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Asset Growth and the Cross-Section of Stock Returns

MICHAEL J. COOPER, HUSEYIN GULEN, and MICHAEL J. SCHILL*

ABSTRACT

We test for firm-level asset investment effects in returns by examining the cross-sectional relation between firm asset growth and subsequent stock returns. Asset growth rates are strong predictors of future abnormal returns. Asset growth retains its forecasting ability even on large capitalization stocks. When we compare asset growth rates with the previously documented determinants of the cross-section of returns (i.e., book-to-market ratios, firm capitalization, lagged returns, accruals, and other growth measures), we find that a firm's annual asset growth rate emerges as an economically and statistically significant predictor of the cross-section of U.S. stock returns.

ONE OF THE PRIMARY FUNCTIONS OF CAPITAL MARKETS is the efficient pricing of real investment. As companies acquire and dispose of assets, economic efficiency demands that the market appropriately capitalizes such transactions. Yet, growing evidence identifies an important bias in the market's capitalization of corporate asset investment and disinvestment. The findings suggest that corporate events associated with asset expansion (i.e., acquisitions, public equity offerings, public debt offerings, and bank loan initiations) tend to be followed by periods of abnormally low returns, whereas events associated with asset contraction (i.e., spinoffs, share repurchases, debt prepayments, and dividend initiations) tend to be followed by periods of abnormally high returns.[1] In

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[1] References include acquisitions (Asquith (1983), Agrawal Jaffe, and Mandelker (1992), Loughran and Vijh (1997), Rau and Vermaelen (1998)), public equity offerings (Ibbotson (1975), Loughran and Ritter (1995)), public debt offerings (Spiess and Affleck-Graves (1999)), bank loan initiations (Billet, Flannery, and Garfinkel (2006)), spinoffs (Cusatis, Miles, and Woolridge (1993), McConnell and Ovtchinnikov (2004)), share repurchases (Lakonishok and Vermaelen (1990), Ikenberry, Lakonishok, and Vermaelen (1995)), debt prepayments (Affleck-Graves and Miller (2003)), and dividend initiations (Michaely, Thaler, and Womack (1995)).

addition to these long-run event studies, other work documents a negative relationship between various forms of corporate investment and the cross-section of returns. For example, capital investment, accruals, sales growth rates, and capital raising are found to be negatively correlated with future returns.[2]

In this study we present new evidence on the debate over whether growth is fairly priced in the cross-section of future stock returns by introducing a new measure of firm growth and studying this variable's ability to help us understand the sources of firm-level growth effects. Our measure of firm growth is motivated by the observation that prior studies on the effects of growth on returns use *components* of a firm's total investment or financing activities, ignoring the larger picture of the potential *total* asset growth effects of comprehensive firm investment and disinvestment. A few recent papers have started down this path by identifying common return effects across components of asset financing and investment. Richardson and Sloan (2003) show that debt and equity issuances are part of a larger net external financing effect. Pontiff and Woodgate (2008) find that seasoned equity offerings, repurchases, and merger effects are part of a broader growth in shares effect.[3] Fairfield, Whisenant, and Yohn (2003) find that accrual effects are a subset of a larger anomaly with respect to a general market mispricing of growth in net operating assets.[4]

As our main test variable, we use a simple and comprehensive measure of firm asset growth, the year-on-year percentage change in total assets (Compustat data item 6). Using the panel of U.S. stock returns over the 1968 to 2003 period, we document a strong negative correlation between a firm's asset growth and subsequent abnormal returns. Sorting by previous-year firm asset growth, we find that raw value-weighted (VW) portfolio annualized returns for firms in the lowest growth decile are on average 18%, while VW returns for firms in the highest growth decile are on average much lower at 5%. The Sharpe ratio of the annual returns of the VW asset growth spread portfolio is 1.07, which is much higher than the Sharpe ratio for the book-to-market (BM) (0.37), size (0.13), and momentum factors (0.73) over our sample. Such large differences in raw returns are hard to explain using traditional measures of expected returns: with standard risk adjustments the spread between low and high asset growth firms remains highly significant at 8% per year for VW portfolios and 20% per year for equal-weighted (EW) portfolios. This asset growth effect is remarkably consistent throughout our sample period. The returns of low asset growth stocks exceed those of high asset growth stocks in 71% of the years on a VW basis and 91% of the years on an EW basis. Moreover, we find that the asset growth effect persists well beyond the first year; asset growth portfolios earn abnormal

[2] See, for example, Lakonishok, Shleifer, and Vishny (1994), Titman, Wei, and Xie (2004), Sloan (1996), Fairfield, Whisenant, and Yohn (2003), Hirshleifer, Hou, Teoh, and Zhang (2004), Richardson and Sloan (2003), Pontiff and Woodgate (2008), Broussard, Michayluk, and Neely (2005), Zhang (2006), and Anderson and Garcia-Feijoo (2006). See also Cochrane (1996), Lamont (2000), Moeller, Schlingemann, and Stulz (2004), Fama and French (2006), and Polk and Sapienza (2008).

[3] Daniel and Titman (2006) also document a share issuance effect that seems to capture much of the information in SEO and repurchase announcements.

[4] See also Hirshleifer, Hou, Teoh, and Zhang (2004).

returns up to 5 years beyond the sorting year. To gauge the robustness of our results across firm capitalization levels, we repeat our analysis across three size-grouped portfolios (small, medium, and large) defined annually using the 30^{th} and 70^{th} NYSE market equity percentiles in June of year t. Our results are robust across the size groupings. Although we do find a particularly strong asset growth effect for the small firms, the effect remains strong among the large cap firms. For example, the annualized three-factor alpha VW portfolio spread between low and high growth rate firms for the large size group is 10%. Our results are also robust to a host of other adjustments for risk and sample formation.

In comparing the asset growth effect with the other standard determinants of the cross-section of returns, we find that firm asset growth remains strong. In fact, in cross-sectional annual stock return regressions that include book-to-market ratios, firm capitalization, short- and long-horizon lagged returns, and other growth measures (including growth in sales from Lakonishok, Shleifer, and Vishny (1994), growth in capital investment from Titman, Wei, and Xie (2004), accruals from Sloan (1996), and a cumulative accruals measure (net operating assets) from Hirshleifer, Hou, Teoh, and Zhang (2004)), the firm asset growth rate is the strongest determinant of future returns, with t-statistics of more than twice those obtained by other previously documented predictors of the cross-section. For large capitalization firms, the ability of asset growth to predict the cross-section is even more pronounced; book-to-market, capitalization, and lagged 6-month returns are almost always insignificant, whereas the coefficient on asset growth is strongly significant.

To better understand the drivers of the asset growth effect, we decompose total asset growth into its major components from both the left-hand (investment) side and right-hand (financing) side of the balance sheet. In doing this, we ask whether the asset growth effect can be explained by variables that have been shown to be important in long-run corporate event studies related to asset expansion or contraction. Our findings suggest that the asset growth effect is common to many of the subcomponents that make up asset growth and financing, although on the investment side of the balance sheet a particularly strong relation exists for changes in operating assets (noncash current assets plus PPE), and on the financing side of the balance sheet growth in debt and stock financing are associated with the strongest effects. Within size groups, growth in debt financing has the strongest effect within small- and medium-sized firms, but growth in stock financing exhibits the strongest effect within large firms. Our decomposition results provide insight as to why asset growth works so well in predicting the cross-section of returns. Because asset growth is the sum of the subcomponents of growth from the left- or right-hand side of the balance sheet, it synergistically benefits from the predictability of all subcomponents of growth, allowing asset growth to better predict the cross-section of returns relative to any single component of growth.

In further tests we examine the relationship between the asset growth effect and the equity issuance/repurchase effect (Ikenberry, Lakonishok, and Vermaelen (1995), Loughran and Ritter (1995), Daniel and Titman (2006)). We find that asset growth is robust to the effects of equity issuance or repurchases and provides a partial explanation for the equity issuance/repurchase anomaly.[5]

We end with a discussion of whether the asset growth effect is most consistent with a risk or mispricing explanation. We show that standard risk-return models (including conditional CAPM) do not explain the effect. We investigate whether the asset growth effect is consistent with time-varying risk induced by changes in the mix of firm growth options and assets in place. Recent theoretical papers suggest that expected returns should systematically decline in response to increasing investment.[6] We find that our results are not consistent with broad implications from these theoretical papers. We also examine whether our results are consistent with several mispricing arguments put forth in recent papers. We find evidence that investors appear to overreact to past firm growth rates, consistent with the Lakonishok, Shleifer, and Vishny (1994, LSV) hypothesis that investors overreact to past firm performance. We also examine stock returns around earnings announcements (similar to tests in La Porta et al. (1997)). Our results show that earnings announcements for low-growth firms are associated with positive abnormal returns and earnings announcements for high growth firms are associated with negative abnormal returns, consistent with the La Porta et al. expectational errors mispricing story. Finally, following Titman, Wei, and Xie (2004), we show that the asset growth effect is weaker in times of increased corporate oversight, consistent with the idea that the asset growth effect arises in part from managerial overinvestment and related investor underappreciation of managerial empire building.

Regardless of the underlying economic causes for our documented growth effect, our main empirical finding is straightforward: A firm's annual asset growth rate is a strong predictor of the cross-section of stock returns. The remainder of the paper is organized as follows. In Section I we describe the data used in our analysis and describe the characteristics of high and low growth firms. In Section II we present results that document the effect of firm growth rates on future returns. In Section III we examine whether the asset growth effect is due to risk or mispricing. Section IV concludes.

I. Data

We use all NYSE, Amex, and NASDAQ nonfinancial firms (excluding firms with four-digit SIC codes between 6000 and 6999) listed on the CRSP monthly stock return files and the Compustat annual industrial files from 1963 through 2003. Some of the variables we examine require 5 years of accounting data, and some of the robustness tests we perform split our sample into firm capitalization-sorted groups. To ensure that we have a reasonable number of

[5] In related work, Lyandres, Sun, and Zhang (2008) document that an investment factor, formed from the spread in returns between low investment stocks and high investment stocks, helps explain the new issues puzzle.

[6] See, for example, Berk, Green, and Naik (1999), Gomes, Kogan, and Zhang (2003), Carlson, Fisher, and Giammarino (2004), Zhang (2005), Cooper (2006), Li, Livdan, and Zhang (2006), and Liu, Whited, and Zhang (2006). Anderson and Garcia-Feijoo (2006) provide empirical support for the theoretical relationship.

firms, especially in the earlier part of the sample, we start all of our portfolio tests and regression analysis in the end of June 1968. To mitigate backfilling biases, a firm must be listed on Compustat for 2 years before it is included in the data set (Fama and French (1993)). In accordance with Fama and French (1992), we form all of our accounting variables at the end of June in year t, using accounting information from fiscal year-end $t-1$ from Compustat. For price-scaled or market value-scaled accounting ratios, such as BM, we use price or market value from December of year $t-1$. For firm capitalization, we use the market value of the firm's equity from CRSP at the end of June of year t. When our tests include lagged return measures (for example, 6-month lagged returns) we estimate a holding period return from the beginning of January of year t to the end of June of year t. All of the variables are updated annually, at the end of June each year.

Our main variable of concern, the annual firm asset growth rate (*ASSETG*), is calculated using the year-on-year percentage change in total assets (Compustat data item 6). The firm asset growth rate for year t is estimated as the percentage change in data item 6 from fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$, as below:

$$ASSETG(t) = \frac{Data6(t-1) - Data6(t-2)}{Data6(t-2)}, \tag{1}$$

To compute this measure, a firm must have nonzero total assets in both years $t-1$ and $t-2$.

Figure 1 reports the average and median annual asset growth rates from 1968 to 2002. The average (median) asset growth rate over this period is

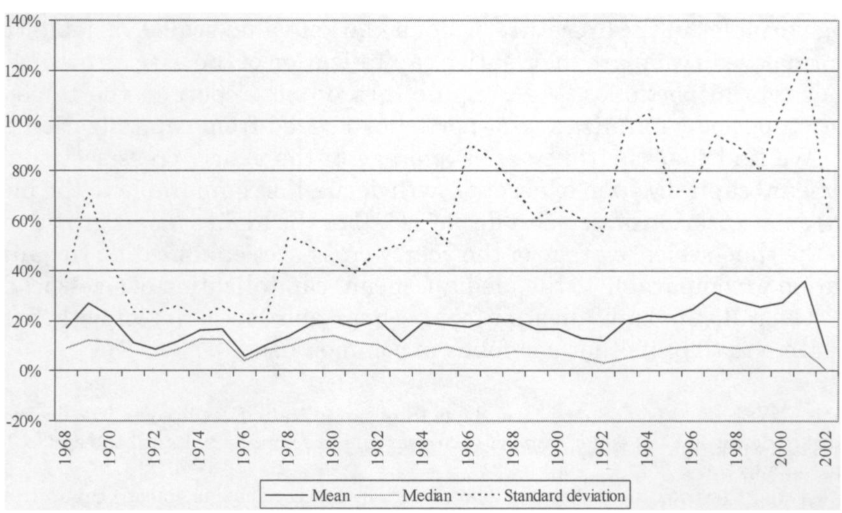

Figure 1. Time series of summary statistics for annual asset growth rates. The figure plots cross-sectional summary statistics for annual asset growth rates for U.S. nonfinancial firms by year from 1968 to 2002.

approximately 19% (8%) per year, with the recent trend being toward higher cross-sectional variance of growth for firms. The yearly average cross-sectional standard deviation of growth is approximately 60% over the entire sample and 95% over the last 10 years. The increased volatility may be due to an increase in the number of young firms listed on public markets (Fink et al. (2005)).

At the end of June of each year t stocks are allocated into deciles based on annual asset growth rates (defined in equation (1)) and portfolios are formed from July of year t to June of year $t+1$. The portfolios are held for 1 year and then rebalanced. In Table I we report formation-period (i.e., for the year prior to and including June of year t) summary statistics for various firm characteristics of the 10 portfolios. The Appendix provides exact formulas for all of the variables used in our tests.

The decile 10 firms are the high growth firms. The time-series average of yearly cross-sectional median growth rates (*ASSETG*) for these firms is substantial at 83.57%. Decile 1 firms are low growth firms, with average annual growth rates of –21.15%. The average growth rate of portfolio 5 is 6.61% per year. High (low) growth rate firms tend to be firms that have also experienced high (low) growth over the year $t-3$ to $t-2$ period (*L2ASSETG*): Over this period, the high growth rate firms grew at 21.68%, whereas the low growth rate firms grew at 0.41%.

