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Dissecting the Asset Growth Anomaly

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Abstract

Studies have shown that firm asset growth predicts cross-sectional stock returns. Firms that shrink their assets earn superior returns while firms that substantially expand their assets incur poor returns in the following years. I show that the negative asset growth often implies poor operating performance and a high probability subsequently to be delisted from the exchanges and that the high asset growth is primarily fuelled by large external financing. The seemingly superior returns of the negative asset growth portfolios are due to the omission of delisting returns. The poor returns of the high asset growth portfolios coincide with the widely-documented return underperformance of firms that have resorted to debt or equity offerings. Controlling for the delisting bias and the underperformance following large external financing, I do not find an independent effect of asset growth on stock returns.

JEL Classifications: G11, G12
Keywords: Cross-Sectional Stock Returns; Asset Growth; Delisting Bias; External Financing

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1. Introduction

Cooper, Gulen, and Schill (2008) present a significant asset growth effect in U.S. stock returns. In the period of 1968-2003, firms in the lowest asset growth decile on average earn risk-adjusted returns of 9.1% in the subsequent year, while firms in the highest asset growth decile earn -10.4%, resulting in an annual return spread of 19.5%. The spread in value-weighted returns reduces to 8.4% per year but remains statistically significant. The return spreads are significant across different size groups and persist into several years after forming the portfolios. This cross-sectional stock return pattern, frequently referred to as "the asset growth anomaly", quickly becomes influential.[1] It is often investigated in recent studies, for example, Fama and French (2008), Li and Zhang (2010), and among others, as a new anomaly, parallel with other well-known cross-sectional anomalies such as momentum, net stock issues, and accrual anomalies.

The median firm in the lowest asset growth decile shrinks its total assets by more than 20% within a year. What has happened and will happen to these firms decreasing their assets at such a fast and furious speed? I show that many of these firms have performed poorly and are dying out in the near future. If the stock of an asset-shrinking firm gets delisted in the following year, I find that over 90% of the time its return in the delisting month is ***not*** reported in CRSP's regular monthly stock return file. Since performance-related delisting returns tend to be very negative (for instance, the mean delisting return in my sample is -38.3%), omitting them in the computation of portfolio returns introduces a significant survivorship bias into the tests. This might result in the seemingly high returns of the negative asset growth portfolios.

[1] Strictly speaking, stock return anomalies refer to excess returns that cannot be explained by the stock's associated risk. Relating risk to return requires the use of an accurate asset pricing model, which researchers are still exploring. More broadly, an anomaly is a stylized pattern in stock returns that cannot be explained by existing asset pricing models such as CAPM or the Fama-French three-factor model. The use of the word "anomaly" in this paper is in reference to this broader definition.

The median firm in the top asset growth decile increases its assets by 125% within a year. What drives the explosive increase in these firms' assets? The 125% increase in assets is unlikely a result of firm organic growth. I show that these firms fast expand their assets by issuing large amounts of debt and equity, or externally financed acquisitions. Large external financing ***mechanically*** increases the issuer's assets. Vast evidence suggests that firms incur abnormally low returns following large equity and debt financing.[2] It is therefore interesting to know to what extent the asset growth anomaly is related to the widely documented external financing anomaly.

In this paper, I show that the asset growth anomaly is almost completely driven by the delisting bias and the external financing anomaly. In particular, the superior returns of the negative asset growth portfolios are due to the omission of delisting returns in the CRSP monthly stock return data. The return outperformance disappears once the delisting returns are included in computing the portfolio returns. The poor returns of the high asset growth portfolios coincide with the return underperformance of firms that have issued a large amount of debt and/or equity. Controlling for these two factors, I do not find an independent effect of asset growth on stock returns.

Shumway (1997) is the first to document the delisting bias in CRSP data. He finds severe omissions of delisting returns in CRSP data, especially for firms delisted for performance reasons. If this fact is ignored, portfolio returns constructed from CRSP data are upward biased. I examine 20,857 non-financial stocks that have appeared in the CRSP monthly stock return file (CRSP.msf)

[2] See, e.g., Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Ritter (2003), Daniel and Titman (2006), and Pontiff and Woodgate (2008) for evidence of underperformance following equity issuances; Spiess and Affleck-Graves (1999), Lee and Loughran (1998), Dichev and Piotroski (1999), Billett, Flannery, and Garfinkel (2006) for evidence of underperformance following various types of debt issuances; Collins and Kim (2013) for evidence of underperformance following acquisition-driven asset growth; Ikenberry, Lakonishok, and Vermaelen (1995), Peyer and Vermaelen (2009) for evidence of outperformance following stock repurchases. Combining them, Bradshaw, Richardson, and Sloan (2006) develop a comprehensive measure of net external financing and confirm a strong negative relation between net external financing and subsequent stock returns.

during the period from July 1968 to December 2013. Among them only 3,929 (18.84%) are still listed by the end of 2013. Of the 16,916 delisted stocks, only 1,589 (9.39%) have a return reported for the delisting month in CRSP.msf. In other words, more than 90% of the delisted stocks do not have their delisting returns recorded in the file. Moreover, I have verified that, even for the less than 10% with a return recorded in CRSP.msf, the reported return is not the delisting return which, recorded in the other file, is 10% lower on average, or 25% lower if conditional on delisting due to performance reasons. How serious is to omit delisting returns? Shumway and Warther (1999) collected a large proportion of missing delisting returns from other sources (such as Pink Sheets) and show that the delisting return is on average -30%. It could reduce further to -55% if the drop in stock liquidity after delisting and the expected worse returns of those uncollectable delisted stocks are accounted for. Beaver, McNichols, and Price (2007) investigate the impact of delisting returns on return anomalies based on accounting variables such as earnings, accruals, cash flows, and the book-to-market ratio (Bernard and Thomas, 1990; Sloan, 1996). They also show that portfolio returns sorted on these accounting variables are sensitive to the treatment of delisting returns, "due to the disproportionate concentration of delisting firm-years with very negative returns in the lowest decile of these variables." (p.342)

Dividing stocks into deciles based on the asset growth rate, I find that firms in the lowest asset growth decile incur extremely poor operating performance (-12.71% in ROA) and the probability of delisting due to poor performance in the following year is almost four times as high as it is for firms in other deciles (9.60% vs. 2.67%). This evidence hints the importance of the delisting bias in generating the asset growth anomaly, especially for the abnormally high portfolio return of the most negative asset growth decile (decile 1). Indeed, after correcting the delisting bias, I do not find that stocks in decile 1 earn significantly higher returns than most other deciles.

On the other tail, stocks in the highest asset growth deciles, deciles 9 and 10 specifically, still earn abnormally low returns. These firms, however, have issued large amounts of debt and equity in the previous year. I show that the dominant part of the high asset growth is mechanically due to the large equity and debt issuances. For instance, of the 125% average increase in assets for firms in decile 10, external financing has contributed 105.5% (84%). In a different way of illustration, 87% of the firms in decile 10 have conducted at least a large equity or debt offering. This number is in sharp contrast to only 3%~5% of the firms in the first seven asset growth deciles that have sought external financing of similar magnitude.

There is ubiquitous evidence that firms realize poor returns following large external financing. Some recent examples are Ritter (2003), Bradshaw, Richardson, and Sloan (2006), Billett, Flannery, and Garfinkel (2006), and Pontiff and Woodgate (2008). What is really interesting is, after controlling for the effect of external financing, whether high asset growth still predicts low stock returns. The mechanical relation between external financing and asset growth allows me to perform a clean and direct test. In particular, I subtract the part of asset growth due to external financing and then examine the relation between the net asset growth and returns. I use multiple ways, based on the balance sheet and statement of cash flow data, to derive this net asset growth. In research methodology, I employ both the portfolio sorting approach and the Fama-MacBeth regressions. Overall, I do not find a robust negative relation between the net asset growth and the subsequent stock returns. In some specifications the relation even becomes positive. I therefore conclude that, after removing the impact of external financing and adjusting the delisting bias, asset growth does not have an independent effect on stock returns in the cross-section.

