS}6 means that for a given decile in each month there exist 6 subdeciles, each of which is initiated in a different month in the prior 6 months. We take the simple average of the subdecile returns as the monthly return of the β^{PS}6 decile.

A.6.32 Pin, Probability of Information-based Trading

At the beginning of each January in year t, we sort stocks into deciles based on the probability of information-based trading, Pin, available from Soeren Hvidkjaer's Web site for the period from 1983 to 2001. Monthly decile returns are calculated from January to December of year t, and the deciles are rebalanced at the beginning of year $t+1$. The sample period for the Pin portfolios is from January 1984 to December 2002.

B Delisting Adjustment

Following Beaver, McNichols, and Price (2007), we adjust monthly stock returns for delisting returns by compounding returns in the month before delisting with delisting returns from CRSP.

As discussed in Beaver, McNichols, and Price (2007), the monthly CRSP delisting returns (file `msedelist`) might not adjust for delisting properly. We follow their procedure to directly construct the delisting-adjusted monthly stock returns. For delisting that occurs before the last trading day in month t, we calculate the delisting-adjusted monthly return, DR_t, as:

$$\mathrm{DR}_t = (1 + \mathrm{pmr}_{dt})(1 + \mathrm{der}_{dt}) - 1, \tag{B1}$$

in which pmr_{dt} is the partial month return from the beginning of the month to the delisting day d, and der_{dt} is the delisting event return from the daily CRSP delisting file (`dsedelist`).

We calculate the partial month return, pmr_{dt}, as follows:

- When the delisting date (item DLSTDT) is the same as the delisting payment date (item DLPDT), the monthly CRSP delisting return, mdr_t, includes only the partial month return:

$$\mathrm{pmr}_{dt} = \mathrm{mdr}_t. \tag{B2}$$

- When the delisting date proceeds the delisting payment date, pmr_{dt} can be computed from the monthly CRSP delisting return and the delisting event return:

$$\mathrm{pmr}_{dt} = \frac{1 + \mathrm{mdr}_t}{1 + \mathrm{der}_{dt}} - 1. \tag{B3}$$

- If pmr_{dt} cannot be computed via the above methods, we construct it by accumulating daily returns from the beginning of month t to the delisting day d:

$$\mathrm{pmr}_{dt} = \prod_{i=1}^{d} (1 + \mathrm{ret}_{it}) - 1, \tag{B4}$$

  in which ret_{it} is the regular stock return on day i.

For delisting that occurs on the last trading day of month t, we include only the regular monthly return for month t, and account for the delisting return at the beginning of the following month: $\mathrm{DR}_t = \mathrm{ret}_t$ and $\mathrm{DR}_{t+1} = \mathrm{der}_{dt}$, in which ret_t is the regular full month return. Differing from Beaver, McNichols, and Price (2007), we do not account for these last-day delistings in the same month, because delisting generally occurs after the market closes. Also, delisting events are often surprises, and their payoffs cannot be determined immediately (Shumway 1997). As such, it might be problematic to incorporate delisting returns immediately on the last trading date in month t.

When delisting event returns are missing, the delisting-adjusted monthly returns cannot be computed. Among nonfinancial firms traded on NYSE, Amex, and Nasdaq, there are 16,326 delistings from 1925 to 2014, with 85.8% of the delisting event returns available. 1 option is to exclude missing delisting returns. However, previous studies show that omitting these stocks can introduce significant biases in asset pricing tests (Shumway 1997, Shumway and Warther 1999). As such, we replace missing delisting event returns using the average available delisting returns with the same stock exchange and delisting type (1-digit delisting code) during the past 60 months. We condition on stock exchange and delisting type because average delisting returns vary significantly across exchanges and delisting types. We also allow replacement values to vary over time because average delisting returns can vary greatly over time. Our procedure is inspired by prior studies. Shumway (1997) proposes a constant replacement value of -30% for all performance-related delistings on NYSE/Amex. Beaver, McNichols, and Price (2007) construct replacement values conditional on stock exchange and delisting type, but do not allow the replacement values to vary over time.