The high growth rate firms are not the largest firms in our sample, with a time-series average of yearly cross-sectional mean capitalization (*MV-AVG*) of $585M, but are larger than the lowest growth rate firms, which have capitalizations of $130M. Using cross-sectional median capitalization market value (*MV*), the high growth rate firms average $85.6M and the low growth rate firms average $15.7M. Deciles 5, 6, and 7 tend to be the firms with the largest market capitalization. Since asset growth, unlike many of the common characteristic sorting variables in the literature, is not a market value-scaled variable, it may be informative to compare the relative capitalization of the asset growth deciles to other typical portfolios. We compute (but do not report in the tables) the formation-period capitalization of portfolios formed from capitalization decile sorts.[7] We find that the time-series average of the yearly cross-sectional median (mean) capitalization of asset growth decile 1 is comparable to the median (mean) capitalization of size-sort decile 3 (7). For the highest asset growth decile firms, the time-series average of the yearly cross-sectional median (mean) capitalization is comparable to the median (mean) capitalization of size-sort decile 6 (9).[8] Overall, the capitalization of the high and low asset growth firms is comparable to that of other portfolios in common use.

[7] We use NYSE breakpoints to perform the market capitalization decile sorts. The decile classifications are defined at the end of June of each year and are maintained until the end of June of the subsequent year.

[8] With respect to book-to-market portfolios, we find that the median (mean) capitalization of growth decile 1 is comparable to the median (mean) capitalization of book-to-market decile 10 (10) and the median (mean) capitalization of growth decile 10 is comparable to the median (mean) of book-to-market decile 6 (6).

Table I

Asset Growth Deciles: Financial and Return Characteristics

At the end of June of each year t over 1968 to 2002, stocks are allocated into deciles based on asset growth (*ASSETG*) defined as the percentage change in total assets from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$. The table reports the financial and return characteristics in the year prior to the portfolio formation date. *L2ASSETG* is the asset growth defined as the percentage change in total assets from the fiscal year ending in calendar year $t-3$ to fiscal year ending in calendar year $t-2$. *ASSETS* is Compustat data item 6, total assets, in millions of \$, from the fiscal year ending in calendar year $t-1$. Market value (*MV*), in millions of \$, is calculated using the price and the number of shares outstanding at the end of June of year t. All accounting variables (book-to-market ratio (*BM*), earnings-to-price ratio (*EP*), leverage, return on assets (*ROA*), and *ACCRUALS*) are calculated using Compustat data in the fiscal year ending in calendar year $t-1$. *BHRET6* is the buy-and-hold return over January(t) to June(t) where t is the portfolio formation year. *BHRET36* is the 36-month buy and hold return over July($t-3$) to June(t). *ISSUANCE* is a 5-year change in the number of equity shares outstanding. The numbers in each cell are time-series averages of yearly cross-sectional medians, with the exception of average market value (*MV-AVG*), in millions of \$, which is the time-series average of yearly cross-sectional mean capitalization. All numbers, with the exception of *ASSETS*, *MV*, and *MV-AVG*, are in decimal form, that is 0.01 is 1%. Details on the construction of these variables are provided in the Appendix.

Decile	ASSETG	L2ASSETG	ASSETS	MV	MV-AVG	BM	EP	Leverage	ROA	BHRET6	BHRET36	ACCRUALS	ISSUANCE
1 (Low)	−0.2115	0.0041	20.86	15.70	130.27	0.8156	−0.1931	0.2446	−0.0186	0.086	−0.3286	−0.1253	0.0803
2	−0.0679	0.0294	48.35	26.64	276.70	1.0266	−0.005	0.2437	0.0704	0.0917	−0.1121	−0.0700	−0.0353
3	−0.0079	0.0447	96.46	53.98	602.21	0.9974	0.0536	0.2485	0.1110	0.0921	0.0647	−0.0487	−0.0841
4	0.0319	0.0601	134.48	84.92	930.28	0.9261	0.0732	0.2429	0.1329	0.0784	0.1964	−0.0356	−0.1139
5	0.0661	0.0748	154.60	106.88	1154.12	0.8515	0.0797	0.2400	0.1473	0.0792	0.2757	−0.0283	−0.104
6	0.1025	0.0950	145.20	112.72	1123.79	0.7710	0.0808	0.2263	0.1608	0.0703	0.3360	−0.0206	−0.0752
7	0.1480	0.1165	130.18	116.69	1051.26	0.6918	0.0794	0.2139	0.1743	0.0662	0.3804	−0.0113	−0.0295
8	0.2168	0.1465	100.71	103.96	889.45	0.6076	0.0759	0.2181	0.1886	0.0622	0.4713	0.0014	0.0144
9	0.3529	0.1839	76.74	95.65	903.01	0.5158	0.0685	0.2356	0.2025	0.0427	0.5657	0.0119	0.1167
10 (High)	0.8357	0.2168	66.69	85.61	585.35	0.4256	0.0528	0.2612	0.2173	0.0074	0.7154	0.0341	0.3012
Spread (10-1)	1.0471	0.2127	45.83	69.91	455.08	−0.39	0.246	0.0165	0.2359	−0.0786	1.044	0.1594	0.2209
t(spread)	15.60	26.26	4.83	5.24	3.32	−6.48	5.61	1.17	20.64	−0.33	15.65	28.10	8.36

In the year that we sort on growth, the high growth firms have lower *BM* equity ratios than do the low growth firms at 0.43 versus 0.82, respectively.[9] This is consistent with Anderson and Garcia-Feijoo (2006), who find that growth in capital expenditures is linked to firms' classifications into BM portfolios. The low growth firms have about the same leverage as do the high growth firms. Also, we find that high growth firms tend to have higher earnings-to-price ratios (*EP*) and tend to be more profitable (*ROA*) than low growth firms. High growth firms also have higher levels of accruals (i.e., accounting income exceeds cash income) than do low growth firms and high growth firms issue more equity (*ISSUANCE*) than low growth firms.

From a stock performance standpoint, high growth firms earn past 6-month returns (*BHRET6*) that are below average, but earn past 36-month returns (*BHRET36*) that are very high compared to other firms. That high growth firms have high returns and high profitability in the year that we rank on growth is likely related to these firms deciding to pursue a policy of high growth (Jensen (1986)). For all of these high/low growth firm characteristic comparisons, with the exception of past 6-month returns and leverage, the spreads in characteristics across deciles 1 and 10 are statistically significant.

II. Results

A. Cross-Sectional Tests

After assigning firms to one of 10 deciles based on annual asset growth rates, we calculate monthly returns for EW and VW portfolios for the next 12 months (from July of year t to June of year $t+1$). For both types of portfolios, we form portfolios using all stocks and form portfolios that control for firm capitalization. To control for firm capitalization, we rank firms into one of three groups in June of year t using the 30$^{\text{th}}$ and 70$^{\text{th}}$ NYSE market equity percentiles in June of year t. For each capitalization group (small, medium, and large) we then assign firms to one of 10 deciles based on annual asset growth rates, and form EW and VW portfolios for the next 12 months. We report EW portfolio returns to allow us to compare our results with the many previous cross-sectional return studies that employ EW. However, to ensure that our results are not being driven primarily by the returns to small firms in the EW portfolios, we report VW and capitalization-segmented portfolios.

After forming the portfolios, we obtain a time series of returns to each portfolio from July 1968 to June 2003. To examine the long-run return effects of sorting on asset growth, we report the average growth rates and the raw returns to the growth-sorted portfolios in Table II in event time (5 years prior to and 5 years following the date of portfolio formation).[10] We also report Fama and

[9] The average correlation between asset growth and book-to-market in our sample is −0.182, and the correlation between asset growth and market capitalization is 0.02.

[10] In Table II, Panel A, the reported year −1 value of average asset growth rates is obtained from the change in total assets from fiscal year-end $t-2$ to $t-1$, the reported year 1 value of the average asset growth rates is obtained from the change in total assets from fiscal year-end $t-1$ to t, etc. In Panels B.1 and B.2, year −1 reports the portfolio returns over July ($t-1$)–June (t) and year 1 reports the portfolio returns over July (t)–June ($t+1$).

Table II
Asset Growth Decile Portfolio Returns and Characteristics in Event Time

At the end of June of each year t over 1968 to 2002, stocks are allocated into deciles based on asset growth rates defined as the percentage change in total assets from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$. Equal- and value-weighted portfolios are formed based on June(t) asset growth decile cutoffs. The portfolios are held for 1 year, from July of year t to June of year $t+1$, and then rebalanced. Portfolio return statistics are reported every year for 10 years around the portfolio formation year (t) over the period of July 1968 to June of 2003. Panel A reports average annual asset growth rates. Panel B.1 reports average monthly raw returns to equal-weighted portfolios and Panel B.2 reports average monthly raw returns to value-weighted portfolios. Panel C.1 reports three-factor alphas of the equal-weighted portfolios and Panel C.2 reports three-factor alphas of the value-weighted portfolios for all firms and for three size-sorted groups. The size groups are defined by ranking firms into one of three groups (small, medium, and large) using the 30th and 70th NYSE market equity percentiles in June of year t. Panel D.1 reports subperiod three-factor alphas of the equal-weighted portfolios and Panel D.2 reports subperiod three-factor alphas of the value-weighted portfolios. In Panel A, the year -1 row reports the asset growth rates from fiscal year ending in calendar year $t-2$ to $t-1$, year 1 reports the asset growth rates from fiscal year ending in calendar year $t-1$ to t, etc. In Panel B, the year -1 row reports the portfolio returns over July ($t-1$)–June (t) and year 1 reports the portfolio returns over July (t)–June ($t+1$). In Panel B, [−5,−1] ([1, 5]) is the cumulative portfolio return over the 5 years prior (after) the portfolio formation period. All numbers, with the exception of the t-statistics, are in decimal form, that is 0.01 is 1%.

Panel A: Average Annual Asset Growth Rates

	Asset Growth Deciles											
YEAR	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
−5	0.0762	0.0771	0.0800	0.0783	0.0845	0.0924	0.102	0.1148	0.1191	0.1023	0.0260	5.04
−4	0.0686	0.0704	0.0723	0.0756	0.0841	0.0937	0.1041	0.1177	0.1320	0.1158	0.0472	7.34
−3	0.0595	0.0544	0.0641	0.0700	0.0792	0.0960	0.1097	0.1306	0.1483	0.1401	0.0805	8.61
−2	−0.0009	0.0257	0.0423	0.0579	0.0727	0.0930	0.1141	0.1442	0.1818	0.2143	0.2152	26.05
−1	−0.2115	−0.0679	−0.0079	0.0319	0.0661	0.1025	0.1480	0.2168	0.3529	0.8357	1.0471	15.60
1	−0.0225	0.0078	0.0332	0.0532	0.0719	0.0906	0.1098	0.1328	0.1580	0.1693	0.1918	23.33
2	0.0249	0.0305	0.0445	0.0590	0.0707	0.0832	0.0947	0.1071	0.1137	0.1076	0.0827	9.41
3	0.0444	0.0440	0.0508	0.0590	0.0692	0.0759	0.0875	0.0909	0.0989	0.0870	0.0426	7.49
4	0.0584	0.0503	0.0549	0.0607	0.066	0.0728	0.0786	0.0887	0.0927	0.0782	0.0198	3.86
5	0.0554	0.0561	0.0583	0.0622	0.0667	0.0708	0.0797	0.0832	0.0869	0.0767	0.0213	3.81

(continued)

Table II—*Continued*

Panel B: Raw Return Portfolios

Panel B.1: Equal-Weighted Portfolio Average Monthly Raw Returns

Asset Growth Deciles

YEAR	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
−5	0.0096	0.0096	0.0099	0.0114	0.0126	0.0144	0.0161	0.0172	0.0198	0.0188	0.0092	7.57
−4	0.0065	0.0069	0.0085	0.0101	0.0116	0.0138	0.0158	0.0193	0.0215	0.0246	0.0181	14.44
−3	0.0004	0.0033	0.0066	0.0093	0.0124	0.0133	0.0162	0.0203	0.0262	0.0349	0.0345	21.53
−2	−0.0064	0.0016	0.0052	0.0087	0.0106	0.0132	0.0159	0.0195	0.0260	0.0386	0.0450	18.80
−1	0.0131	0.0119	0.0121	0.0125	0.0125	0.0132	0.0125	0.0128	0.0113	0.0104	−0.0026	−1.08
1	0.0199	0.0176	0.0154	0.0141	0.0134	0.0124	0.0118	0.0114	0.0085	0.0026	−0.0173	−8.45
2	0.0159	0.0159	0.0141	0.0138	0.0137	0.0132	0.0138	0.0128	0.0119	0.0076	−0.0083	−4.67
3	0.0176	0.0173	0.016	0.0147	0.0145	0.0144	0.0143	0.0140	0.0137	0.0124	−0.0053	−3.79
4	0.0169	0.016	0.0154	0.0141	0.0138	0.0136	0.0132	0.0125	0.0134	0.0127	−0.0042	−3.14
5	0.0167	0.0167	0.0161	0.0143	0.0138	0.0135	0.0133	0.0132	0.0133	0.0134	−0.0033	−2.41
Cumulative Return												
[−5,−1]	0.3157	0.5054	0.6963	0.9000	1.0833	1.3169	1.5596	1.9929	2.6093	3.7079	3.3922	10.52
[1, 5]	1.6507	1.6201	1.4535	1.3156	1.2562	1.1745	1.1601	1.1008	1.0079	0.7708	−0.8799	−8.63

Panel B.2: Value-Weighted Portfolio Average Monthly Raw Returns

	Asset Growth Deciles											
YEAR	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
−5	0.0121	0.0123	0.0117	0.0129	0.0142	0.0146	0.0165	0.0207	0.0243	0.0271	0.0150	7.55
−4	0.0114	0.0109	0.0119	0.0131	0.0128	0.0146	0.0172	0.0202	0.0288	0.0307	0.0193	9.15
−3	0.0064	0.0085	0.0100	0.0123	0.0143	0.0151	0.0157	0.0212	0.0279	0.0357	0.0292	10.92
−2	0.0062	0.0083	0.0090	0.0116	0.0135	0.0149	0.017	0.0206	0.0266	0.0396	0.0334	12.86
−1	0.0223	0.0175	0.0153	0.0146	0.0147	0.0141	0.0153	0.0177	0.0192	0.0230	0.0007	0.28
1	0.0148	0.0124	0.0122	0.0116	0.0100	0.0100	0.0102	0.0092	0.0077	0.0043	−0.0105	−5.04
2	0.0133	0.0126	0.0125	0.0101	0.0109	0.0102	0.0098	0.0097	0.0097	0.0065	−0.0068	−3.39
3	0.0169	0.0137	0.0141	0.0126	0.0102	0.0112	0.0116	0.0105	0.0116	0.0116	−0.0053	−2.82
4	0.0132	0.0107	0.012	0.0109	0.0114	0.0103	0.0103	0.0123	0.0111	0.0120	−0.0012	−0.61
5	0.0128	0.0133	0.0121	0.0123	0.0103	0.01	0.0107	0.0113	0.013	0.0126	−0.0002	−0.11
	Cumulative Return											
[−5,−1]	1.0449	0.9918	1.0078	1.2375	1.3631	1.4788	1.7985	2.5321	3.9221	6.4272	5.3822	4.78
[1, 5]	1.2879	1.1133	1.1305	1.0038	0.931	0.8934	0.9352	0.9056	0.9458	0.7911	−0.4967	−4.25