The asset growth anomaly has generated much research interest. Studies have attempted to explain the phenomena from behavioral or economic points of view. Cooper, Gulen, and Schill (2008) argue that the asset growth anomaly is most consistent with investor over extrapolation of past gains to growth. Chan, Karceski, Lakonishok, and Sougiannis (2008) show that the anomaly is more pronounced in firms with low past profitability and poor corporate governance, and suggest that it is due to investors' under-reaction to managers' empire-building investments. Lipson, Mortal, and Schill (2011) show that the anomaly is more evident in stocks with high idiosyncratic volatility and argue that costly arbitrage is the driving force behind the anomaly. Li and Zhang (2010) also imply that limits-to-arbitrage seems to excel the q-theory in a horse race to explain the anomaly. Lam and Wei (2011) however suggest that the q-theory with investment frictions explains the anomaly as much as limits-to-arbitrage does.

Watanabe, Xu, Yao, Yu (2013) confirm the asset growth effect in many international markets, however, they find that the effect is stronger in relatively more developed and efficient capital markets and is not related to country characteristics representing limits to arbitrage, investor protection, and accounting quality. Their evidence casts doubt on the behavioral explanations for the anomaly. Chen, Novy-Marx, and Zhang (2011) show that the anomaly can largely be explained by the market risk premium factor and two new factors they propose — an investment factor and a return-on-asset factor. Since these factors are motivated by rational economic models, they suggest that the anomaly could be explained by risk-based theories.

I take a different approach. Instead of searching for economic or behavioral driving forces, I scrutinize whether the observed return pattern represents a new anomaly or just morphs from some known return regularities. My empirical methods are simple, straightforward, yet illustrative. My findings point to the latter. The findings highlight the importance of correcting the delisting bias in asset pricing tests, first proposed by Shumway (1997). I show that the CRSP monthly stock return file (CRSP.msf) that researchers frequently rely on does not include delisting returns. Asset pricing tests that are sensitive to the delisting bias should incorporate delisting returns recorded in the other CRSP file. In addition, I show the strong mechanical relation between high asset growth and external financing. The asset growth anomaly in a large part reflects the return underperformance following large external financing. However, this paper does not investigate the reasons for the external financing anomaly. A few studies have already made efforts along this important line of research, for instance, Carlson, Fisher, and Giammarino (2004; 2006), Lyandres, Sun, and Zhang (2008), Li, Livdan, and Zhang (2013), among others.

2. Data and Variables

Following Cooper, Gulen, and Schill (2008, hereafter CGS), I examine all NYSE, AMEX, and NASDAQ nonfinancial firms (excluding firms with SIC codes between 6000 and 6999) with returns included in the CRSP monthly stock return file (CRSP.msf) and accounting information included in the COMPUSTAT fundamentals annual file (COMP.funda). Firms are also required to be included in the fundamentals annual file for at least two fiscal years so that we can construct the asset growth variable. Stock returns examined in CGS are between July 1968 and December 2003 and I extend their sample to December 2013 or 544 months in total. I also calculate the asset growth rate (AG) as the year-to-year percentage change in total assets (AT):

$$AG(t-1) = \frac{AT(t-1)}{AT(t-2)} - 1 \,. \tag{1}$$

At the end of June of each year t from 1968 to 2013, stocks are allocated into deciles based on the ranking of each firm's asset growth rate from fiscal year t-2 to t-1. Firms in decile 1 have the lowest and firms in decile 10 have the highest asset growth rates. Portfolios are held from July of year t to June of year t+1 and then rebalanced (based on the growth rates from fiscal year t-1 to t).

The first row in Table 1 reports the time-series average of the cross-sectional median asset growth rate in each decile. The average year-to-year asset growth rate is about -22% for firms in decile 1 (the lowest AG) and is 125% for firms in decile 10 (the highest AG). The sorting results in the spread between decile 1 and 10 to be as high as 147%. The average asset growth rate of firms in the whole sample is 8.5% and about 27% of firms reduce their assets.

Table 1 also presents the time-series average of the cross-sectional median market capitalization (ME) in the previous month and book-to-market equity ratio (B/M) in the previous fiscal year. Market capitalization is adjusted by the Consumer Price Index (CPI) to the December

2013 dollars and reported in millions. It shows an inverse U-shape across the asset growth deciles. Firms in the middle deciles are the largest in size and firms on the two sides are relatively small. Especially for firms in decile 1 that have incurred the most negative asset growth, the average market capitalization is only about $ 50 million in 2013 dollars. The statistics on B/M suggest that assets-shrinking firms are value firms while assets-expanding firms are growth firms. I follow Fama and French (2008) in computing B/M ratios.

3. The asset growth anomaly in portfolio returns

After allocating firms into decile portfolios based on their asset growth rates in fiscal year *t*-1, I calculate the monthly equal- and value-weighted returns for portfolios from July of year *t* to June of year *t*+1. This procedure generates a time-series of returns for each portfolio from July 1968 to December 2013 (544 months in total). Table 1 presents the time-series means of the monthly portfolio returns. The equal-weighted (value-weighted) portfolio returns decrease (almost) monotonically from low asset growth deciles to high asset growth deciles. Stocks in the lowest asset growth decile (decile 1) earn an equal-weighted monthly return of 1.79% and stocks in the highest asset growth decile (decile 10) earn 0.20% on average. A hedging portfolio long in decile 1 stocks and short in decile 10 stocks earns a monthly return of 1.59% (*t*-statistic = 9.49) in the following year. It translates to an annual return spread of 19.08%. In value-weighted portfolio returns, firms in decile 1 earn 1.21% and firms in decile 10 earn 0.41% on average per month, resulting in a spread of 0.81% (t-statistic = 4.07). As a comparison, CGS reports a monthly spread of 1.73% (t-statistic = 8.45) in equal-weighted portfolio returns and 1.05% (t-statistic = -5.04) in value-weighted portfolio returns for their sample.[3] For the purpose of later analysis, I also report the return spreads between decile 1 and decile 6, where decile 6 is taken as the middle decile. Firms in decile 6 have achieved some positive growth in assets but not large in magnitude (10.6% on

[3] The slight differences in magnitude between CGS and my results are due to the difference in our sample periods. In fact, I was able to replicate their results in their sample period in almost the same magnitude.

average). The equal-weighted return spread between decile 1 and 6 is also statistically significant (0.53% per month with a t-statistic of 2.66), mainly due to the superior returns of stocks in decile 1. If portfolio returns are value-weighted, the spread between decile 1 and 6 is positive but not statistically significant.

Next, I run time-series regressions of the portfolio returns on the Fama and French (1993) three factors. This is to estimate the alphas – the average returns that are not explained by the Fama and French three factors. The implicit null hypothesis is that the Fama and French three-factor model does an adequate job of explaining expected returns associated with firm asset growth. Therefore, a statistically significant alpha – the intercept from the time-series regression - suggests an "abnormal" return. The regression results are again similar to those reported in CGS. Using equal-weighted portfolio returns, firms in the lowest asset growth decile have a monthly alpha of 0.54%, while the highest growth firms have an alpha of –0.89%. Both the outperformance of decile 1 and the underperformance of decile 10 are statistically significant at the 1% level. The alpha for the hedging portfolio is 1.42% (*t*-statistic = 9.53). Using value-weighted portfolio returns, firms in the lowest asset growth decile have a monthly alpha of 0.05%, and firms with the highest asset growth rates have an alpha of –0.46%. The alpha for the hedging portfolio is 0.51% (*t*-statistic = 3.15). The hedging portfolio long decile 1 and short decile 6 yields a significantly positive alpha if returns are equal-weighted but no abnormal return if returns are value-weighted.