(continued)

Table II—*Continued*

Panel C. Equal- and Value-Weighted Portfolio Fama–French Alphas in Year 1 by Size Groups

Panel C.1: Equal-Weighted Portfolio Fama–French Monthly Alphas

	Asset Growth Deciles											
	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
All Firms	0.0076	0.006	0.0035	0.0026	0.002	0.0013	0.0006	0.0003	−0.0026	−0.0087	−0.0163	−8.33
Small size	0.0081	0.0067	0.0044	0.003	0.0027	0.0012	0.0002	0.0001	−0.0033	−0.0096	−0.0177	−9.12
Medium size	−0.0004	0.0007	0.0010	0.0010	0.0011	0.0010	0.0010	0.0002	−0.0016	−0.0064	−0.0060	−2.85
Large size	0.0044	0.0011	0.0003	0.0014	0.0005	0.0001	0.0005	0.0011	−0.001	−0.0041	−0.0086	−3.12

Panel C.2: Value-Weighted Portfolio Fama–French Monthly Alphas

	Asset Growth Deciles											
	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
All Firms	0.0024	0.0013	0.0013	0.0017	0.0003	0.0006	0.0015	0.0013	−0.0001	−0.0046	−0.007	−3.84
Small size	0.0005	0.0020	0.0013	0.0016	0.0015	0.0007	−0.0009	−0.0006	−0.0043	−0.0109	−0.0114	−6.46
Medium size	−0.0002	0.0003	0.001	0.0005	0.0008	0.0008	0.0013	0.0004	−0.0012	−0.0057	−0.0055	−2.45
Large size	0.0052	0.0018	0.0013	0.0019	0.0003	0.0005	0.0018	0.0015	0.0008	−0.0028	−0.0081	−2.91

Panel D. Equal- and Value-Weighted Asset Growth Decile Portfolio Fama–French Alphas in Year 1 by Subperiods

Panel D.1: Equal-Weighted Portfolio Fama–French Monthly Alphas

	Asset Growth Deciles											
Period	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
1968–1980	0.004	0.0038	0.0025	0.0027	0.0023	0.0006	0.0005	0.001	0.0004	−0.0031	−0.0071	−3.87
1981–1990	0.0016	0.0013	0.0011	0.0018	0.0017	0.0026	0.0008	−0.0001	−0.0038	−0.0118	−0.0134	−4.80
1991–2003	0.0146	0.0117	0.0068	0.0043	0.0029	0.0018	0.0016	0.0008	−0.0045	−0.0123	−0.027	−6.62

Panel D.2: Value-Weighted Portfolio Fama–French Monthly Alphas

	Asset Growth Deciles											
Period	1(Low)	2	3	4	5	6	7	8	9	10(High)	Spread (10-1)	t(spread)
1968–1980	0.003	0.0029	0.002	0.0016	−0.0002	0.0005	−0.0001	0.0003	0.0004	−0.0005	−0.0035	−1.69
1981–1990	0.0006	−0.0001	0.0022	0.0025	0.0005	0.0018	0.0018	0.0001	−0.0009	−0.0059	−0.0066	−2.51
1991–2003	0.0037	0.001	0.001	0.0017	0.001	0.0005	0.0035	0.0031	0.0002	−0.007	−0.0107	−2.52

French (1993) three-factor alphas for the asset growth decile portfolios, but to save space in the tables we only report the alpha results for the first year after portfolio formation (we discuss the event-time alpha results in the text). For most of our portfolio tests throughout the paper, we concentrate on pricing errors from the three-factor model. Using the three-factor model's pricing errors to make inferences about growth (instead of solely examining raw returns) is important, since spreads in raw returns from the asset growth-sorted portfolios are likely to be explained somewhat by the size and BM factors. Throughout the paper, our null is based on the initial assumption that the three-factor model does an adequate job of explaining expected returns associated with firm growth.[11] Thus, statistically significant nonzero intercepts from the three-factor model serve as preliminary evidence of mispricing that merits further scrutiny in the paper.

Before we examine returns, we note that there is strong persistence in firm asset growth rates and returns prior to the sorting year. In Panel A of Table II, high growth firms experience consistently higher growth relative to the low growth firms, over the 4 years prior to sorting: In years –2, –3, –4, and –5, the spread in annual growth rates between high and low growth firms is a significant 21.5%, 8.1%, 4.7%, and 2.6%, respectively. This spread may be fueled by higher returns to the high growth firms over this period relative to the low growth firms. In years –2, –3, –4, and –5, as reported in Panel B.2 of Table II, the average VW monthly return spread between high and low growth firms is a significant 3.34%, 2.92%, 1.93%, and 1.50%, respectively. Especially notable are the large return spreads (and high returns to decile 10 growth firms) in years –2 and –3, quite likely providing the impetus for large future increases in assets to these decile 10 firms. One might ask whether the high return performance of the high growth rate firms continues after the portfolio formation year.

This question is answered in Panels B.1 and B.2 of Table II. Conditioning on growth rates creates a large and economically significant dispersion in average returns across the 10 portfolios in the year after portfolio formation, but in the opposite direction from the preranking period relation between growth and returns. In Panel B.1, during the year after sorting on growth (the "YEAR 1" row in the tables), the low growth firms (decile 1) earn average EW portfolio monthly returns of 1.99% and the high growth firms earn returns of 0.26%, a monthly spread of –1.73% (t-statistic = –8.45). The negative relation between growth and returns is perfectly monotonic across all 10 deciles, with decile 2 growth firms earning 1.76% per month, which smoothly decreases to 0.85% per month for decile 9 firms. Using VW to form the portfolios (Panel B.2), the low growth firms (decile 1) earn average monthly returns of 1.48% and the high growth firms earn returns of 0.43%, a monthly spread of –1.05% (t-statistic = –5.04).

[11] For example, Berk, Green, and Naik's (1999) model implies that BM and size are sufficient statistics for the aggregate risk of assets in place. In their model, book-to-market equity summarizes risk related to assets in place and changes in a firm's asset portfolio over time lead to an explanatory role for market value because these changes alter the relative importance of a firm's growth options.

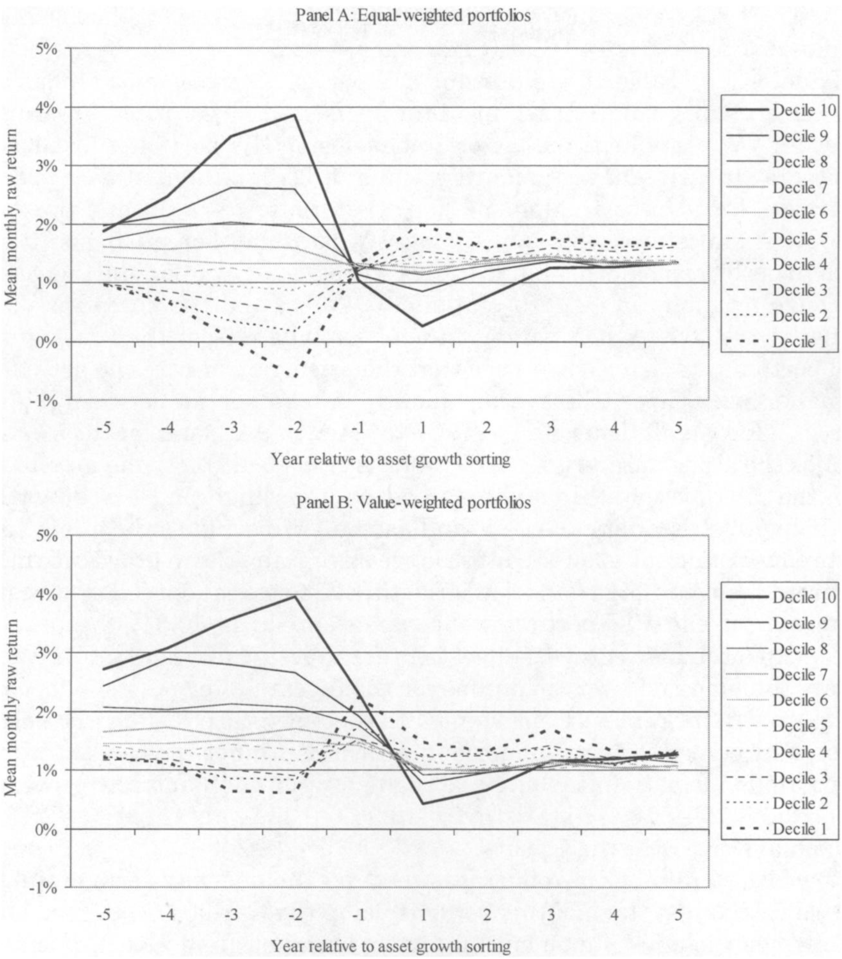

Figure 2. Mean returns for asset growth deciles in event time. At the end of June of each year from 1968 to 2002, stocks are allocated into deciles based on asset growth rates defined as the percentage change in total assets from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$. Equal-weighted (Panel A) and value-weighted (Panel B) portfolio return statistics are reported every year for 10 years around the portfolio formation year (t) over the period of July 1968 to June 2003. Monthly average returns to the portfolios formed in June (t) and held over the July(t)–June($t+1$) are reported on the x-axis labeled as Year 1, over the July($t+1$)–June($t+2$) period are reported on the x-axis labeled as Year 2, over the July($t-1$)–June(t) period are reported on the x-axis labeled as Year -1, etc.

The negative relation between growth and returns continues in years 2 through 5 after portfolio formation, as is illustrated in Figure 2. For both the EW and VW portfolios, the spreads between low growth and high growth firms are strong. In the last rows of Table II, Panels B.1 and B.2, we report the cumulative year 1 to year 5 spread between decile 1 and decile 10 firms. The difference in returns between high and low growth firms for the EW portfolios is –87.99%

(t-statistic = –8.63) over the 5 years after first forming the portfolios; using VW portfolios, the spread is –49.67% (t-statistic = –4.25).

In Panel C.1 of Table II, we present EW portfolio three-factor alphas separately for all firms, small firms, medium firms, and large firms. In Panel C.2 we present VW portfolio three-factor alphas. Using EW portfolios for all firms, the low growth firms have a monthly alpha of 0.76% (t-statistic = 3.28), the high growth firms have an alpha of –0.87 (t-statistic = –5.81), and the spread is −1.63% (t-statistic = −8.33).[12] Using VW portfolios for all firms, the low growth firms have a monthly alpha of 0.24% (t-statistic = 1.65), the high growth firms have an alpha of –0.46 (t-statistic = −3.74), and the spread is –0.70% (t-statistic = −3.84). When we examine the robustness of the asset growth-sorted portfolios to firm size, we see that the pricing errors are the greatest for the smaller-sized firms (the average monthly alpha spread between high and low growth EW small firms is –1.77% (t-statistic = –9.12) and for the VW small portfolios the alpha spread is –1.14% (t-statistic = –6.46)). For the medium size group, the average monthly alpha spread between high and low growth EW firms is –0.60% (t-statistic = –2.85) and for the VW portfolios the alpha spread is –0.55% (t-statistic = –2.45). For the large size group, the average monthly alpha spread between high- and low growth EW firms is –0.86% (t-statistic = −3.12) and for the VW portfolios the alpha spread is –0.81% (t-statistic = −2.91). Thus, the asset growth effect is present across all size groups. We also estimate the long-run average alphas for the 5 years after portfolio formation (not reported in the tables). Consistent with the raw return results, the negative relation between growth and abnormal returns continues in years 2 through 5 after portfolio formation; the alpha spread between high and low growth EW VW portfolios is –0.73%, t-statistic = −10.96 (–0.39%, t-statistic = –2.73) per month on average over the 5 years.

We perform a number of robustness tests on the one-way sorts of Table II. First, we risk adjust the monthly returns using the Carhart (1997) four-factor model, which includes a momentum factor (obtained from Ken French's web page). The results are similar to the three-factor alpha results: In the year after sorting, the average monthly alpha spread between high and low growth EW VW portfolios is −1.48%, t-statistic = −7.45 (–0.60%, t-statistic = –2.84). The four-factor results are robust across the size groupings. For example, for large firms, the average monthly alpha spread between high and low growth EW VW portfolios is –0.81%, t-statistic = –2.91 (–0.63%, t-statistic = –2.13). We also perform various screens using June price per share (excluding stocks priced below \$3 or \$5 per share), screens on fiscal year-end total assets (excluding firm years with less than \$10M in assets), and sorts based on the end of March, and find that our inferences are unchanged: High growth firms earn lower future returns than do low growth firms.

[12] The t-statistics that compare the alpha estimates of the extreme deciles are estimated via the "delta method" (Greene (1997), Theorem 4.16, p. 124). For these extreme decile portfolios, we estimate the three-factor alphas and their covariance matrix jointly using GMM with a robust heteroskedasticity and autocorrelation consistent covariance estimator. The asymptotic distribution of the difference between the alphas of the two series is given in Theorem 4.16 of Greene (1997).

We also form portfolios omitting those firms that have experienced an equity offering or acquisition around the portfolio formation year. We do this to determine whether our results are simply demonstrating the well-documented long-run equity offering or acquisition effects. We use the Thomson Financial Global New Issues Data set to identify firms involved in an equity offering (either an IPO and/or SEO) or acquisition during year $t-1$ and discard the respective firm-years over years $t-1$ to $t+2$ from the sample. There is still a large and statistically significant spread in both EW and VW raw returns and three-factor alphas across all three size groups. For example, the average monthly alpha spread between high and low growth large firm VW portfolios is –0.92%, t-statistic = –3.72. Thus, the asset growth effect does not appear to be subsumed by the long-run return effects related to seasoned equity offerings, IPOs, or acquisitions.