So far I have reproduced the key evidence of asset growth anomaly. Next in Section 4, I examine the operating performance and the probability of delisting for firms in each decile and the implication for portfolio returns if delisting returns are omitted. In Section 5, I investigate to what extent high asset growth is fuelled by large external financing and the implications for the asset growth anomaly if external financing is controlled for.

4. The delisting bias and its implications for the asset growth anomaly

Stock exchanges sometimes delist stocks before investors are able to sell them. Reasons for delisting include mergers and acquisitions, liquidations, moving to other exchanges, and poor performance (e.g. bankruptcy, insolvency, insufficient capital etc.). The CRSP monthly stock return file, in particular CRSP.msf, often does not include the delisting-month returns of the delisted stocks. Omitted delisting returns introduce a survivorship bias in empirical tests, as only the survivors' returns are accounted for. The delisting bias in the CRSP data is first documented by Shumway (1997). He shows that CRSP return data do not include delisting returns for most stocks that have been delisted for poor performance reasons. For example, only 120 out of 1029 firms (11.7%) delisted from NYSE and AMEX due to poor performance during the period between 1962 and 1993 have their delisting return reported in CRSP's stock return files. For these reported cases, the average delisting return is -41.56%. The situation is even worse for NASDAQ – more firms have been delisted from NASDAQ due to poor performance, and none of their delisting returns is included in CRSP's stock return files. He also shows that delists for performance-related reasons are generally surprises and thus incur very negative returns.

Motivated by Shumway's work, the CRSP research department has expended efforts and resources to retrieve delisting returns. Over 90% of the delisting returns are successfully retrieved, according to the CRSP white paper *CRSP Delisting Returns* (2001). This certainly saves researchers efforts from collecting the delisting returns from sources like Pink Sheets as Shumway did earlier. The retrieved delisting returns are recorded in a file called monthly stock event file (CRSP.mse), which is separate from CRSP's monthly stock return file (CRSP.msf).[4] The monthly stock return file collects monthly returns of the stocks traded in the NYSE, AMEX, or NASDAQ since January 1926 and is currently the most popular database for empirical tests on stock returns. But this file does

[4] I was informed by the CRSP staff that the separation of the regular-month returns and the delisting-month returns into two files could result from WRDS's repackaging of the CRSP data.

not include delisting returns. If researchers perform empirical tests solely based on this file, their results suffer from the delisting bias.

I use a simple test to illustrate that delisting returns are often omitted in CRSP.msf. Table 2 reports my findings. I first identify all non-financial firms that have their stock returns once included in the CRSP monthly stock return file during the period from July 1968 to December 2013. Of the 20,857 stocks in total, only 3,929 (19%) are still listed and traded at one of the three markets by December 2013. Of the remaining stocks, I am able to identify the month of delisting for 16,916 stocks using CRSP's monthly stock event file (CRSP.mse). I then check if CRSP.msf reports a non-missing return in the month of delisting for these delisted stocks. Only 1,589 out of the 16,916 stocks (9.39%) have a return reported for the delisting month, while the remaining over 90% stocks fail to do so. Among them about a half are delisted for performance-related reasons. Moreover, even for the 1,589 delisted stocks with returns reported in CRSP.msf for the delisting month, most of the reported returns have not accounted for the delisting effect. For example, if the delists are for performance-related reasons, the delisting returns reported in CRSP.mse are on average 25% lower than the reported returns in CRSP.msf. Of the 16,916 delisted stocks in my sample period, the average delisting return is -16.22%, and if the delisting is due to performance reasons (46.5%), the average delisting return reduces to -38.3%.

Omitted delisting returns introduce a bias into studies that only use CRSP's monthly stock return file, especially when the variable of interest is correlated with the probability of delisting. For example, Shumway and Warther (1999) show that the widely-documented size effect disappears after correcting the delisting bias. Firms often reduce in size before being delisted for poor performance. Small firms are found to have abnormally high returns because, when the returns of size portfolios are computed based on CRSP.msf, it fails to account for the very negative returns of those delisted small firms. In other words, only returns of the survived small firms are used to compute the portfolio returns, which results in an inflated portfolio return for small stocks.

The delisting bias could also lead to the discovery of the asset growth anomaly. It is not surprising to expect a decline of asset value for a distressed firm before delisting. If firms in the negative asset growth portfolios tend to be delisted more often than firms in the positive growth portfolios, the superior returns found in the following year for the low growth portfolios could merely be the result of omitted delisting returns.

I examine the potential of such a delisting bias on the asset growth anomaly. First I investigate whether firms with the lowest asset growth tend to perform poorly and have a higher chance to be delisted in the following period. Table 3 presents the results. The first row shows that the average operating performance, measured by returns on assets (ROA), monotonically increases from -12.71% for firms in decile1 to 8.00% for decile 9 while it drops a bit for firms in decile 10. The extremely poor performance of decile 1 raises serious doubt on the firms' survival in the following period. Indeed I find that the probability of delisting is as high as 13.71% for stocks in decile 1. In other words, if a firm's asset growth is in the bottom 10% among all the firms, the chance for the firm to be delisted in the following year is almost 14%. Shumway (1997) suggests that the delisting bias is more pronounced for stocks delisted for performance-related reasons. I follow his work to estimate the probability of delisting due to poor performance. Reasons for delisting (i.e., the delisting code) are obtained from CRSP's stock event file. Stocks in the lowest asset growth decile have a 9.60% probability of being delisted in the following year due to poor performance, while the probability is 4.82% for stocks in the highest asset growth decile. The difference is statistically significant at the 1% level using a two proportion z-test. Stocks in the second lowest asset growth decile (decile 2) also have a high probability of delisting for performance-related reasons, i.e. 4.58%. In comparison, the probability for deciles 3 to 9 ranges only from 1.58% to 2.90%. The evidence sends a clear message: compared to stocks with moderate or high asset growth, stocks with negative asset growth have a significantly higher probability of delisting in the following year due to poor performance. Omitting delisting returns therefore introduces a significant bias to the returns on the portfolios of poorly performed stocks.

To correct the delisting bias, we need backfill the delisting returns for the delisted stocks into the stock return file. CRSP has retrieved delisting returns for more than 95% of the delisted stocks in my sample period. The delisting returns together with the reasons for delisting are stored in the stock event file (again, not the monthly stock return file). As suggested in Shumway (1997), delisting triggered by performance-related reasons (delisting codes 500, 505 to 588) incur extremely negative returns. Based on CRSP.mse, about 28% of the stocks delisted from NYSE or AMEX are triggered by poor firm performance and these stocks have an average delisting return of -36%. The average delisting return for poor-performing NASDAQ stocks is -18.2% but a higher proportion of the delisted stocks in NASDAQ (54%) are triggered by poor performance. Moreover, stocks that do not have their delisting return retrieved are primarily triggered by performance-related reasons (93% of 142 observations). Shumway and Warther (1999) argue that the delisting returns of those unidentified stocks are almost certainly worse and the fact that there remains no trace of those stocks suggests that many may have become worthless.