To examine consistency in the asset growth effect over time, we examine the annual returns in the 12 months after portfolio formation for each of the 35 years in our sample period. In Figure 3 we plot the annual Year 1 returns for EW and VW portfolios of asset growth decile 1 (low growth) and decile 10 (high growth). We also plot the spread between these two series (the bold line), which is simply the difference between low growth and high growth portfolio returns. The graph shows that returns of low growth firms consistently exceed those of high-growth firms, particularly for the EW portfolios. Over our 35-year sample period, for the EW portfolio, the spread between low growth and high growth firms is positive in all but 3 years. In the years that the spread is negative (1984, 1985, 1996), it is so by only a small amount (–1%, –5%, –2%). To rephrase the result, over this 35-year period, low growth firms outperformed high growth EW portfolio firms on an annual basis 91% of the years. The effect is also consistent (but less so) based on value weighting with low growth firm returns beating high growth firm returns in 71% of the years. We more formally examine consistency in the asset growth effect in Panel D of Table II where we report results decade-by-decade for EW portfolios (Panel D.1) and VW portfolios (Panel D.2) in the first year after portfolio formation. For both the EW and VW portfolios, the three-factor alpha spreads between low and high growth portfolios are negative and statistically significant in all three subperiods (1968 to 1980, 1981 to 1990, and 1991 to 2003), with the exception of the VW spread portfolio from 1968 to 1980 being less significant (alpha = –0.35%, t-statistic = –1.69) than in other subperiods. Interestingly, the asset growth effect is not decreasing in strength over time, as evidenced by the fact that the spread is strongest in the last subperiod (1991 to 2003).

The overall conclusion from the one-way sorts is that asset growth rates are a strong predictor of future returns. This finding is consistent with papers showing that firm growth should be fundamentally linked to lower expected returns (Berk, Green, and Naik (1999), Gomes, Kogan, and Zhang (2003), Carlson, Fisher, and Giammarino, (2004), Anderson and Garcia-Feijoo (2006), Fama and French (2006), and others). However, we also document that firm growth is a powerful and robust predictor of future *abnormal* returns (at least as measured by the three- and four-factor models), which is consistent with the previous literature linking corporate growth-related decisions to various forms of mispricing

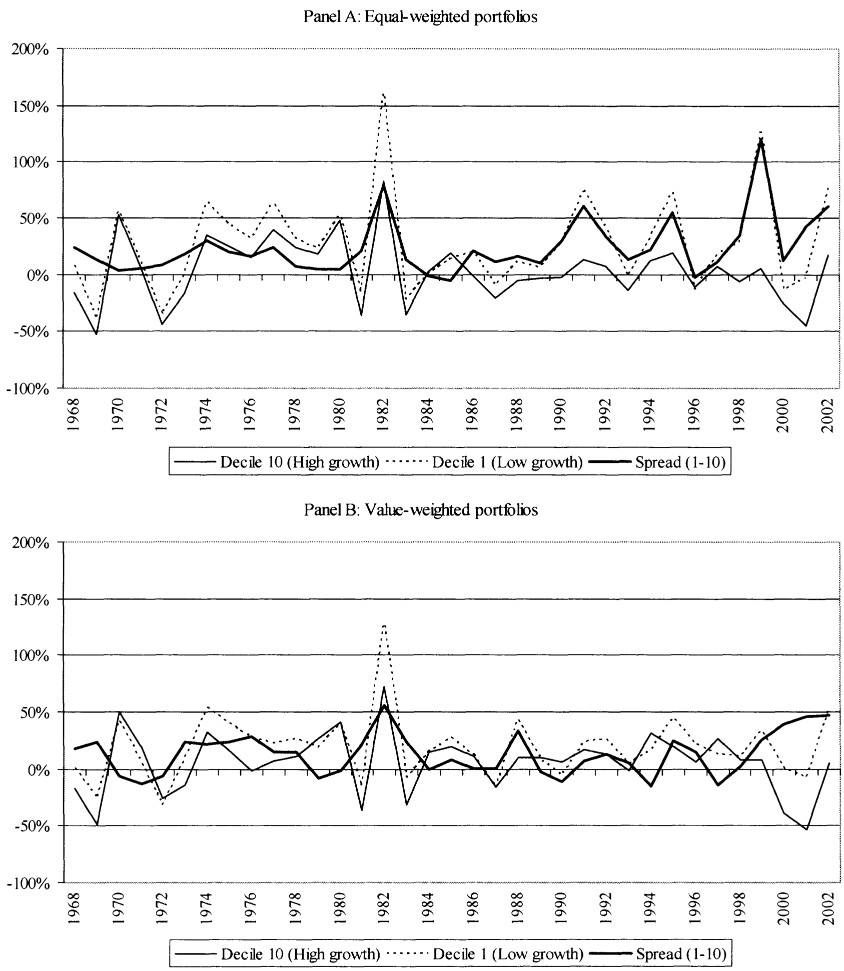

Figure 3. Time series of annual returns for asset growth portfolios. The figure plots the annual buy-and-hold return for equal-weighted (Panel A) and value-weighted (Panel B) portfolios sorted by past asset growth rates. Decile 1 refers to firms in the lowest asset growth decile and decile 10 refers to firms in the highest asset growth decile. The spread is the difference between the returns of the low growth stocks and those of the high growth stocks.

(Agrawal, Jaffe, and Mandelker (1992), Ikenberry, Lakonishok, and Vermaelen (1995), Loughran and Ritter (1995), Rau and Vermaelen (1998), Titman, Wei, and Xie (2004), and others).

B. Comparing the Asset Growth Effect to Other Important Determinants of the Cross-Section

In this section we perform Fama and MacBeth (1973) cross-sectional regressions of annual firm stock returns on asset growth and other firm characteristics. We seek to determine if the asset growth effect is merely a manifestation of other important determinants of the cross-section of returns. We compete asset growth with a base set of control variables that include firm BM equity, capitalization, 6-month lagged returns, and 36-month lagged returns (DeBondt and Thaler (1985), Fama and French (1992), and Jegadeesh and Titman (1993)). We also consider other recently documented growth rate-related determinants of the cross-section such as accruals (Sloan (1996), Hirshleifer et al. (2004), and Zhang (2006)), capital investment (Titman, Wei, and Xie (2004) and Anderson and Garcia-Feijoo (2006)), and growth rates in sales (Lakonishok, Shleifer, and Vishny (1994)). To mitigate the potential effects of possible microstructure biases emanating from the use of CRSP monthly closing prices, we use geometrically compounded annual firm returns (instead of the typical monthly returns) as the dependent variable in the cross-sectional regressions. To be included in any regression, firms must have nonmissing data for the following variables in our base model: BM equity, capitalization, 6-month lagged returns, and asset growth. We exclude all firms with negative book value in year $t-1$. As with the one-way sorts, we perform the regressions on all firms, and on small, medium, and large size-sorted groups. The standard errors from the regressions are adjusted for autocorrelation in the beta estimates.[13] We discuss results first for asset growth and the base set of control variables, and then for asset growth and the other growth-related variables.

In model 1 of Table III, Panel A, we report the results of multiple regressions on all firms. Asset growth is not subsumed by the other important determinants of the cross-section, and in fact appears to be the strongest determinant, in terms of t-statistics, of the cross-section of annual returns relative to book-to-market (*BM*), capitalization (*MV*), lagged 6-month returns (*BHRET6*), and lagged 36-month returns (*BHRET36*). The coefficient on asset growth is strongly statistically significant, with a t-statistic of –6.52, confirming the strong negative and economically significant relation between growth and returns from the one-way sorts of Table II. In model 2, the coefficient on the growth rate from the prior year (*L2ASSETG*, which is the asset growth rate from year -3 to -2) is also significant. There are no real surprises on the coefficients of the base set of control variables; the coefficient on book-to-market (*BM*) is strongly significant, but capitalization (*MV*) and lagged 6-month returns (*BHRET6*), while exhibiting the expected sign on the coefficients (negative and positive, respectively), are less significant than BM.

[13] The resulting parameter estimates are time-series averages of annual regression coefficient estimates. The statistical significance is ascertained by using the standard errors of the time-series averages of the regression parameters. Since the existence of autocorrelation in the parameter estimates from year-by-year regressions would bias the statistical significance, we adjust the standard errors of the average slopes to control for autocorrelation. The autocorrelation adjustment is made by adjusting the standard errors for first-order autocorrelation by multiplying the standard errors of the average parameters by $\sqrt{\frac{(1+\rho)}{(1-\rho)}}$, where ρ is the first-order autocorrelation in yearly parameter estimates. The t-statistics in Tables III and IV reflect this first-order autocorrelation correction. Similar adjustments are done in Lakonishok and Lee (2001), Fama and French (2002), Chakravarty, Gulen, and Mayhew (2004), and others.

Table III

Fama–MacBeth Regressions of Annual Stock Returns on Asset Growth and Other Variables

Annual stock returns from July 1968 to June 2003 are regressed on lagged accounting and return-based variables. *BM* (book-to-market ratio) is calculated using the Compustat data in the fiscal year ending in calendar year $t-1$ and is defined as in Davis, Fama, and French (2000). *MV* is the June(t) market value, *BHRET6* is the buy-and-hold return over January(t)–June(t), *BHRET36* is the 36-month buy and hold return over July($t-3$) to June(t), *CI* is the measure of abnormal capital investment as defined in Titman, Wei, and Xie (2004), *L2ASSETG* is the asset growth defined as the percentage change in total assets from the fiscal year ending in calendar year $t-3$ to fiscal year ending in calendar year $t-2$, *ASSETG* is the asset growth defined as the percentage change in total assets from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$, *5YASSETG* is a 5-year weighted average rank of asset growth, and *5YSALESG* is a 5-year weighted average rank of growth rate in sales. *ACCRUALS* is from Sloan (1996) and *NOA/A* is net operating assets divided by total assets adjusted from Hirshleifer, Hou, Teoh, and Zhang (2004). More details on the construction of these variables are provided in the Appendix. Size groups are defined by ranking firms into one of three groups (small, medium, and large) using the 30th and 70th NYSE market equity percentiles in June of year t. Panel A reports regressions for all firms, and Panels B, C, and D report regressions for small, medium, and large firms, respectively. Beta estimates are time-series averages of cross-sectional regression betas obtained from annual cross-sectional regressions. The t-statistics, in parentheses, are adjusted for autocorrelation in the beta estimates.

Panel A. All Firms

Model		Constant	ASSETG	L2ASSETG	BM	MV	BHRET6	BHRET36	5YSALESG	CI	NOA/A	ACCRUALS	5YASSETG
1	Beta	0.1373	−0.0922	.	0.029	−0.0044	0.0248	0.0056	.		.	.	.
	t-stat	(4.55)	(−6.52)	.	(3.40)	(−1.57)	(1.09)	(0.57)	.		.	.	.
2	Beta	0.1423	−0.0874	−0.0312	0.0276	−0.0044	0.0234	0.0062	.		.	.	.
	t-stat	(4.65)	(−6.76)	(−2.25)	(3.32)	(−1.58)	(1.06)	(0.62)	.		.	.	.
3	Beta	0.1378	−0.0893	.	0.0281	−0.0043	0.0241	0.0055	−0.0041		.	.	.
	t-stat	(3.79)	(−7.41)	.	(3.52)	(−1.57)	(1.11)	(0.55)	(−0.27)		.	.	.
4	Beta	0.1378	−0.0868	.	0.029	−0.0044	0.024	0.0058		−0.0072	.	.	.
	t-stat	(4.55)	(−6.05)	.	(3.38)	(−1.60)	(1.06)	(0.58)		(−3.32)		.	.
5	Beta	0.2058	−0.0918	.	0.0322	−0.0046	0.0249	0.0044	.		−0.1109	.	.
	t-stat	(4.25)	(−6.10)	.	(3.75)	(−1.62)	(1.11)	(0.45)	.		(−2.43)	.	.
6	Beta	0.1223	−0.0704	.	0.0347	−0.0045	0.0122	0.0046	.		.	−0.1785	.
	t-stat	(3.89)	(−5.24)	.	(4.22)	(−1.59)	(0.41)	(0.44)	.	.	.	(−4.00)	.
7	Beta	0.1739	−0.0839	.	0.0245	−0.0041	0.0229	0.0049	.	.	.	.	−0.0275
	t-stat	(5.43)	(−6.98)	.	(3.14)	(−1.50)	(1.03)	(0.48)	.	.	.	.	(−2.22)

Table III—*Continued*

Panel B. Small Size Firms													
Model		Constant	ASSETG	L2ASSETG	BM	MV	BHRET6	BHRET36	5YSALESG	CI	NOA/A	ACCRUALS	5YASSETG
1	Beta	0.1781	−0.0944	.	0.0236	−0.4243	0.0157	−0.0023	.	.	.	.	.
	t-stat	(3.78)	(−5.18)	.	(2.20)	(−1.47)	(0.72)	(−0.20)	.	.	.	.	.
2	Beta	0.1839	−0.0871	−0.0414	0.0222	−0.4136	0.0143	−0.002	.	.	.	.	.
	t-stat	(3.86)	(−5.57)	(−2.25)	(2.10)	(−1.44)	(0.66)	(−0.18)	.	.	.	.	.
3	Beta	0.1728	−0.0933	.	0.0227	−0.4046	0.0148	−0.0025	−0.0013	.		.	.
	t-stat	(3.57)	(−5.77)	.	(2.19)	(−1.40)	(0.67)	(−0.23)	(−0.11)	.		.	.
4	Beta	0.1803	−0.0867	.	0.0233	−0.4472	0.0154	−0.0016		−0.008	.	.	.
	t-stat	(3.82)	(−4.64)	.	(2.18)	(−1.54)	(0.71)	(−0.14)		(−3.67)	.	.	.
5	Beta	0.2387	−0.0932	.	0.0265	−0.4087	0.0153	−0.0029	.		−0.1007	.	.
	t-stat	(3.86)	(−4.91)	.	(2.48)	(−1.40)	(0.70)	(−0.27)	.		(−2.09)	.	.
6	Beta	0.1588	−0.0711	.	0.0289	−0.3165	−0.0136	−0.0021	.	.	.	−0.2015	.
	t-stat	(3.12)	(−4.51)	.	(2.41)	(−0.90)	(−0.43)	(−0.22)	.	.	.	(−3.40)	.
7	Beta	0.2056	−0.0895	.	0.0211	−0.385	0.0132	−0.0038	.	.	.	.	−0.0239
	t-stat	(4.62)	(−5.33)	.	(2.14)	(−1.25)	(0.59)	(−0.35)	.	.	.	.	(−2.20)

(continued)