I correct the delisting bias as follows. For the 90% of stocks in the monthly stock return file without delisting-month returns, I compound their last-reported return with the delisting return in the monthly stock event file. For the other 10% of stocks that have a return reported for the delisting month, I take the average of the reported return in the stock return file and the delisting return in the stock event file (Note: the results do not change if I also compound them). Note there are about 5% of delists that CRSP is unable to retrieve their delisting returns. I replace the missing delisting returns in the stock event file by the average delisting returns in the same stock exchange, depending on if the delisting is due to performance-related reasons or not. That is, if an NYSE or AMEX (NASDAQ) stock delisted for performance-related reasons does not have its delisting return reported, I assume its delisting return is -36.0% (-18.2%). Otherwise an NYSE/AMEX (NASDAQ) stock with missing delisting return is assumed to have a delisting return of 2.76% (3.14%). This is a more conservative treatment relative to assuming -100% for irretrievable poor-performing delisted stocks.

Table 3 presents the portfolio returns after correcting the delisting bias. The correction results in lower returns for all asset growth portfolios, but its effect is the largest on the lowest decile. The average equal-weighted return of decile 1 drops from 1.79% per month before correction to 1.45% after correction. This translates into a drop of 34 basis points per month or 4.16% per annum. The average equal-weighted return of decile 10 also drops from 0.20% to 0.09%. The spread between decile 1 and 10 thus remains as high as 1.36% per month and statistically significant (*t*-statistic = 8.12). The significant spread however is due to the poor returns of stocks in decile 10. If we compute the return spread between decile 1 and decile 6, it reduces from a statistically significant 0.53% before correcting the delisting bias to an insignificant 0.24% (i.e., a drop of 55%). The correction of the delisting bias has a smaller effect on the value-weighted returns. The reason is straightforward: in the month before delisting, most stocks have a small market capitalization. Therefore, their low returns in the following month contribute little to the value-weighted portfolio returns.

One may deem the correction of delisting bias unimportant because it does not eliminate the return spread between deciles 1 and 10. I disagree for two simple reasons. First, the estimated portfolio returns (of any decile) are *biased* without the correction. Second, the "outperformance" of the low growth deciles and the "underperformance" of the high growth deciles have distinct reasons, as I will show in the next section. It is still important that the delisting bias alone explains the "abnormal" performance of the lowest asset growth decile but not the return spread between the two extreme deciles.

Next I run time-series regressions on both the equal- and value-weighted portfolio returns. The alpha estimates suggest consistent results. Both the equal- and value-weighted portfolio alphas for the lowest asset growth portfolio (decile 1) are not statistically different from zero. Recall that the alpha for equal-weighted returns is a statistically significant -0.54% before adjusting the delisting bias. The spreads in alphas between deciles 1 and 10 are still positive and statistically significant. They are clearly driven by the large and negative alphas of the highest asset growth portfolio, which is -1.00% for the equally-weighted portfolio and -0.47% for the value-weighted portfolio. Both are statistically significant at the 1% level. In fact, the alpha of decile 1 is not different from the alphas of deciles 2 to 8 for the equally-weighted portfolios, and of deciles 2 to 9 for the value-weighted portfolios. In contrast, the alpha of decile10 is significantly different from the alphas of almost all the other deciles.

In summary, the superior (equal-weighted) returns of the low asset growth portfolios are largely driven by the delisting bias in CRSP's monthly stock return file. After correcting this bias, the lowest asset growth portfolio earns similar returns to other asset growth portfolios except for the two highest asset growth portfolios (deciles 9 and 10).

5. External financing and its impact on the asset growth anomaly

It is interesting to learn what drives the significant asset growth for firms in deciles 9 and 10 and why these firms earn poor returns in the following year. Note that the average asset growth rate within a year is 125% for firms in decile 10. It's hard to imagine any firm can organically grow its assets at such a pace. Instead, the substantial asset growth is most likely fuelled by large amounts of external financing.

There is ubiquitous evidence that stock returns underperform following large equity or debt financing. Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995) find that firms conducting seasoned equity offerings significantly underperform non-issuing firms for up to five years following the offerings. Ritter (2003) shows the underperformance during the first five years is about 20% relative to control firms matched on size and book-to-market equity. Ikenberry, Lakonishok, and Vermaelen (1995), Peyer and Vermaelen (2009), on the other hand, find that stock returns outperform various benchmarks following announcement of repurchases. Collins and Kim (2012) show that stock-financing acquisitions contribute significantly to asset growth and the poor performance following the transaction. Daniel and Titman (2006) and Pontiff and Woodgate (2008) construct comprehensive measures of equity issuances that capture outstanding share variations due to SEOs, stock acquisitions, stock repurchases, and other corporate transactions, and find that net equity issues are negatively related to future returns. Spiess and Affleck-Graves (1999) find return underperformance for firms that have conducted public bond offerings. The average magnitude is over 20% in five years. Lee and Loughran (1998) and Dichev and Piotroski (1999) find that firms with large issues of convertible debt significantly underperform the market in the following years. Billett, Flannery, and Garfinkel (2006) find significant long-run return underperformance following bank loans despite the widely-documented positive announcement returns. Combining the above findings, Bradshaw, Richardson, and Sloan (2006) develop a comprehensive measure of net external financing and show a negative relation between this measure and future stock returns. The economic and statistical significance of their results is stronger than in the previous studies that focus on an individual category of financing.

I examine two research questions in this section: (1) To what extent are the large increases in firm assets driven by external financing? (2) Do the poor returns of the high asset growth firms merely reflect the widely-documented return underperformance following large equity or debt issuances? To answer the first question, I construct external financing in two different ways, using information respectively from balance sheet and statement of cash flow. Here are the variables constructed from the balance sheet (BS) data:

Equity Financing = Change in (Common Equity (CEQL) + Preferred Stock (PSTKL));

Debt Financing = Change in (Long-Term Debt (DLTT) + Debt in Current Liabilities (DLC)).

Following Fama and French (2008) in constructing the book value of equity, I use the liquidity value for preferred stock (PSTKL) if available, or the redemption value (PSTKRV) if available, or the carrying value (PSTK). For common equity, I also use the liquidity value (CEQL) if available, or the tangible value (CEQT) if available, or the total value (CEQ). The balance sheet external financing is the sum of equity and debt financing. The variables constructed from the statement of cash flow (SCF) data are as follows:

Equity Financing = Sale of Common and Preferred Stock (SSTK)

- Purchase of Common and Preferred Stock (PRSTKC)

- Cash Dividends (DV);

Debt Financing = Long-Term Debt Issuance (DLTIS)

– Long-Term Debt Reduction (DLTR)

+ Current Debt Changes (DLCCH).

External financing is the sum of equity and debt financing except after 1987, the fundamental annual file provides an item called Net Cash Flow from Financing Activities (FINCF), which includes excess tax benefits of stock options (TXBCOF) and other financing activities (FIAO), in addition to the above equity and debt financing items. I thus use FINCF for net external financing since 1988. Note the statement of cash flow data are only available since fiscal year 1971. So for the later return tests based on this data, the sample period starts from July 1972.

Table 4 reports the time-series average of the median external financing by firms in each asset growth decile. For the purpose of comparison, I reproduce the average asset growth rate in the first row. The reported equity, debt, and total external financing are all deflated by the lagged total assets, the same as done for the asset growth variable. The impact of external financing on asset growth is obvious. For example, the average asset growth rate for firms in decile 10 is 125.5%. Based on the balance sheet data, these firms have issued equity amounting to 80% and issued debt amounting to 16% of its total assets in the previous year. On average, external financing (105.5% of the lagged total assets) explains 84% of the 125.5% asset growth for firms in decile 10. Interestingly, for firms in decile 1, the net external financing of -18.7% of the lagged assets also accounts for 87% of the -21.55% asset growth. This might be driven by poor performing firms' failure to refinance their debt. Combined together, of the -147.05% spread in asset growth between decile 1 and 10, 85% (-124.24%) is mechanically driven by the firms' difference in net external financing.

The last three rows of Table 4 presents the external financing variables constructed from the statements of cash flow data. These flow variables are presumably "cleaner" measures of external financing. Their magnitude is often smaller than that constructed from the stock variables of the balance sheet, which could include financing of alternative forms such as capital leases. Nevertheless, firms in the highest asset growth decile have issued debt and equity that amount to 86.16% of its existing assets, which accounts for nearly 70% of their asset growth. It is clear that a dominant part of the large asset growth is funded by external financing. Therefore it is necessary to control for the impact of external financing before claiming asset growth a new determinant of cross-sectional returns.

To examine if asset growth, net of the impact of external financing, has an independent effect on returns, I first subtract each firm's asset growth by its external financing and then perform return tests based on this net asset growth variable. I employ both portfolio sorting and Fama-MacBeth regressions and the results are reported, respectively, in Table 5 and 6. Delisting returns are included in the tests. Panel A of Table 5 shows the portfolio sorting results based on the balance sheet adjusted net asset growth rate. Note the composition of firms in each decile is different from that sorted on the raw asset growth rate. The spread in the net asset growth between decile 1 and 10 becomes smaller, -33.82%, after removing the impact of external financing. The patterns on ME and B/M are similar to Table 1 where we sort portfolios based on the raw asset growth. The portfolio returns and the Fama-French three-factor alphas suggest no outperformance for stocks in decile 1. They even underperform relative to stocks in decile 6, though the differences are not always significant. For stocks in decile 10, there is no underperformance if returns are value-weighted, while equal-weighted returns still show significant underperformance. Further analysis suggests it is mainly due to poor returns of some small firms (i.e., market capitalization smaller than $50 million). Overall, the evidence does not support a reliable asset growth effect.

Panel B of Table 5 reports the portfolio returns sorted on the asset growth net of the statement of cash flow external financing. Unlike in Panel A, the spread in asset growth in this SCF–adjusted variable is still as large as -87.03%. Nevertheless, neither the portfolio return spreads nor the spreads in alphas from the three-factor models are significantly positive. If anything, the value-weighted return spreads suggest the opposite.

A recent study by Fama and French (2008) also suggests the importance of equity issues in affecting the asset growth anomaly. They divide firms' total assets by the number of shares outstanding and measure asset growth on a per share basis, by which they control for the growth of assets due to new equity issues, stock-swap acquisitions, and stock repurchases (for negative growth). They show that the asset growth anomaly (on a per share basis) is not robust in large stocks. However, even if based on their measure of asset growth, the anomaly still exists in microcap and small stocks (market cap below the NYSE median), in both equal- and value-weighted returns. Note their asset growth variable does not account for the asset growth driven by debt issuances. Next I investigate the results by also controlling for net debt issues.

Like Fama and French (2008), I also construct a variable of asset growth on a per share basis. Unlike them, I subtract net debt issues from asset growth.

$$Assets\ per\ share\ net\ of\ debt\ =$$

$$\frac{\text{Total Assets (AT) – (Long–Term Debt (DLTT) + Debt in Current Liabilities (DLC))}}{\text{Common Shares Outstanding (CSHO)}}.$$

Asset growth is calculated as the percentage change of this variable. The results, presented in Panel C, are similar to the previous two Panels. First, there is a large spread in the per share asset growth rate; it is -121.82%. Second, there is no outperformance of stocks in decile 1, as suggested by the portfolio return spreads and the alpha spreads between decile 1 and 6. If any, firms in decile 1 tend to underperform relative to firms in other deciles except decile 10. Third, the underperformance of stocks in decile 10 relative to those in decile 1 disappears when returns are value-weighted. The evidence highlights the importance of controlling for the impact of debt issues.

The portfolio sorting results do not support the asset growth effect on stock returns once external financing is controlled for, and especially when value-weighted returns are used in the analysis. I also investigate it by Fama-MacBeth regressions. Table 6 presents the results. The dependent variable in Panel A is the one-year cumulative returns, from July of year t to June of year t+1. The independent variable asset growth is measured from fiscal year t-2 to t-1. I employ the raw asset growth rate in the first model. Then in various specifications, I subtract the aggregate external financing, or equity and debt financing respectively, from the raw asset growth. The first row labels whether these financing variables are based on balance sheet or statement of cash flow items. In all specifications I include the log of market capitalization, the book-to-market equity ratio, and the previous 12 month return to control for the potential size, value, and momentum effects. The cross-sectional regressions are run for each year and the table reports the time-series average of the regression coefficient estimates. Statistical significance is evaluated by the standard error of the time-series coefficients. The regression results are consistent with the portfolio sorting results in Table 5. In particular, I confirm a significantly negative relation between the raw asset growth rate and stock return in the cross-section. As shown in the first specification, the coefficient of the asset growth rate is -0.054 with a t-statistic of -6.48. However, once I subtract external financing in the other model specifications, the net asset growth rate loses explanatory power in all specifications. In contrast, external financing, especially net debt issuance, is negatively related to the cross-sectional returns. The evidence again confirms that the asset growth anomaly is primarily driven by the external financing effect that has been documented by many previous studies.

I examine the result robustness by using the three-year cumulative returns as the dependent variable. That is, for asset growth from fiscal year t-2 to t-1, I compute the cumulative returns from July of year t to June of year t+3. All independent variables remain the same. Panel B reports the regression results. They are very similar to Panel A results in which the dependent variable is the one-year cumulative returns. In addition, the negative coefficients of equity financing also become statistically significant. This is consistent with Loughran and Ritter (1995) and Ritter's (2003) findings that the underperformance following SEOs usually becomes worse after the first year. It is important to reiterate that the asset growth net of external financing does not predict the subsequent three-year returns, in spite of the external financing variables constructed from balance sheet or statement of cash flow data.

In their Section II.D (p.1638-1643), CGS examine the interaction between the asset growth anomaly and the share issuance/repurchase anomaly. They run Fama-MacBeth regressions of annual stock returns on asset growth and several share issuance variables, and find that the coefficient estimates of the asset growth variable remain statistically significant after including the share issuance variables. They conclude at the end of the section that "asset growth survives controls for the effects of equity issuances and repurchases". I have two comments. First, the raw asset growth variable in CGS's regressions contains the growth of assets by equity financing. My findings in Tables 4 suggest high *mechanical* correlations between these two variables and therefore, multicollinearity is a significant concern and the coefficient estimates of the correlated variables are not reliable. Greene (2008, p.59) points out that if explanatory variables are highly correlated, coefficient estimates of the regression may have the "wrong" sign or implausible magnitudes and, moreover, small changes in the data produce wide swings in the coefficient estimates. My regression specifications for the table 6 results overcome this concern. Second, like Fama and French (2008), they do not control for the effect of debt issuances on asset growth. Spiess and Affleck-Graves (1999) show that small firms underperform by more following debt offerings.

CGS's finding of a stronger asset growth effect in small and medium firms after controlling for share issuances, in another way, implies it could be driven by the underperformance following debt issuances.

In fact, some of the CGS results imply the lack of an independent asset growth effect after controlling for equity and debt issuances. In their Section II.C, CGS decompose total asset growth into four components: stock financing growth, debt financing growth, retained earnings growth, and the leftover (which they call operating liabilities growth). They run Fama-MacBeth regressions of annual stock returns on the these components of asset growth in all firms as well as firms in different size groups, and find that growth in debt predicts significantly negative returns in the following year for small and medium size firms but not for large firms whereas growth in equity predicts negative returns for small and large firms but not for medium firms. However, neither the growth in retained earnings growth nor the growth in operating liabilities predicts returns in the subsequent year, after controlling for debt and equity growth, in all the regressions. This is consistent with my findings in Table 6 – asset growth net of external financing does not predict lower future returns.