Table III—*Continued*

Panel C. Medium Size Firms

Model		Constant	ASSETG	L2ASSETG	BM	MV	BHRET6	BHRET36	5YSALESG	CI	NOA/A	ACCRUALS	5YASSETG
1	Beta	0.1243	−0.0793	.	0.0229	−0.0618	0.0667	0.0138	.	.	.	.	.
	t-stat	(3.71)	(−3.80)	.	(1.50)	(−1.26)	(1.63)	(1.42)	.	.	.	.	.
2	Beta	0.1242	−0.0795	−0.0083	0.0232	−0.06	0.0624	0.0153	.	.	.	.	.
	t-stat	(3.67)	(−3.97)	(−0.31)	(1.53)	(−1.18)	(1.51)	(1.60)	.	.	.	.	.
3	Beta	0.1164	−0.0777	.	0.0235	−0.0593	0.0666	0.0132	−0.0005	.		.	.
	t-stat	(2.77)	(−3.55)	.	(1.64)	(−1.21)	(1.65)	(1.25)	(−0.02)	.		.	.
4	Beta	0.1254	−0.0739	.	0.0229	−0.0679	0.065	0.0141		−0.0139	.	.	.
	t-stat	(3.78)	(−3.76)	.	(1.49)	(−1.34)	(1.58)	(1.43)		(−1.79)	.	.	.
5	Beta	0.1768	−0.0764	.	0.0302	−0.0601	0.0666	0.0133	.		−0.0881	.	.
	t-stat	(4.28)	(−3.63)	.	(2.13)	(−1.23)	(1.66)	(1.37)	.		(−2.02)	.	.
6	Beta	0.1148	−0.0525	.	0.026	−0.0455	0.0677	0.0143	.	.	.	−0.1682	.
	t-stat	(3.37)	(−2.31)	.	(1.76)	(−0.90)	(1.44)	(0.97)	.	.	.	(−1.42)	.
7	Beta	0.138	−0.0765	.	0.0198	−0.0616	0.0656	0.013	.	.	.	.	−0.0163
	t-stat	(3.60)	(−3.63)	.	(1.40)	(−1.24)	(1.63)	(1.22)	.	.	.	.	(−0.97)

Panel D. Large Size Firms

Model		Constant	ASSETG	L2ASSETG	BM	MV	BHRET6	BHRET36	5YSALESG	CI	NOA/A	ACCRUALS	5YASSETG
1	Beta	0.1015	−0.0594	.	0.0106	−0.0007	0.0651	0.0147	.	.	.	.	.
	t-stat	(4.74)	(−3.60)	.	(0.58)	(−0.84)	(1.55)	(2.21)	.	.	.	.	.
2	Beta	0.1058	−0.0544	−0.0455	0.008	−0.0007	0.0632	0.0156	.	.	.	.	.
	t-stat	(4.92)	(−4.32)	(−1.27)	(0.45)	(−0.81)	(1.45)	(2.40)	.	.	.	.	.
3	Beta	0.1045	−0.0562	.	0.0103	−0.0007	0.067	0.0142	−0.0132	.		.	.
	t-stat	(3.30)	(−4.59)	.	(0.65)	(−0.84)	(1.65)	(2.14)	(−0.68)	.		.	.
4	Beta	0.1005	−0.0557	.	0.0105	−0.0008	0.0615	0.0157		−0.0039	.	.	.
	t-stat	(4.66)	(−3.23)	.	(0.56)	(−0.87)	(1.52)	(2.39)		(−0.41)	.	.	.
5	Beta	0.1744	−0.0612	.	0.0187	−0.001	0.0686	0.0124	.		−0.1184	.	.
	t-stat	(4.18)	(−3.76)	.	(1.18)	(−1.12)	(1.70)	(1.95)	.		(−2.54)	.	.
6	Beta	0.0952	−0.0633	.	0.0134	−0.0006	0.0622	0.0064	.	.	.	−0.1182	.
	t-stat	(4.25)	(−2.39)	.	(0.72)	(−0.61)	(1.59)	(0.68)	.	.	.	(−0.96)	.
7	Beta	0.1234	−0.0469	.	0.0048	−0.0007	0.0669	0.0123	.	.	.	.	−0.0291
	t-stat	(2.93)	(−3.79)	.	(0.30)	(−0.79)	(1.65)	(1.74)	.	.	.	.	(−1.07)

In Panels B, C, and D we report the regressions for the small, medium, and large groups, respectively. Across the size groups for the base regression specification model 1, the t-statistics corresponding to the coefficient on asset growth are –5.18 for small firms, –3.80 for medium firms, and –3.60 for large firms. Thus, the coefficient on asset growth is robust across size groups, especially as compared to the lack of robustness for some of the established predictors of the cross-section. For example, the coefficient on *BM* is significant in almost all models within small firms, but is less significant within medium firms, and loses significance in all of the large firm models, and *MV* exhibits a similar decrease in significance from the small firm to the large firm regressions.

Next, we examine if the asset growth effect remains strong when we control for other important growth rate variables. In Table III Panel A, we estimate various annual return regression models using the base set of control variables, asset growth, and other growth-rate variables from the literature: 5-year growth rate in sales (*5YSALESG*) from Lakonishok, Shleifer, and Vishny (1994), growth in capital investment (*CI*) from Titman, Wei, and Xie (2004), *ACCRUALS* from Sloan (1996), and a cumulative accruals measure (net operating assets, *NOA/A*) adjusted from Hirshleifer et al. (2004).[14] We find that asset growth remains highly significant in models with the alternative growth rate variables; in Table III Panel A, with sales growth, the t-statistic for the coefficient on asset growth is –7.41 and the t-statistic for the coefficient on *5YSALESG* is –0.27; with capital investment, the t-statistic for the coefficient on asset growth is –6.05 and the t-statistic on the coefficient of *CI* is –3.32; with *NOA/A*, the t-statistic for the coefficient on asset growth is –6.10 and the t-statistic for the coefficient on *NOA/A* is –2.43; and finally, with accruals, the t-statistic for the coefficient on asset growth is –5.65 and the t-statistic for the coefficient on *ACCRUALS* is –4.00.

In Panels B, C, and D we present the same models on the small, medium, and large size groups. Again, asset growth is not subsumed by other growth rate variables; asset growth remains strongly statistically significant in all models across the size groups. In fact, asset growth appears to subsume many of the other growth-related variables, especially within the large firms: In the regressions with asset growth, capital investment is not significant for large size firms; 5-year growth rate in sales is not significant within any of the size groups; and the accrual effect is not significant within medium and large firms.

We also examine time horizon variations in the construction of our asset growth variable. The results thus far suggest that historical growth (that is, growth 2 years prior) is important in addition to our standard measure based on last year's growth. We introduce an additional variable to model long-term asset

[14] See the Appendix for details on the construction of these variables. We note that the Hirshleifer et al. measure is in fact mechanically correlated with our total asset growth measure. To identify this link, one can decompose the Hirshleifer et al. measure, Net Operating Assets/Lag Assets, into the product of two factors: cumulative accruals [Net Operating Assets/Assets (NOA/A)] and asset growth [Assets/Lag Assets]. In Table III, we use the first term of the decomposition [NOA/A] in the regressions with asset growth. Zhang (2006) shows how the accrual effect is indirectly related to various measures of real firm-level investment growth.

growth, a 5-year weighted average asset growth rank (*5YASSETG*), estimated from years $-2, -3, \ldots -5$, which is constructed in a similar manner to how Lakonishok, Shleifer, and Vishny (1994) construct their 5-year sales growth variable.[15] We skip year -1 in the construction of this variable to avoid built-in correlation with our 1-year asset growth variable. In Model 7 of Table III Panel A, the 1-year asset growth variable (*ASSETG*) retains its status as the most statistically significant predictor, and the 5-year growth rate coefficient is negative and significant, suggesting that the asset growth effect is robust to alternative time horizons in measuring growth.

As with the one-way sorts, we conduct a number of robustness tests for the regressions. We first examine subperiod stability of the coefficient estimates. We again divide the sample into three subperiods: 1968 to 1980, 1981 to 1990, and 1991 to 2003. Because of power issues with the annual regressions, we use monthly firm returns as the dependent variable for the subperiod regressions. In all three subperiods, the coefficients on asset growth are highly significant in all of the regression models. For example, the t-statistic for the asset growth coefficient in Model 1 is –3.98, –4.46, and –6.14 in the three periods, respectively. Compared to the other variables in Table III, asset growth is by far the most significant and consistent predictor across the subperiods. For example, the t-statistic for the coefficient on BM in Model 1 is 1.40, 2.12, and 2.23 in the three periods, respectively, and the t-statistic for the coefficient on *ACCRUALS* in Model 6 is –2.18, –1.44, and –3.08 in the three periods, respectively.

To examine the effects of outliers in the asset growth distribution, we winsorize the asset growth distribution at the 1% and 99% points of the distribution. Winsorizing the data has the effect of making the asset growth relationship stronger. In regression Model 1 of Panel A, the t-statistic for the coefficient on asset growth using the truncated data is –9.47 (without winsorizing, it is –6.52), the t-statistic on BM is 3.27, and the t-statistic on capitalization is –1.58.

To minimize the effects of possible microstructure biases emanating from the use of CRSP monthly closing prices in our regressions, we have thus far (with the exception of the subperiod analysis) presented results using annual returns as the dependent variable in the cross-sectional regressions. We also estimate monthly stock return regressions, and find that the results are similar to the annual return regressions; the t-statistic for the coefficient on asset growth in Table III Panel A Model 1 is –7.36. Again, asset growth is highly significant across the three size groups, and the significance of the other variables is qualitatively similar to the annual return results.[16]

[15] See the appendix for details of how we construct *5YASSETG*.

[16] We perform other robustness tests. We remove utilities (firms with four-digit SIC codes between 4900 and 4999) from the sample; the inferences are unchanged. We retain firms with negative book value of equity in the sample. The main effect of this is to make the coefficient on book-to-market much less significant (t-statistic $= 1.21$) in Model 1 of Panel A, but the coefficient on asset growth remains significant (t-statistic $= -6.02$). Finally, we toss out firm-year observations any time total assets are less than \$10 million; the t-statistics for the coefficients on book-to-market and asset growth are 2.63 and -6.00, respectively.

The overall message from the cross-sectional regressions is that asset growth is not subsumed by previously documented predictors of the cross-section of returns. In fact, firm annual asset growth rates appear to be the most important predictor of the cross-section of future returns; across the entire sample from 1968 to 2003, asset growth is hands down the strongest variable, in many cases obtaining t-statistics of more than twice those obtained by other previously documented predictors of the cross-section. Asset growth retains its forecasting ability even on large capitalization stocks, a subgroup of firms for which other documented predictors of the cross-section lose much of their predictive punch. In addition, asset growth is stronger than other previously documented firm growth rate variables. Of course, the various growth-related variables we examine in this section are subcomponents of total asset growth, so these results suggest that other components of asset growth, in addition to those captured in asset growth from the previous literatures' investment/growth rate variables, are also important. To shed further light on this, in the next section of the paper we decompose asset growth into the major balance sheet components related to a firm's investment and financing decisions.

C. Decomposing Asset Growth

Total asset growth captures the aggregate growth of a firm. We ask whether growth in the various subcomponents of asset growth is uniformly associated with a negative return effect. We also ask whether the manner in which the growth is financed affects the return effect. If the asset growth effect is simply a matter of managers engaging in market timing, for example, one might expect that only public equity-financed growth would be associated with such an effect. By looking at the components of asset growth we are able to compare our results with the various growth-related corporate event studies that allege long-run abnormal returns. To address these questions we decompose our asset growth variable into the major balance sheet components as an accounting identity. The asset investment decomposition is as follows:

$$\begin{aligned}
&\text{Total asset growth } (ASSETG)\\
&\quad = \text{Cash growth } (\Delta Cash)\\
&\qquad + \text{Noncash current asset growth } (\Delta CurAsst)\\
&\qquad + \text{Property, plant, and equipment growth } (\Delta PPE)\\
&\qquad + \text{Other assets growth } (\Delta OthAssets). \qquad (2)
\end{aligned}$$

Cash is defined as Compustat data item 1. Noncash current assets are defined as Compustat data item 4 less Compustat data item 1. Property, plant, and equipment are defined as Compustat data item 8. Other assets are defined as total assets less all the above asset categories. To maintain an asset growth identity, each asset category difference is scaled by the previous year's total asset value such that the sum equals the contemporaneous total asset growth value for that firm.

We repeat the same process for the right-hand side of the balance sheet. In this case we construct an asset financing identity as follows:

$$
\begin{aligned}
&\text{Total asset growth } (ASSETG) \\
&\quad = \text{Operating liabilities growth } (\Delta OpLiab) \\
&\qquad + \text{Retained earnings growth } (\Delta RE) \\
&\qquad + \text{Stock financing growth } (\Delta Stock) \\
&\qquad + \text{Debt financing growth } (\Delta Debt). \qquad (3)
\end{aligned}
$$

Retained earning is Compustat data item 36. Stock financing is defined as Compustat data item 130 plus Compustat data item 60 plus Compustat data item 38 less Compustat data item 36. Debt financing is Compustat data item 34. Operating liabilities are defined as total assets less all the above asset categories. To maintain an asset growth identity, each asset category difference is again scaled by the previous year's total asset value.

We use Fama and MacBeth (1973) regressions of annual firm stock returns on the lagged components of asset growth. We perform the regressions for all firms as well as for the size subgroups. From an asset investment standpoint, we find for the all-firms group in Table IV Panel A that increases in current assets, property, plant, and equipment, and other assets are associated with significant negative coefficients. In particular, t-statistics for the coefficients on the significant investment components vary from –3.34 for other assets to –4.80 for PPE. Growth in cash is not significant. When we include all four investment components of asset growth in the same regression, we find that growth in current assets, property, plant, and equipment, and other assets is significant, with growth in current assets and PPE exhibiting the strongest effect (the t-statistic for the coefficients is –3.74 and –2.76, respectively), suggesting that for the investment side of the balance sheet, a particularly strong relation exists for changes in operating assets (noncash current assets plus PPE). This finding is similar to that of Fairfield, Whisenant, and Yohn (2003), who find a negative correlation between returns and different forms of asset growth (in their case, net asset accruals and long-term operating assets).[17] We note, however, that the negative relationship between returns and the asset growth components is never as strong as between returns and overall asset growth. The results for the investment decomposition are reasonably robust across the size groups as reported in Panels B through D of Table IV; growth in cash is never significant, and the coefficients on current assets, property, plant, and equipment, and other assets are always negative and typically significant, with the exception of less

[17] An interesting additional finding is that of Eberhart, Maxwell, and Siddique (2004), who show that increases in R&D expenditure (a form of expensed investment) are associated with subsequent positive abnormal returns.

significance for the coefficients on current assets and other assets in the large capitalization group.