In examining the cross-sectional relation between share issuance and future stock returns, Pontiff and Woodgate (2008) find very different results in the pre- and post-1970 data. The relation is significantly negative in the post-1970 data but not significant in the pre-1970 data. Since equity financing is a significant driver of asset growth and, at least partly, the reasons for the findings of the anomaly in my sample, their findings suggest that the asset growth anomaly may also be different in the pre-1970 data. The current COMPUSTAT fundamental annual file covers corporate accounting data back to 1950, which allows us to do an out-of-sample test of the anomaly. Table 7 reports the sorting portfolio returns for the period from July 1952 to June 1968, which is not examined in CGS. Stocks are sorted into deciles based on their raw asset growth rates in the previous fiscal year. The spread in asset growth between decile 1 and 10 is still large though not as much as in the later sample. Firms are on average larger in size, due to COMPUSTAT's coverage of only relatively large firms in the early period. The portfolio return spreads and the Fama-French three-factor alphas do not suggest the existence of a robust asset growth anomaly. There is some weak evidence in equal-weighted returns but completely no support in value-weighted returns. This evidence is consistent with Pontiff and Woodgate (2008) and also confirms the significant role of equity financing in driving the asset growth anomaly. The anomaly disappears in the period that equity financing does not predict returns. However, a caveat is that firms in the early sample are on average larger in size. The asset growth anomaly is shown to be less significant in larger firms (Fama and French, 2008).[5]

6. Conclusion

Cooper, Gulen, and Schill (2008) find a significant asset growth effect in the cross-section of stock returns. Stocks in the low asset growth deciles outperform while stocks in the high asset growth deciles underperform in the following years, generating a substantial return spread for the hedging portfolio. This cross-sectional return pattern has generated much research interest and is often investigated as a significant new anomaly. Various behavioral and economic explanations are provided. I take a different approach by scrutinizing the empirical findings. I show that the superior returns of the low asset growth deciles result from the delisting bias in CRSP data and that the poor returns of the high asset growth deciles coincide with the return underperformance following large external financing. High asset growth is primarily driven by large equity and debt offerings. After controlling for the delisting bias and the impact of external financing, I do not find an independent asset growth effect on stock returns.

[5] Note, however, Fama and French's (2008) per-share asset growth has adjusted the impact of equity financing so made their findings less comparable to the one reported here. Without adjusting share issuance (using the raw asset growth variable), CGS actually show that the asset growth anomaly is robust in large firms which is defined to have market cap above the 70th of NYSE firms (CGS, Table 2 Panel C, p.1620).

My study highlights the importance of correcting delisting bias in asset pricing tests, especially in computing returns of portfolios that are potentially related to the delisting probability. For instance, value stocks earn higher returns than growth stocks, but value firms tend to perform poorly and have a higher probability to be delisted in the subsequent period. The higher returns of value stocks could partly be attributed to the omission of delisting returns, if any. The same could also apply to the investment growth anomaly, in which firms cutting investment are expected to earn higher returns than firms expanding investment.

Researchers over time have identified dozens of cross-sectional anomalies. For example, Pontiff and McLean (2013) survey 82 characteristics that are shown to explain returns in the cross-section. My findings in the paper suggest that, before accepting some newly-found return patterns as independent anomalies, we should explore hard their potential relations to existing styled return patterns. Avramov, Chordia, Jostova, and Philipov (2013) is such a good example. They find that financial distress is an important commonality behind the profitability of many cross-sectional return anomalies. Dissections of this sort improve our understanding of anomalies and help to reconcile the economic or behavioral rationales behind these anomalies.

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Table 1
Portfolio returns sorted on the asset growth rate

At the end of June of each year *t* from 1968 to 2013, non-financial stocks are allocated into deciles based on their asset growth rate from fiscal year *t*-2 to *t*-1. The portfolios are held for 12 months, from July of year *t* to June of year *t*+1, and then rebalanced. The sample of stock returns spans from July 1968 to December 2013, 544 months in total. This table reports the time-series averages of cross-sectional median annual asset growth rates, market capitalization in the month prior to the returns (adjusted by the CPI to December 2013 dollars, in $ millions), book-to-market equity ratio of fiscal year *t*-1, equal-weighted and value-weighted monthly portfolio returns, and Fama and French alphas – the intercepts of the time-series regressions of the monthly portfolio returns on the Fama-French three factors. Alphas marked with * are statistically significant at the 5% level. All returns are in percentage. Corporate accounting data are obtained from COMPUSTAT's fundamental annual file and stock return data are from CRSP's monthly stock return file.

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (1-10) (t-stat)	Spread (1-6) (t-stat)
Asset growth rate from fiscal year t-2 to t-1	-21.55	-7.09	-1.09	2.95	6.60	10.59	15.75	24.20	42.88	125.49	-147.05 (-38.24)	-32.14 (-99.21)
Standard deviation of the asset growth rates	9.15	5.79	4.36	3.70	3.45	3.63	4.61	7.81	18.35	87.06		
Market capitalization in the previous month ($ millions, CPI-adjusted)	53.45	117.48	209.13	299.09	374.96	400.14	402.46	332.36	282.43	197.36	-143.91 (-29.14)	-346.69 (-28.31)
Book-to-market equity ratio in fiscal year t-1	0.39	0.48	0.46	0.42	0.38	0.35	0.31	0.28	0.25	0.21	0.19 (44.77)	0.05 (21.65)
EW portfolio monthly returns (July t - June t+1)	1.79	1.63	1.56	1.39	1.32	1.27	1.20	1.00	0.82	0.20	1.59 (9.49)	0.53 (2.66)
VW portfolio monthly returns (July t - June t+1)	1.21	1.18	1.17	1.09	1.01	0.96	1.00	0.87	0.81	0.41	0.81 (4.07)	0.25 (1.54)
FF alpha for EW portfolio returns	0.54*	0.42*	0.36*	0.24*	0.21*	0.17*	0.10	-0.09	-0.27*	-0.89*	1.42 (9.53)	0.37 (2.24)
FF alpha for VW portfolio returns	0.05	0.12	0.15*	0.15*	0.06	0.08	0.15*	0.03	0.00	-0.46*	0.51 (3.15)	-0.03 (-0.24)

Table 2
The missing of delisting returns in CRSP monthly stock return file

This table presents the delisting-month return missing information of non-financial firms in the CRSP monthly stock return file during July 1968 to December 2013. I first identify the month when a stock is delisted and the last month that the stock's return is reported in the CRSP monthly stock return file, and then compute the time difference between the month of delisting and the last month of reporting return. The month of delisting is obtained from the CRSP monthly stock event file (CRSP.mse). Delisting stocks with the codes 500, and 505 to 588 are considered as triggered by performance-related reasons.

Delisting information	**Number of stocks (%)**	**Mean delisting return**	**Stocks delisted for performance reasons (%)**	**Mean delisting return due to poor performance**
Delisted stocks (Total)	16916 (100%)	-16.22%	7863 (46.49%)	-38.29%
Month (Delisted) = Month (last reported return)	1589 (9.39%)	-11.54%	510 (32.14%)	-37.88%
Month (Delisted) = Month (last reported return) +1	15247 (90.13%)	-16.52%	7292 (47.83%)	-38.11%
Month (Delisted) > Month (last reported return) +1	80 (0.47%)	-50.41%	61 (76.25%)	-64.41%
Stocks that are still listed by December 2013	3929			

Table 3
Delisting and the impact on asset growth portfolio returns

This table presents the time-series average of the median return on assets (ROA) and the probability of delisting for stocks in each asset growth decile. The differences in probability between decile 1 and 10 are tested using the two-proportion *z*-test. The table also reports the equal and value-weighted portfolio returns after correcting the delisting bias and the alphas from the Fama-French three-factor model for each asset growth portfolio, as well as the spreads and the associated *t*-statistics between deciles 1 and 10. Alpha estimates marked with * are statistically significant at the 5% level.

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (1-10) (z/t-stat)	Spread (1-6) (z/t-stat)
Return on Assets (ROA)	-12.71	-1.01	2.46	4.01	5.08	6.07	6.92	7.73	8.00	3.46	-16.17 (-21.06)	-18.78 (-43.73)
Probability of delisting	13.71	9.55	7.75	6.93	6.30	6.33	6.48	6.58	7.44	10.04	3.67 (14.47)	7.38 (31.37)
Probability of delisting for poor performance	9.60	4.58	2.64	1.94	1.58	1.71	1.75	2.11	2.90	4.82	4.78 (23.57)	7.89 (43.62)
EW portfolio monthly returns (July t - June t+1)	1.45	1.50	1.50	1.34	1.29	1.22	1.16	0.96	0.76	0.09	1.36 (8.12)	0.23 (1.16)
VW portfolio monthly returns (July t - June t+1)	1.20	1.18	1.17	1.09	1.01	0.96	1.00	0.87	0.81	0.40	0.80 (4.05)	0.24 (1.48)
FF alpha for EW portfolio returns	0.20	0.29*	0.30*	0.19*	0.18*	0.13	0.06	-0.14	-0.32*	-1.00*	1.20 (8.05)	0.08 (0.47)
FF alpha for VW portfolio returns	0.04	0.12	0.15*	0.16*	0.06	0.08	0.15*	0.03	0.00	-0.47*	0.51 (3.14)	-0.04 (-0.32)

Table 4
External financing and the impact on asset growth portfolio returns

At the end of June of each year *t* from 1968 to 2013, non-financial stocks are allocated into deciles based on their asset growth rate from fiscal year *t*-2 to *t*-1. The portfolios are held for 12 months, from July of year *t* to June of year *t*+1, and then rebalanced. This table presents the time-series average of the median net equity issues, net debt issues, and external financing (i.e., the sum of net equity and debt issues) in fiscal year *t*-1 relative to the issuing firms' total assets in fiscal year *t*-2. The financing variables are obtained, respectively, from the balance sheet and the statement of cash flow data items. Details of variable construction are presented in Section 5.

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (1-10)
Asset growth rate from fiscal year t-2 to t-1	-21.55	-7.09	-1.09	2.95	6.60	10.59	15.75	24.20	42.88	125.49	-147.05
External financing constructed from balance sheet											
Net equity issues	-13.36	-2.81	0.42	2.14	3.69	5.36	7.42	10.92	20.03	80.01	-93.37
Net debt issues	-2.85	-1.66	-0.89	-0.15	0.52	1.22	2.71	4.90	9.13	15.82	-18.67
External financing	-18.70	-5.99	-1.13	1.94	4.67	7.70	11.67	18.34	33.65	105.54	-124.24
External financing constructed from statement of cash flow											
Net equity issues	0.06	-0.25	-0.73	-1.06	-1.08	-0.88	-0.57	-0.03	4.59	61.70	-61.64
Net debt issues	-1.93	-1.44	-0.93	-0.38	0.10	0.51	1.39	2.70	5.02	8.09	-10.01
External financing	-2.12	-3.04	-3.08	-2.37	-1.44	-0.28	1.68	5.82	18.84	86.16	-88.28

Table 5
Asset growth portfolio returns after controlling for the delisting bias and external financing

This table presents the portfolio returns sorted on asset growth after controlling for the delisting bias and external financing. I subtract external financing from the raw asset growth for each stock and sort stocks into deciles based on the net asset growth. The table presents firm characteristics and portfolio returns. The delisting bias is corrected in computing portfolio returns. Estimates of Fama and French alphas marked with * are statistically significant at the 5% level. Variables of external financing are constructed from the balance sheet data items for Panel A and from the statement of cash flow data items for Panel B. The net asset growth variable for Panel C is constructed on the per share basis, net of debt issues. Details of variable construction are presented in Section 5.

Panel A: Net asset growth based on balance sheet: 1968:07 – 2013:12

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (1-10) (t-stat)	Spread (1-6) (t-stat)
Net asset growth rate from fiscal year t-2 to t-1	-8.47	-2.89	-0.80	0.55	1.71	2.96	4.52	6.79	10.96	25.35	-33.82 (-82.95)	-11.43 (-142.76)
Standard deviation of the net asset growth rates	2.15	1.25	1.01	0.91	0.91	1.01	1.20	1.63	2.73	8.70		
Market capitalization in the previous month ($ millions, CPI-adjusted)	72.12	136.24	224.76	281.55	337.48	364.57	362.70	318.22	260.47	189.58	-117.46	-292.45
Book-to-market equity ratio in fiscal year t-1	0.38	0.44	0.42	0.39	0.38	0.35	0.33	0.30	0.27	0.22	0.16	0.03
EW portfolio monthly returns (July t - June t+1)	1.19	1.38	1.32	1.32	1.23	1.28	1.22	1.08	0.98	0.33	0.86 (7.05)	-0.08 (-0.63)
VW portfolio monthly returns (July t - June t+1)	0.83	1.21	0.97	1.03	0.97	1.03	0.95	0.93	0.99	0.70	0.13 (0.80)	-0.20 (-1.61)
FF alpha for EW portfolio returns	-0.01	0.16	0.14	0.18*	0.11	0.16*	0.13	-0.01	-0.12	-0.76*	0.75 (7.16)	-0.17 (-1.46)
FF alpha for VW portfolio returns	-0.26*	0.20*	-0.01	0.08	0.04	0.12*	0.08	0.10	0.15	-0.16	-0.10 (-0.70)	-0.38 (-3.56)

Panel B: Net asset growth based on statement of cash flow: 1972:07 – 2013:12

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread(1-10) (t-stat)	Spread(1-6) (t-stat)
Net asset growth rate from fiscal year t-2 to t-1	-35.70	-10.52	-1.76	2.83	6.14	9.17	12.61	17.16	25.07	51.33	-87.03 (-64.14)	-44.88 (-65.87)
Standard deviation of the net asset growth rates	16.87	7.54	4.54	3.26	2.67	2.47	2.50	2.80	4.57	15.92		
Market capitalization in the previous month ($ millions, CPI-adjusted)	47.93	70.37	121.29	204.29	301.40	373.66	416.80	441.77	422.19	282.42	-234.49	-325.73
Book-to-market equity ratio in fiscal year t-1	0.27	0.48	0.54	0.51	0.45	0.40	0.34	0.29	0.24	0.23	0.04	-0.13
EW portfolio monthly returns (July t - June t+1)	0.96	1.35	1.47	1.37	1.38	1.31	1.32	1.29	1.06	0.56	0.40 (1.82)	-0.36 (-1.28)
VW portfolio monthly returns (July t - June t+1)	0.66	1.14	1.06	1.14	1.06	1.05	1.05	0.94	0.97	0.74	-0.09 (-0.40)	-0.39 (-1.59)
FF alpha for EW portfolio returns	-0.31	0.04	0.17	0.11	0.17*	0.12	0.17*	0.14*	-0.04	-0.59*	0.28 (1.41)	-0.42 (-1.83)
FF alpha for VW portfolio returns	-0.43*	-0.03	-0.05	0.10	0.02	0.08	0.11	0.04	0.19*	-0.09	-0.34 (-1.78)	-0.51 (-2.73)