From an asset financing standpoint, we find for the all-firms group that growth in all forms of external asset financing are associated with negative future abnormal returns, but that the relationship with retained earnings is not significant. In the multiple regressions, growth in debt and stock financing is associated with the strongest effects. This finding is consistent with the

Table IV

Fama–MacBeth Annual Stock Return Regressions: Asset and Financing Decompositions

Annual stock returns from July 1968 to June 2003 are regressed on variables obtained from a balance sheet decomposition of asset growth into an investment aspect and a financing aspect. The investment decomposition defines total assets as the sum of: (1) Cash (Δ*Cash*: Compustat #1), (2) Noncash current assets (Δ*CurAsst*: Compustat #4 – Compustat #1), (3) Property, plant and equipment (Δ*PPE*: Compustat #8), and (4) Other assets (Δ*OthAssets*: Δ*Total assets* – Δ*Cash* – Δ*CurAsst* – Δ*PPE*). The financing decomposition defines total assets as the sum of: (1) Retained earnings (Δ*RE*: Compustat #36), (2) Stock (Δ*Stock*: Compustat #130 + Compustat #60 + Compustat #38 – Compustat #36), (3) Debt (Δ*Debt*: Compustat #9 + Compustat #34), and (4) Operating liabilities (Δ*OpLiab*: Δ*Total assets* – Δ*RE* – Δ*Stock* – Δ*Debt*). Variables used in the cross-sectional regressions are changes in these variables from the fiscal year ending in calendar year $t-2$ to the fiscal year ending in calendar year $t-1$ scaled by total assets in the fiscal year ending in calendar year $t-2$. Size groups are defined by ranking firms into one of three groups (small, medium, and large) using the 30th and 70th NYSE market equity percentiles in June of year t. Panel A reports regressions for all firms, and Panels B, C, and D report regressions for small, medium, and large firms, respectively. Beta estimates are time-series averages of cross-sectional regression betas obtained from annual cross-sectional regressions. t-statistics, in parentheses, are adjusted for autocorrelation in the beta estimates.

Panel A. All Firms

Constant	ΔCash	ΔCurAsst	ΔPPE	ΔOthAssets	ΔOpLiab	ΔDebt	ΔStock	ΔRE
0.1555	−0.0014	.	.	.				
(5.38)	(−0.03)	.	.	.				
0.1639	.	−0.1995	.	.				
(5.64)	.	(−4.80)	.	.				
0.1629	.	.	−0.2015	.				
(5.41)	.	.	(−3.91)	.				
0.1556	.	.	.	−0.1202				
(5.34)	.	.	.	(−3.34)				
0.1703	0.0076	−0.154	−0.1483	−0.0704				
(5.61)	(0.19)	(−3.74)	(−2.76)	(−1.95)				
0.1615	.	.	.	.	−0.1704	.	.	.
(5.45)	.	.	.	.	(−4.00)	.	.	.
0.1595	.	.	.	.	.	−0.1583	.	.
(5.47)	.	.	.	.	.	(−6.59)	.	.
0.1612	.	.	.	.	.	.	−0.2158	.
(5.50)	.	.	.	.	.	.	(−1.88)	.
0.1567	.	.	.	.	.	.	.	−0.0654
(5.39)	.	.	.	.	.	.	.	(−0.83)
0.1689	.	.	.	.	−0.0507	−0.1503	−0.1986	−0.0759
(5.59)	.	.	.	.	(−0.99)	(−5.01)	(−2.13)	(−0.91)

(continued)

Table IV—*Continued*

Panel B. Small Size Firms

Constant	ΔCash	ΔCurAsst	ΔPPE	ΔOthAssets	ΔOpLiab	ΔDebt	ΔStock	ΔRE
0.17	−0.0041	.	.	.	.	.	.	.
(4.84)	(−0.09)	.	.	.	.	.	.	.
0.1789	.	−0.2151	.	.	.	.	.	.
(5.01)	.	(−5.74)	.	.	.	.	.	.
0.1748	.	.	−0.1967	.	.	.	.	.
(4.86)	.	.	(−3.41)	.	.	.	.	.
0.1698	.	.	.	−0.0989	.	.	.	.
(4.79)	.	.	.	(−1.77)	.	.	.	.
0.1836	−0.0089	−0.1778	−0.1213	−0.0618	.	.	.	.
(5.04)	(−0.18)	(−4.93)	(−2.11)	(−1.13)	.	.	.	.
0.1742	.	.	.	.	−0.1724	.	.	.
(4.88)	.	.	.	.	(−4.58)	.	.	.
0.1739	.	.	.	.	.	−0.1629	.	.
(4.89)	.	.	.	.	.	(−5.68)	.	.
0.1748	.	.	.	.	.	.	−0.2247	.
(4.94)	.	.	.	.	.	.	(−2.14)	.
0.1686	.	.	.	.	.	.	.	−0.0179
(4.80)	.	.	.	.	.	.	.	(−0.33)
0.1795	.	.	.	.	−0.072	−0.1519	−0.2098	−0.0307
(5.00)	.	.	.	.	(−1.46)	(−4.09)	(−2.33)	(−0.43)

Panel C. Medium Size Firms

Constant	ΔCash	ΔCurAsst	ΔPPE	ΔOthAssets	ΔOpLiab	ΔDebt	ΔStock	ΔRE
0.1407	0.0525	.	.	.	.	.	.	.
(5.06)	(0.88)	.	.	.	.	.	.	.
0.1483	.	−0.1617	.	.	.	.	.	.
(5.46)	.	(−3.22)	.	.	.	.	.	.
0.1469	.	.	−0.108	.	.	.	.	.
(5.24)	.	.	(−3.03)	.	.	.	.	.
0.1404	.	.	.	−0.0556	.	.	.	.
(5.15)	.	.	.	(−1.17)	.	.	.	.
0.1522	0.077	−0.1384	−0.0612	−0.0002	.	.	.	.
(5.46)	(1.25)	(−2.39)	(−1.46)	(0.00)	.	.	.	.
0.142	.	.	.	.	−0.065	.	.	.
(5.22)	.	.	.	.	(−0.90)	.	.	.
0.1445	.	.	.	.	.	−0.1077	.	.
(5.24)	.	.	.	.	.	(−3.39)	.	.
0.1454	.	.	.	.	.	.	−0.1358	.
(5.25)	.	.	.	.	.	.	(−1.46)	.
0.1401	.	.	.	.	.	.	.	0.0295
(5.24)	.	.	.	.	.	.	.	(0.36)
0.1481					0.0971	−0.1289	−0.1211	−0.0299
(5.38)					(1.48)	(−3.90)	(−1.45)	(−0.32)

(continued)

Table IV—*Continued*

Panel D. Large Size Firms								
Constant	ΔCash	ΔCurAsst	ΔPPE	ΔOthAssets	ΔOpLiab	ΔDebt	ΔStock	ΔRE
0.1225	0.0446	.	.	.	.	.	.	.
(5.34)	(0.54)	.	.	.	.	.	.	.
0.1273	.	−0.0892	.	.	.	.	.	.
(5.50)	.	(−1.18)	.	.	.	.	.	.
0.1319	.	.	−0.1897	.	.	.	.	.
(5.60)	.	.	(−2.62)	.	.	.	.	.
0.1233	.	.	.	−0.1579	.	.	.	.
(5.43)	.	.	.	(−1.53)	.	.	.	.
0.1345	0.0562	−0.0165	−0.1665	−0.1125	.	.	.	.
(5.72)	(0.72)	(−0.22)	(−2.64)	(−1.12)	.	.	.	.
0.125	.	.	.	.	−0.0538	.	.	.
(5.41)	.	.	.	.	(−0.68)	.	.	.
0.1251	.	.	.	.	.	−0.0688	.	.
(5.51)	.	.	.	.	.	(−1.79)	.	.
0.1277	.	.	.	.	.	.	−0.3374	.
(5.41)	.	.	.	.	.	.	(−3.27)	.
0.129	.	.	.	.	.	.	.	−0.1208
(5.55)	.	.	.	.	.	.	.	(−1.06)
0.1319	.	.	.	.	0.0789	−0.056	−0.3228	−0.1097
(5.69)	.	.	.	.	(0.92)	(−1.15)	(−2.61)	(−0.95)

findings of Richardson and Sloan (2003), Pontiff and Woodgate (2008), and Billet, Flannery, and Garfinkel (2007), who also identify a common financing effect in returns. However, as with the investment side of the balance sheet, the relationship between returns and the components of financing is not as strong as the relationship between returns and total asset growth. Within size groups, growth in debt financing has the strongest effect within small and medium firms, but growth in stock financing exhibits the strongest effect within large firms.

The decomposition results in Table IV provide insight as to why asset growth works so well in predicting the cross-section of returns. Because asset growth is the sum of the subcomponents of growth from the left- or right-hand side of the balance sheet, it benefits from the predictability of all of the subcomponents, as is illustrated by the regression results of Table IV. This advantage of asset growth is further illustrated by the size group results in Table IV; as we move from the small firms to the large firms, the components of asset growth shift in terms of their relative importance in predicting the cross-section. For example, on the investment side of the balance sheet, for small firms changes in current assets is the most important component of asset growth, but for large firms changes in property, plant, and equipment become the most important component. Similarly, on the finance side of the balance sheet, changes in debt is the important component for small firms, but changes in stock financing is the important component for large firms.

Thus, the major source of the asset growth effect fluctuates in the sense that the relative importance of the components of growth shifts across size groups.

This finding is consistent with a recent paper by Fama and French (2008), who show that asset growth, with the equity financing component removed from the measure, is a very strong predictor of the cross-section of returns on all firms, but has significantly less explanatory power for large firm returns.[18] As equity financing is an important component of the asset growth effect for large firms, it makes sense that removing the equity component of asset growth would attenuate the effect. In contrast, our measure of asset growth, which includes all major financing components, is not only a strong predictor of the cross-section of returns on all stocks, but as we document, is a strong predictor of returns for large-capitalized firms as well. As a final test, we regress annual returns on asset growth and each of the individual investment and financing components to identify whether the effect of any of the components subsumes the asset growth effect. Although not reported in Table IV, we find that the coefficient on asset growth is the strongest across all financing and investment components. The only exception to this is the effect of changes in stock financing among the large capitalization firms in which an increase in stock has a stronger effect than asset growth: The coefficient on stock financing is significant (t-statistic = –2.25) and the coefficient on asset growth is still negative, but is now insignificant (t-statistic = –0.56), suggesting again that for large firms the component of asset growth related to growth in stock financing is more important than the other financing components. Taken as a whole, the results in this section suggest that asset growth predicts the cross-section of returns better than any individual investment or financing component of the balance sheet.

D. The Asset Growth Effect and Equity Issuances and Repurchases

The above results suggest that the asset growth effect appears to be related to the equity issuance/repurchase effect, with the caveat that the way we define the issuance/repurchase variables is based on the setup of our tests in Table IV (that is, a 1-year return window and changes in equity measured from 6 months to 18 months prior to the 1-year return period). Thus, these are not exactly the variables used in the equity issuance/repurchase literature. Therefore, to more precisely test the interaction of our asset growth effect on the share issuance/repurchase anomaly, we estimate cross-sectional regressions of annual stock returns on variables from the issuance/repurchase literature. Ikenberry, Lakonishok, and Vermaelen (1995) document long-run positive return effects following announcements of stock repurchase programs and Loughran and Ritter (1995) document long-run negative return effects following SEOs. Thus, we include data on SEOs and repurchase announcements. We construct

[18] We construct the Fama and French (2008) asset growth variable (which differs from ours in that Fama and French remove 1-year growth in shares from their measure). We use their asset growth measure in our Model 1 regression from Table III. We find that the t-statistic on the coefficient of the Fama and French "asset growth" measure is -0.73 for the large firm stocks. In contrast, our measure of asset growth, which includes all financing components, obtains a t-statistic (as reported in Panel D of Table III) for the coefficient on asset growth of -3.60 for the large firms.

two dummy variables. The first is an indicator variable equal to one if a firm issued equity in the 2-year period prior to the interval over which the dependent variable (annual returns) is measured, and zero otherwise. The second is an indicator variable equal to one if a firm announced a repurchase in the 2-year period prior to the interval over which the dependent variable is measured, and zero otherwise.[19] To complement the SEO/repurchase dummies, we also include Daniel and Titman's (2006) share issuance variable (*ISSUANCE*). Daniel and Titman show that their issuance variable captures important issuance/repurchase effects that are different from the information contained in the simple indication of an SEO or repurchase announcement. We use the 3-year issuance variable from Daniel and Titman.[20] Due to limitations on the availability of the SEO and repurchase data, regressions that include the dummies are estimated on data from July 1982 to June 2002. When we estimate regressions without the dummies (such as models with share issuance and/or asset growth) we use the period from July 1968 to June 2003. In each model, we include (but do not report the coefficients on) an intercept and the base set of control variables used in the Table III regressions (BM equity, capitalization, 6-month lagged returns, and 36-month lagged returns).

We report the results of these annual return regressions in Table V. Confirming the issuance/repurchase anomaly within our sample on all firms, the coefficient on the 3-year *ISSUANCE* variable in Model 1 of Panel A is negative and strongly significant (t-statistic = –4.00), and the coefficient on the SEO indicator variable is negative and significant in Model 3 (t-statistic = –2.44). The coefficient on the repurchases indicator variable in Model 3 is positive, but it is not statistically significant. The t-statistic on the coefficient of *ISSUANCE* is significant across the different size groups. However, the SEO and repurchase effect is weak on small firms and increases in strength as we move from small to large firms: Within the small firms in Panel B, the coefficients on SEOs and repurchases are of the expected sign, but are insignificant; within the large firm group in Panel D, the coefficient on the SEO indicator in Model 3 has a t-statistic of –4.29, and the repurchase indicator has a t-statistic of 3.52.

[19] All equity offerings are identified based on the issue date from Thomson Financial SDC Global New Issues dataset. All share repurchase programs are identified based on the announcement date from the Thomson Financial SDC Global Mergers and Acquisitions data set complemented with the repurchase announcements in Ikenberry, Lakonishok, and Vermaelen (1995). We thank Dave Ikenberry for generously sharing his data with us.

[20] The Daniel and Titman (2006) share issuance variable is likely to be more representative of the long-run effects documented in the issuance/repurchase literature than is our 1-year change in stock variable from Table IV. Thus, in this section we use their issuance variable instead of our 1-year change in stock variable. Daniel and Titman construct their 3-year issuance variable as the log of market equity in year t divided by market equity in year $t-3$. They subtract from that ratio the buy-and-hold return over the same period. Thus, their issuance variable captures the portion of market value growth that is not attributable to returns. They attribute the success of their issuance variable to the fact that it may capture other forms of issuance and repurchase (such as conversions of convertible debt and the exercise of executive stock options) that have not been studied in previous SEO and repurchase papers.

In models with just asset growth and *ISSUANCE*, asset growth is stronger than *ISSUANCE* in the all- firms group in Panel A (the t-statistic for the coefficient on *ISSUANCE* = –2.99 and the t-statistic for the coefficient on asset growth = –5.86). In the small and medium size firms asset growth is slightly more significant than *ISSUANCE*, and in the large size firms *ISSUANCE* is stronger than asset growth (the t-statistic on *ISSUANCE* = –3.98 and the t-statistic on asset growth = –1.91). In the other models of Table V, we provide evidence on the interactive effects of asset growth and the three equity effect variables. In Panel A, the all-firms group, asset growth weakens the *ISSUANCE* and SEO/repurchase variables. In the model with all four variables (Model 6), the t-statistic for the coefficient asset growth is –4.54, and the coefficients on the other variables are insignificant.

Table V

Fama–MacBeth Regressions of Annual Stock Returns on Asset Growth and Share Issuance Related Variables

Annual stock returns are regressed on lagged accounting and return-based variables. *ASSETG* is asset growth defined as the percentage change in total assets from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$. *ISSUANCE* is a 3-year composite log share issuance variable from Daniel and Titman (2006). *SEODUM* is an indicator variable equal to one if a firm had an SEO in the 2-year period prior to the interval over which the dependent variable (annual returns) is measured, and zero otherwise. *REPDUM* is a is an indicator variable equal to one if a firm announced a repurchase in the 2-year period prior to the interval over which the dependent variable (annual returns) is measured, and zero otherwise. Due to the availability of the SEO and repurchase data, regressions that include the dummies are estimated over July of 1982 to June of 2002. When we estimate regressions without the dummies (such as models with share issuance and/or asset growth) we use the period July of 1968 to June of 2003. In each model, we include (but do not report the coefficients) an intercept and the base set of control variables used in the Table III regressions (book-to-market equity, capitalization, 6-month lagged returns, and 36-month lagged returns). Models 1 through 6 use lagged variables from year $t-1$. Model 7 uses lagged variables from year $t-2$. Size groups are defined by ranking firms into one of three groups (small, medium, and large) using the 30th and 70th NYSE market equity percentiles in June of year t. Panel A reports regressions for all firms, and Panels B, C, and D report regressions for small, medium, and large firms, respectively. Beta estimates are time-series averages of cross-sectional regression betas obtained from annual cross-sectional regressions. t-statistics, in parentheses, are adjusted for autocorrelation in the beta estimates.

Panel A. All Firms

Model		ASSETG ($t-1$)	ISSUANCE ($t-1$)	REPDUM ($t-1$)	SEODUM ($t-1$)
1	Beta	.	−0.0820	.	.
	t-stat	.	(−4.00)	.	.
2	Beta	−0.0787	−0.0616	.	.
	t-stat	(−5.86)	(−2.99)	.	.
3	Beta	.	.	0.0043	−0.0545
	t-stat	.	.	(0.20)	(−2.44)
4	Beta	−0.0709	.	0.0026	−0.0403
	t-stat	(−4.51)	.	(0.12)	(−1.92)
5	Beta	.	−0.0635	−0.0033	−0.0447
	t-stat	.	(−1.90)	(−0.15)	(−1.79)
6	Beta	−0.0668	−0.0464	−0.0027	−0.0356
	t-stat	(−4.54)	(−1.36)	(−0.13)	(−1.49)
		ASSETG ($t-2$)	ISSUANCE ($t-2$)	REPDUM ($t-2$)	SEODUM ($t-2$)
7	Beta	−0.0234	−0.0553	0.0126	0.0057
	t-stat	(−2.85)	(−1.23)	(1.30)	(0.48)

(continued)

Table V—*Continued*

Panel B. Small Size Firms					
Model		ASSETG ($t-1$)	ISSUANCE ($t-1$)	REPDUM ($t-1$)	SEODUM ($t-1$)
1	Beta	.	−0.0858	.	.
	t-stat	.	(−4.53)	.	.
2	Beta	−0.0776	−0.0665	.	.
	t-stat	(−4.12)	(−3.86)	.	.
3	Beta	.	.	0.0189	−0.0346
	t-stat	.	.	(0.69)	(−1.46)
4	Beta	−0.0851	.	0.0169	−0.0113
	t-stat	(−3.95)	.	(0.62)	(−0.51)
5	Beta	.	−0.0821	0.0091	−0.0119
	t-stat	.	(−2.58)	(0.33)	(−0.46)
6	Beta	−0.0767	−0.0652	0.0093	0.0032
	t-stat	(−4.31)	(−2.05)	(0.34)	(0.13)
		ASSETG ($t-2$)	ISSUANCE ($t-2$)	REPDUM ($t-2$)	SEODUM ($t-2$)
7	Beta	−0.0357	−0.0579	0.0194	0.0276
	t-stat	(−2.70)	(−1.45)	(1.52)	(1.67)

Panel C. Medium Size Firms					
Model		ASSETG ($t-1$)	ISSUANCE ($t-1$)	REPDUM ($t-1$)	SEODUM ($t-1$)
1	Beta	.	−0.0934	.	.
	t-stat	.	(−2.90)	.	.
2	Beta	−0.0644	−0.0768	.	.
	t-stat	(−3.18)	(−2.49)	.	.
3	Beta	.	.	−0.0027	−0.0404
	t-stat	.	.	(−0.10)	(−2.15)
4	Beta	−0.0543	.	−0.0024	−0.035
	t-stat	(−2.15)	.	(−0.09)	(−1.93)
5	Beta	.	−0.0811	−0.0087	−0.0274
	t-stat	.	(−1.38)	(−0.34)	(−1.29)
6	Beta	−0.0438	−0.0687	−0.0080	−0.0254
	t-stat	(−2.33)	(−1.20)	(−0.32)	(−1.21)
		ASSETG ($t-2$)	ISSUANCE ($t-2$)	REPDUM ($t-2$)	SEODUM ($t-2$)
7	Beta	−0.0028	−0.0581	0.0230	−0.0007
	t-stat	(−0.14)	(−0.86)	(1.58)	(−0.03)

Panel D. Large Size Firms					
Model		ASSETG ($t-1$)	ISSUANCE ($t-1$)	REPDUM ($t-1$)	SEODUM ($t-1$)
1	Beta	.	−0.1220	.	.
	t-stat	.	(−4.67)	.	.
2	Beta	−0.0332	−0.1068	.	.
	t-stat	(−1.91)	(−3.98)	.	.
3	Beta	.	.	0.0295	−0.05
	t-stat	.	.	(3.52)	(−4.29)
4	Beta	−0.0285	.	0.0263	−0.0445
	t-stat	(−2.24)	.	(2.83)	(−4.33)
5	Beta	.	−0.0650	0.0253	−0.0443
	t-stat	.	(−1.91)	(3.24)	(−3.78)
6	Beta	−0.0201	−0.0555	0.0236	−0.0407
	t-stat	(−1.32)	(−1.47)	(2.67)	(−3.55)
		ASSETG ($t-2$)	ISSUANCE ($t-2$)	REPDUM ($t-2$)	SEODUM ($t-2$)
7	Beta	−0.0155	−0.0535	0.0241	−0.0116
	t-stat	(−0.83)	(−0.95)	(1.27)	(−0.41)

Within the small and medium size firms, as reported in Model 6 of Panels B and C, respectively, the coefficient on asset growth is always significant, and the coefficients on *ISSUANCE*, SEOs and repurchases are insignificant with the exception of a significant coefficient on *ISSUANCE* for the small firms (t-statistic = –2.05). When we move to the large firm group in Panel D, Model 6, the SEO and repurchase indicator variables exhibit the strongest effects, and the coefficients on both *ISSUANCE* and asset growth are insignificant. Interestingly, a strong positive correlation between *ISSUANCE* and asset growth within the large firms may to some extent drive down the significance of those two variables in Model 6 for the large firms. As we have mentioned, *ISSUANCE* is an inherent part of asset growth, and the results from Table IV show that an increasing proportion of the asset growth effect is attributable to growth in stock as we move from small to large firms.[21] Thus, in Model 4, we drop *ISSUANCE* from the full model and estimate a regression using only SEOs, repurchases, and asset growth (and similarly in Model 5, we drop asset growth from the full model). In Model 4 of Panel D, the coefficient on asset growth is now significant (t-statistic = –2.24) and in Model 5, the coefficient on *ISSUANCE* becomes marginally significant (t-statistic = –1.91). Overall, the results from Table V show that the asset growth effect is not due solely to an issuance effect; growth in shares is an important component of asset growth, but even for large firms the other components of asset growth provide explanatory power above and beyond the information in growth in shares.

To further explore the relation between asset growth and *ISSUANCE*, we examine the distinction between the growth in book value, which is considered in this paper, and the growth in market value, which is considered in Daniel and Titman (2006). For example, consider an all-equity firm with a book value of \$100 and a market value of \$1,000. If the firm raises \$100 in new equity, its book value increases 100% but its market value increases only 10%. To examine this distinction in the definition of growth, we decompose the growth in assets over the market value of equity into two components: book value growth and the ratio of assets to market value of equity.[22] We examine the effects of the relative scale of book value and market value changes by augmenting the models in Table V with the second term in the decomposition, the ratio of assets to market value of equity (A/MV). If this scaling is important, we would expect to observe changes in the significance of asset growth and *ISSUANCE*. Across all of the models in Table V, we find no qualitative changes in the results. For example, in Model 2 of Panel A, the all-firms group, the t-statistic for the coefficient on asset growth is –5.53, the t-statistic for the coefficient on Issuance is –2.95, and the coefficient on A/MV is positive but insignificant.

We also examine the timing of the asset growth and issuance signals. Specifically, we examine whether the horizon used to compute asset growth and Issuance has an effect on the relative importance of the two variables in models

[21] The correlation between *ISSUANCE* and asset growth is 0.19, 0.33, and 0.39 for the small, medium, and large stocks, respectively.

[22] Specifically, the decomposition is computed as ΔAssets/MVEquity($t-1$) = ΔAssets/Assets($t-1$) * Assets($t-1$)/MVEquity($t-1$). We denote this last ratio as A/MV.

that include both *ISSUANCE* and asset growth. For example, Daniel and Titman (2006) examine 3- and 5-year horizons over which to construct *ISSUANCE*, and find that 3-year *ISSUANCE* is the strongest. We estimate regression models using combinations of 1-, 3-, or 5-year *ISSUANCE* along with 1-, 3-, or 5-year asset growth definitions, where the end of the formation period for both variables is the fiscal year ending in calendar year $t-1$. The general pattern in these models is that both asset growth and *ISSUANCE* are significant across different horizons. The coefficient on *ISSUANCE* attains its highest level of significance at the 1- and 3-year horizons (t-statistics range from –2.72 to –4.55) regardless of the horizon of asset growth. The coefficients on *ISSUANCE* and asset growth are weaker at the 5-year horizon, with t-statistics ranging from –1.80 to –2.80 for *ISSUANCE* and –1.33 to –1.60 for asset growth. Lastly, the coefficient on asset growth also attains its highest level of significance at the 1- and 3-year horizons (t-statistics range from –5.32 to –5.98) regardless of the horizon of *ISSUANCE*. In summary, both *ISSUANCE* and asset growth exhibit their strongest effects at shorter horizons, yet neither variable subsumes the other.

Since Loughran and Ritter (1995) and Ikenberry, Lakonishok, and Vermaelen (1995) document SEO and repurchase return effects lasting longer than 1 year, we also estimate an additional model in which the independent variables are lagged 2 years prior to the dependent variable, annual returns. This specification is reported in Model 7 of Table V. For all firms in Panel A, 2-year lagged asset growth subsumes *ISSUANCE* and the SEO and repurchase dummies. Across the size groups, the coefficient on lagged asset growth is always negative, but is only significant for the small firms. The other variables are insignificant in the small, medium, and large size groups.[23]

Overall, asset growth survives controls for the effects of equity issuance or repurchases, and provides a partial explanation for the equity issuance/repurchase anomaly. The asset growth effect appears to be particularly strong among small and medium firms, whereas the SEO/repurchase effect is strong among large firms.

III. Is the Asset Growth Effect Due to Risk or Mispricing?

A. Tests of Risk-Based Explanations

Our results so far show that standard models of risk, such as the three- and four-factor models of Fama and French (1993) and Carhart (1997), have difficulty in explaining the variation in returns associated with asset growth portfolios. We also estimate conditional CAPM pricing errors using a standard set of macroeconomic variables and find that the model is not able to explain

[23] For completeness, we also estimate annual return regressions using 3-year lags of the independent variables. In those results (not reported), we find that the signs on the coefficients are generally as expected (negative on asset growth, *ISSUANCE* and SEOs, and positive on repurchases) but are never statistically significant.

the asset growth effect.[24] We compute the Sharpe ratio of the annual returns of the asset growth spread portfolio. For the EW spread portfolio, the Sharpe ratio is 1.19, and for the VW portfolio, it is 1.07. For comparison, the Sharpe ratio for the BM (HML), size (SMB), and momentum factors (UMD) is smaller over our sample period at 0.37, 0.13, and 0.73, respectively.[25]

We investigate whether the asset growth effect is consistent with time-varying risk induced by changes in the mix of firm growth options and assets in place. Recent theoretical papers suggest that expected returns should systematically decline in response to increasing investment. For example, Berk, Green, and Naik (1999) model expected returns as a function of the mix of firm growth options and assets in place. As firms invest, the importance of growth options relative to existing assets declines, reduces overall risk, and induces a negative link between investment and expected return. Other related theoretical work includes Gomes, Kogan, and Zhang (2003), Carlson, Fisher, and Giammarino (2004), Zhang (2005), Cooper (2006), Li, Livdan, and Zhang (2006), and Liu, Whited, and Zhang (2006). Anderson and Garcia-Feijoo (2006) provide empirical support for the theoretical relationship. We examine whether our results are consistent with broad implications from these theoretical papers.

First, we note that the spread in three-factor model abnormal returns between low and high growth portfolios appears to be inconsistent with the above models. For example, Berk, Green, and Naik's (1999) model shows that the investment-related expected return relationship is related to a firm's size and BM (Anderson and Garcia-Feijoo (2006) confirm this empirically), suggesting that the three-factor model of Fama and French (1993) should capture much of the differences in expected returns across the growth-sorted portfolios. We find results inconsistent with this; the magnitude of the three-factor model abnormal return spreads across low and high growth firms, as documented in Table II Panel C, is economically large. Thus, a proponent of a risk-based explanation must ultimately accept that changes to the firm's inventory of growth options are able to explain three-factor model abnormal return differences across growth-sorted portfolios of 8 and 20 annual percentage points for the VW and EW portfolios, respectively. Justifying a drop in the cost of capital of 20 percentage points is arguably a tall order for these risk-based explanations.