Panel C: Net asset growth on per share basis: 1968:07 – 2013:12

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread(1-10) (t-stat)	Spread(1-6) (t-stat)
Net asset growth rate from fiscal year t-2 to t-1	-45.03	-19.54	-7.62	-0.98	3.38	7.05	10.96	16.08	26.02	76.79	-121.82 (-60.99)	-52.09 (-118.27)
Standard deviation of the net asset growth rates	9.34	8.49	5.86	3.99	3.01	2.63	2.55	3.16	6.32	40.01	-30.68	6.71
Market capitalization in the previous month ($ millions, CPI-adjusted)	143.38	100.41	137.61	210.96	307.29	374.20	408.07	378.84	314.80	175.42	-32.04	-230.81
Book-to-market equity ratio in fiscal year t-1	0.25	0.36	0.45	0.46	0.43	0.39	0.35	0.31	0.26	0.21	0.04	-0.14
EW portfolio monthly returns (July t - June t+1)	0.90	1.25	1.25	1.32	1.31	1.31	1.25	1.23	1.00	0.53	0.37 (3.18)	-0.41 (-2.56)
VW portfolio monthly returns (July t - June t+1)	0.73	0.95	0.94	1.07	0.98	1.03	1.06	1.01	1.02	0.56	0.17 (1.13)	-0.30 (-2.68)
FF alpha for EW portfolio returns	-0.30	0.05	0.07	0.16	0.17*	0.20*	0.14*	0.12	-0.09	-0.56*	0.26 (2.34)	-0.50 (-3.63)
FF alpha for VW portfolio returns	-0.16	-0.03	-0.04	0.10	0.02	0.10	0.17*	0.15*	0.21*	-0.29*	0.12 (0.95)	-0.27 (-2.71)

Table 6
Fama-MacBeth regression of stock returns on asset growth and external financing

This table presents the Fama-MacBeth regression results. The dependent variable is 12-month (for Panel A) or 36-month (for Panel B) cumulative stock returns following the construction of the asset growth rate. The independent variable of research interest is the raw asset growth rate (for the first model) or the net asset growth rate after removing the impact of external financing (for the other models). The asset growth rate in the last model is on the per-share basis, net of debt issues. Variables of external financing are constructed based on the balance sheet data items (labelled as BS adjusted) or the statement of cash flow data items (labelled as SCF adjusted). Other independent variables included as control are natural log of market capitalization, book-to-market equity ratio, and the previous 12-month return. The asset growth rates are updated every year and the regressions are run for each year. The table presents the time-series average coefficient estimates and, in the parentheses, the associated t-statistics based on the standard error of the time-series coefficient estimates. The last three rows report the number of years (regressions), the median number of stocks in annual regressions, and the time-series average R-squared.

Panel A: Dependent variable: 12-month cumulative stock returns from July of year *t* to June of year *t*+1

Asset growth calculated by	BS - original	BS adjusted	BS adjusted	SCF adjusted	SCF adjusted	Per-share adjusted
(Net) Asset growth rate	-0.054 (-6.48)	-0.027 (-1.43)	-0.021 (-1.33)	-0.005 (-0.70)	-0.001 (-0.10)	-0.000 (-0.07)
Debt financing rate			-0.067 (-4.38)		-0.071 (-3.88)	
Equity financing rate			-0.012 (-0.78)		-0.029 (-1.32)	
External financing rate		-0.028 (-3.25)		-0.041 (-3.41)		
Ln(ME)	-0.82 (-1.32)	-0.86 (-1.39)	-0.86 (-1.40)	-1.05 (-1.59)	-1.01 (-1.54)	-0.86 (-1.37)
Ln(B/M)	2.99 (3.71)	3.12 (3.79)	3.23 (4.03)	3.52 (4.19)	3.52 (4.24)	3.49 (4.20)
Ret(t-1)	0.02 (1.11)	0.02 (1.04)	0.02 (0.93)	0.02 (1.59)	0.02 (1.52)	0.02 (0.98)
N(years)	45	45	45	41	41	45
N(stocks)	3789	3771	3771	3837	3825	3753
R^2 (%)	4.12	3.88	4.01	3.76	3.95	3.67

Panel B: Dependent variable: 36-month cumulative stock returns from July of year t to June of year t+3

Asset growth calculated by	BS - original	BS adjusted	BS adjusted	SCF adjusted	SCF adjusted	Per-share adjusted
Asset growth rate	-0.128 (-5.78)	-0.026 (-0.71)	-0.022 (-0.58)	0.019 (0.70)	0.022 (0.85)	0.010 (1.07)
Debt financing rate			-0.138 (-4.45)		-0.189 (-6.15)	
Equity financing rate			-0.077 (-2.51)		-0.308 (-5.85)	
External financing rate		-0.109 (-4.89)		-0.223 (-8.11)		
Ln(ME)	-0.80 (-0.68)	-0.86 (-0.63)	-0.87 (-0.63)	-1.86 (-1.30)	-1.84 (-1.28)	-0.96 (-0.70)
Ln(B/M)	11.08 (5.57)	11.17 (5.50)	11.27 (5.60)	11.13 (5.21)	11.24 (5.23)	12.04 (5.82)
Ret(t-1)	0.01 (0.42)	0.01 (0.45)	0.01 (0.42)	-0.00 (-0.03)	-0.00 (-0.01)	0.01 (0.41)
N(years)	45	45	45	41	41	45
N(stocks)	3531	3506	3506	3520	3520	3508
R^2 (%)	3.70	3.77	3.81	3.76	3.86	3.54

Table 7
Out of sample test of the asset growth anomaly: 1952:07-1968:06

This table presents the asset growth portfolio returns in an earlier period. At the end of June of each year *t* from 1952 to 1967, non-financial stocks are allocated into deciles based on their asset growth rate from fiscal year *t*-2 to *t*-1. The portfolios are held for 12 months, from July of year *t* to June of year *t*+1, and then rebalanced. Stock returns used in the tests spans from July 1952 to June 1968, 192 months in total. This table reports the time-series averages of cross-sectional median annual asset growth rates, market capitalization in the month prior to the returns (adjusted by the CPI to December 2013 dollars, in $ millions), equal-weighted and value-weighted monthly portfolio returns, and Fama and French alphas – the intercepts of the time-series regressions of the monthly portfolio returns on the Fama-French three factors. Alphas marked with * are statistically significant at the 5% level. All returns and asset growth rates are in percentage. Corporate accounting data are obtained from COMPUSTAT's fundamental annual file and stock return data are from CRSP's monthly stock return file.

Asset growth deciles formed in June of year t	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (1-10) (t-stat)	Spread (1-6) (t-stat)
Asset growth rate from fiscal year t-2 to t-1	-5.56	-0.18	2.24	4.08	5.91	7.98	10.25	13.47	18.99	35.11	-40.68 (-54.56)	-13.54 (-74.29)
Standard deviation of the asset growth rates	0.14	0.12	0.11	0.10	0.09	0.09	0.09	0.09	0.08	0.08		
Market capitalization in the previous month ($ millions, CPI-adjusted)	258.17	526.06	703.30	943.66	1355.98	1051.56	1169.37	1052.14	856.61	685.36		
EW portfolio monthly returns (July t - June t+1)	1.79	1.51	1.43	1.35	1.43	1.37	1.48	1.36	1.51	1.42	0.37 (2.52)	0.42 (2.39)
VW portfolio monthly returns (July t - June t+1)	1.18	1.04	0.99	0.97	1.24	1.06	1.23	1.25	1.34	1.24	-0.06 (0.24)	0.12 (0.76)
FF alpha for EW portfolio returns	0.17	0.16	0.17*	0.15	0.21*	0.12	0.22*	0.01	0.08	-0.08	0.24 (1.97)	0.05 (0.38)
FF alpha for VW portfolio returns	-0.10	-0.20	-0.14	-0.06	0.20*	-0.04	0.21	0.11	0.12	0.01	-0.11 (-0.50)	-0.06 (-0.41)