[24] We estimate a conditional CAPM regression using the model:

$$r_{t+1} = \alpha + (b_0 + b_1 DIV_t + b_2 DEF_t + b_3 TERM_t + b_4 TB_t) r_{mt+1} + \varepsilon_{t+1},$$

where r_{t+1} is the monthly asset growth spread portfolio (return of the low asset growth decile portfolio minus the high asset growth decile portfolio), r_{mt+1} is the VW excess market return, α and b_k ($k = 1, \ldots, 4$) are estimated regression coefficients, DIV_t is the dividend yield of the CRSP VW index, DEF_t is the yield spread between Baa-rated and Aaa-rated corporate bonds, $TERM_t$ is the yield spread between 10-year T-bonds and 3-month T-bills, TB_t is the yield of a T-bill with 3 months to maturity, and ε_t is an error term. Data for DIV, DEF, and $TERM$ are obtained from the *Federal Reserve Bulletin* and T-bill data are from CRSP. If the conditional CAPM can explain the asset growth effect, then the estimated alpha should be indistinguishable from zero. We find that the alpha from the regression is 1.65% with a t-statistic = 8.02, suggesting that time-varying risk from a conditional CAPM model does not explain the asset growth effect.

[25] The HML, SMB, and UMD factors are from Ken French's web page and are VW portfolios.

Second, the above theoretical models predict that expected returns decrease as a firm increases investment, but they do not predict an average zero risk premium for high investment stocks. We find a very low average risk premium for the high asset growth stocks; from Table II, Panel B the mean annualized returns over the 35-year sample period for the high growth firms are only 5.2% and 3.1%, respectively, for the VW and EW portfolios. Using risk-free rate data from Ken French's web page, the average annual risk-free rate from 1968 to 2003 is about 6.3%, implying a zero or slightly negative risk premium for the high-growth firms, clearly inconsistent with the theoretical investment growth models.

Third, our event-time results from Panel B of Table II show that high growth firms exhibit a pattern of increasing returns in years 1 through 5 (the difference in returns for high growth firms from year 5 to year 1 is a highly statistically significant 1.08% for the EW portfolios and 0.83% for the VW portfolios), even though the growth rates for the high growth firms in these years are positive. Thus, the increasing returns to high growth firms during years 1 through 5 are inconsistent with the investment growth models, which would likely predict decreasing returns over this period due to positive growth.

B. *Tests of Mispricing-Based Explanations*

Next, we examine whether our results are consistent with several mispricing arguments put forth in recent papers. First, we investigate if the event-time operating performance of firms sorted by asset growth is consistent with the Lakonishok, Shleifer, and Vishny (1994, LSV) hypothesis that investors overreact to past firm performance. The LSV hypothesis predicts a negative relation between preformation and postformation profitability and returns. In Figure 4 we provide a plot of the average operating margin (*EBITDA* / *Sales*) for each asset growth decile over the 5 years before and 5 years after the asset growth sorting year. Figure 4 shows that firms that grow (contract) tend to be firms with future negative (positive) profitability shocks with respect to performance in the sorting year. The decrease and then subsequent improvement in operating performance is particularly acute for the low growth stocks. In statistical tests we confirm that the difference between the operating margins in Year -1 and Year 1 (as well as Year 5) is highly significant for both the high growth and low growth stocks.

Second, although the profitability pattern observed in Figure 4 is consistent with mispricing, we cannot be sure that investors are surprised by the subsequent profitability reversal. To test the relationship between subsequent firm operating performance and stock return reactions, we follow La Porta et al. (1997) and examine stock returns around earnings announcements after portfolio formation. Following La Porta et al. we predict that if the asset growth effect is explained by risk, the mean returns on earnings announcement days (EADs) should be similar to the mean returns on non-EADs. If mispricing is the explanation, the prediction is that for high growth (low growth) firms the earnings announcement day returns will tend to be lower (higher) than the

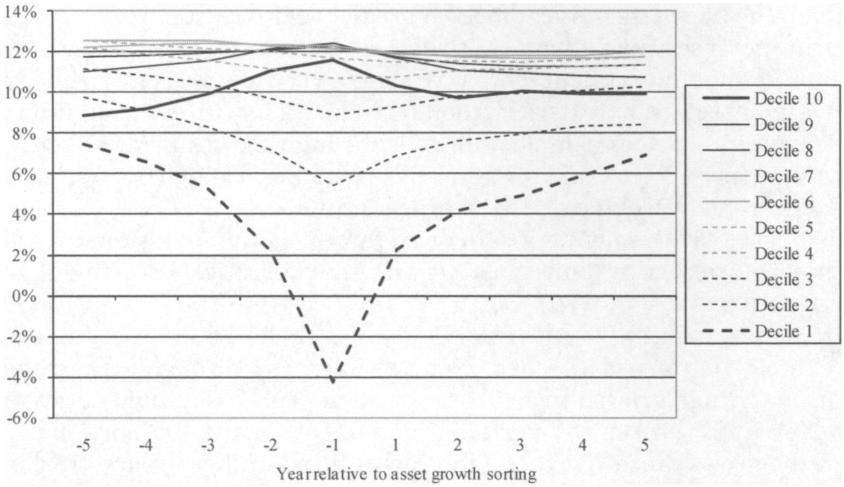

Figure 4. Mean equal-weighted operating margin for asset growth deciles in event time. At the end of June of each year from 1968 to 2002, stocks are allocated into deciles based on asset growth rates defined as the percentage change in total assets from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$. The time-series mean of the annual median decile operating margin statistics is reported every year for 10 years around the portfolio formation year (t) over the period of July 1968 to June of 2003. Operating margin is defined as operating income before depreciation (Compustat data item 13) divided by contemporaneous net sales (Compustat data item 12). Mean operating margin for the portfolios in the year following portfolio formation is reported on the x-axis labeled as Year 1, over the next year is reported on the x-axis labeled as Year 2, and over the contemporaneous sorting period is reported on the x-axis labeled as Year -1.

nonearnings announcement day returns as investors are surprised by the subsequent unanticipated bad (good) news.

To test these competing predictions we obtain EADs from the quarterly Compustat data (RDQE). For Year 1 we compute the mean daily return for the 3 days around the four quarterly EADs (Day –1 to Day +1). For a firm to be included in the tests it is required to have at least three daily EAD returns in Year 1. We then compute the mean daily return for all non-EADs in Year 1. We sort firms into asset growth deciles and compare the mean daily returns for the two types of days over the sample period (Compustat provides RDQE values only after 1970). For the low growth decile, the mean EAD returns and non-EAD returns are 0.27% and 0.11%, respectively. The 16-basis point difference in daily returns is statistically significant with a t-statistic of 3.41. For the high growth decile we observe the opposite; the mean EAD returns and non-EAD returns are –0.10% and 0.00% respectively. The 10-basis point difference is again significant with a t-statistic of –3.59. For deciles 2 through 9 the relationship is fairly monotonic between the two extreme deciles. The evidence suggests that subsequent earnings announcements for low growth firms are associated with positive abnormal returns and subsequent earnings announcements for high growth firms are associated with negative abnormal returns. The results are consistent with the La Porta, Lakonishok, Shleifer, and Vishny expectational errors mispricing story.

Third, Titman, Wei, and Xie (2004) claim that an increase in corporate oversight (due to the increased threat of a hostile takeover) should have a dampening effect on investment-related mispricing over the 1984 to 1989 period. To test the Titman, Wei, and Xie (2004) implication, we perform the one-way decile asset growth sorts of Table II and form portfolios from 1984 to 1989, the period of heightened corporate oversight. Using EW portfolios, the spread in three-factor alphas across high and low growth firms is –0.86% (t-statistic = –2.56) and using VW portfolios, the spread is –0.46% (t-statistic = –1.51) for the period. Thus, relative to the full 1968 to 2003 results, the spreads over this period of increased managerial control are lower, consistent with the idea that the asset growth effect arises in part from managerial overinvestment and related investor underappreciation of managerial empire building.

Finally, Cooper, Gutierrez, and Hameed (2004) argue that mispricing is correlated with the lagged state of the market, which proxies for the level of overconfidence.[26] We examine the correlation between asset growth spreads and the lagged return on the market portfolio. We regress the spread in average asset growth rates between high growth and low growth decile portfolios in year t on 36-month buy-and-hold VW market returns in year $t-1$ (computed over years $t-4$ to $t-1$). The t-statistic on the 36-month market return coefficient is 4.80. We also regress the returns to the asset growth spread portfolio (return of the low asset growth decile portfolio minus the high asset growth decile portfolio) on the spread in average asset growth rates between high growth and low growth decile portfolios in year $t-1$. The t-statistic on the lagged spread in growth rates is 2.17. Thus, high market returns increase growth spreads between high and low growth firms, which in turn increases the asset growth return effect. These results are consistent with high growth managers becoming more overconfident following market increases, resulting in increased investment, which in turn leads to increased investor overreaction to high growth rates and greater mispricing between high and low growth firms.

IV. Conclusion

We document a substantial asset growth effect in firm returns. Over our sample period, firms with low asset growth rates earn subsequent annualized risk-adjusted returns of 9.1% on average while firms with high asset growth rates earn –10.4%. The large 19.5% per year spread is highly significant. Weighting the firms by capitalization reduces the spread to a still large and significant 8.4% per year. Using a battery of tests, we find that firm total asset growth dominates other standard variables in predicting the cross-section of future returns: in terms of t-statistics, it is more important than BM equity, firm capitalization, momentum, accruals, and other growth rate variables and provides a partial explanation of the equity issuance, and repurchase effects. We show that the ability of asset growth to predict the cross-section of returns is due to its ability

[26] Using the lagged state of the market as a proxy for overconfidence, Cooper, Gutierrez, and Hameed (2004) test various overconfidence-based theories of momentum, including Daniel, Hirshleifer, and Subrahmanyam (1998) and Hong and Stein (1999).

to capture common return effects across components of a firm's total investment or financing activities and that the relative importance of these components varies across firm size. Our results suggest that asset growth captures complex linkages among returns, size groups, and financing types, and motivates further study of why different components of asset growth are associated with variation in return effects across size groups. Overall, our findings are most consistent with the interpretation that investors overextrapolate past gains to growth.

This paper addresses one of the fundamental conditions for efficient financial markets: the unbiased pricing or capitalization of asset investment. In functionally efficient markets, investment opportunities are priced such that capital can be systematically allocated to the most productive uses (Tobin (1984)). In contrast, bias in the capitalization of new investments leads to a host of potential investment policy distortions. This paper provides evidence that such potential distortions are present and economically meaningful.

Appendix

The variables used in the paper are listed below (with Compustat data items in parentheses).

Market value (*MV*) is the price per share times shares outstanding at the end of June of calendar year t.

Book-to-market equity, (*BM*), for the fiscal year ending in calendar year t, is as defined as in Davis, Fama, and French (2000), where book equity (*BE*) is the stockholders' equity (data216), plus balance sheet deferred taxes and investment tax credit (data35), minus book value of preferred stock (in the following order: data56 or data10 or data130) and *ME* is the price times shares outstanding at the end of December of calendar year t.

Assets-to-market equity (A/MV), for the fiscal year ending in calendar year t, is defined as total firm assets (data6) scaled by the market value of equity (*MV*), where *MV* is the price times shares outstanding at the end of December of calendar year t.

EP is earnings-to-price ratio [*EPS* (data53)/ Price (data24)].

ROA is the operating income before depreciation (data13) scaled by total assets (data6).

LEVERAGE is the sum of long-term debt and debt in current liabilities, scaled by total assets [(data9 + data34)/data6].

SALESG is the yearly growth rate in sales (data12).

BHRET6 is the 6-month buy-and-hold return over January (t) to June (t) $[(1+r_1) \times \cdots \times (1+r_6)-1]$ where r_i is the return in month i.

BHRET36 is the 3-year buy-and-hold return over July ($t-3$) to June (t) $[(1+r_1) \times \cdots \times (1+r_{36}) -1]$ where r_i is the return in month i.

Asset growth (*ASSETG*) is the 1-year percentage change in total firm assets $[(assets_t - assets_{t-1})/\ assets_{t-1}]$, where assets are Compustat data item 6. To compute *ASSETG*, a firm must have nonzero total assets in both year $t-1$ and $t-2$.

5YASSETG is a weighted average of asset growth rates from the 5 years prior to portfolio formation. We omit year $t-1$ growth rates to avoid serial correlation between this variable and the 1-year asset growth variable (*ASSETG*). Every year, stocks are sorted by their asset growth in that year and assigned a sorted rank value (low-growth stocks are assigned lower rank values, etc). Then, each stock's weighted average rank over years -5 to -2 is calculated, with the most recent year receiving the greatest weight. Year -5, -4, -3, and -2 rank values receive weights of 10%, 20%, 30%, and 40%, respectively.

5YSALESG is the weighted average rank of growth rate in sales, calculated the same way as *5YASSETG*.

L2ASSETG is the 1-year lagged value of *ASSETG*.

CI is the abnormal capital investment measure used in Titman, Wei, and Xie (2004). $[CE_t\,/\,(CE_{t-1} + CE_{t-2} + CE_{t-3})/3 - 1]$, where CE_t is capital expenditures (data128) in fiscal year t and each capital expenditure term is scaled by that year's net sales (data12).

CASH FLOW, as used in Titman, Wei, and Xie (2004). It is defined as (Operating income before depreciation − interest expenses − taxes − preferred dividends − common dividends)/total assets [data13-(data15+data16+data19+data21)]/data6.

Leverage, as used in Titman, Wei, and Xie (2004). It is defined as long-term debt/(long-term debt+market value of equity) [data9/(data9+data199 ∗ data25)].

NOA, as used in Hirshleifer et al. (2004), is net operating assets scaled by lagged total assets. Net operating assets is the difference between operating assets (*OA*) and operating liabilities (*OL*), where

OA = total assets (data6) – cash and short-term investments (data1), and

OL = total assets (data6) – debt in current liabilities (data34) – long-term debt (data9) – minority interest (data38) – preferred stock (data130) – common equity (data60).

NOA/*A* is the first component from the decomposition of the *NOA* variable into two components: 1) Net Operating Assets/Assets and 2) Assets/Lag Assets.

ACCRUALS = [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets). [(Δdata4 − Δdata1) − (Δdata5 − Δdata34 − Δdata71) − data14]/[$(data6_t + data6_{t-1})/2$].

ISSUANCE, as used in Daniel and Titman (2006), is $\log[ME_t/ME_{t-3}] - r_{t,t-3}$, where *ME* is total market equity = data199 ∗ data25 and $r_{t,t-3}$ is the 3-year log return.

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