Aalto University
School of Business

THE ASSET GROWTH ANOMALY AND THE ACQUISITION PUZZLE

Examining an investable asset growth effect and its implications for low post-deal acquirer returns

Master's Thesis

Niklas Viitanen
Aalto University School of Business
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Author Niklas Viitanen		
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Abstract

PURPOSE OF THE STUDY
The purpose of my study is to increase present knowledge of a strong and stable stock market anomaly, the asset growth effect and its connection to post-deal acquirer returns. More specifically, focusing on investability, I reveal how the anomaly has changed along the years and assess whether it still offers an opportunity for investors. I then use the anomaly to search for an answer to the acquisition puzzle by matching post-deal acquirer returns to returns of non-acquirers based on asset growth.

DATA AND METHODOLOGY
I use data on US companies from the merged CRSP-Compustat database from the years 1982 to 2017. I gather acquisition data from the SDC database, and data on Fama French coefficients and the risk-free rate from Kenneth French's website. I then construct a total of 54 calendar-time portfolios based on asset growth and acquisition activity, including asset growth-decile portfolios for the basis of my analysis and taking into account lags in information disclosure. I use a zero-investment CME portfolio to capture the asset growth-effect and analyse its connection to the market and the value and size effects. I then use asset-growth matched non-acquirer control portfolios to analyse whether I can explain post-deal acquirer returns based on the asset growth effect. I also construct an "acquisition risk factor" AMNA to further analyse the connections and differences between the two phenomena.

RESULTS
I find a significant and strong asset growth effect in the US market, which produces annual returns of 11.6% over the total sample period. I find that the effect is stronger than either the value or the size effect combined. I also find that the effect's high returns cannot be explained by common risk factors or a propensity for crashing.
Second, I find that asset growth, to a very high extent, explains poor post-deal acquirer returns, but that I cannot exclude the possibility for differences between the two phenomena. Interestingly, I also find that the effect has vanished during the 2010s, but that the connection between asset growth and acquirer returns has persisted, with acquirers performing better than previously. My analysis suggests that this vanishing would be due to the high-liquidity and low-yield market of the last decade, which has allowed companies to more easily meet their required rates of return on investment. The better scalability of modern tech giants may also be to blame for the anomaly's disappearance.

Niklas Viitanen,
363802

Tekijä Niklas Viitanen		
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Tiivistelmä

TUTKIMUKSEN TARKOITUS
Tutkimukseni tarkoitus on lisätä ymmärrystä omaisuuden kasvun anomaliasta, joka on vahva ja vakaa osakemarkkina-anomalia. Keskittyen sijoitettavuuteen, näytän miten anomalia on kehittynyt vuosikymmenien aikana ja arvioin tarjoaako anomalia edelleen sijoitettavan mahdollisuuden sijoittajille. Käyttäen omaisuuden kasvun anomaliaa, haen vastausta akvisitiokysymykseen yhdistämällä yritysostojen jälkeiset ostajatuotot niiden yhtiöiden tuottoihin, jotka eivät ole tehneet akvisitioita mutta joiden omaisuus on kasvanut samaa tahtia.

DATA JA METODOLOGIA
Käytän dataa Yhdysvaltalaisista yhtiöistä yhdistetystä CRSP-Compustat tietopankista vuosilta 1982 - 2017. Lisäksi kerään yritysostodatan SDC tietopankista, ja datan liittyen Fama French kertoimiin Kenneth Frenchin verkkosivuilta. Luon näiden pohjalta analyysiäni varten 54 kalenteri-aikaportfoliota perustuen varojen kasvuun sekä yritysostoaktiviteettiin, mukaan lukien desiiliportfoliot varojen kasvun mukaan. Otan huomioon viiveen tiedon julkaisemisessa portfolion luonnissa. Käytän nollainvestointiportfolio CME:tä anomalian vangitsemiseen, ja analysoin sen yhteyttä markkinaan sekä arvo- ja kokoanomalioihin. Tämän jälkeen käytän varojen kasvun mukaan yhdistettyä kontrolliportfoliota yhtiöistä, jotka eivät ole tehneet yrityskauppoja analysoidakseni, voinko selittää matalat yritysostotuotot varojen kasvun anomalian avulla. Lisäksi luon AMNA ”yritysostoriskikertoimen” analysoidakseni yhteyksiä ja eroja näiden kahden ilmiön välillä.

TULOKSET
Löydän merkittävän ja vahvan omaisuuden kasvun anomalian Yhdysvaltojen markkinalla, joka tuottaa 11.6% vuodessa tutkimusperiodini yli. Tämä tekee anomaliasta vahvemman, kun koko- ja arvoanomaliat yhteensä. Löydän myös, että näitä tuottoja ei voida selittää strategian altistumisella yleisille riskitekijöille tai sen taipumuksella romahtaa.
Toiseksi löydän, että varojen kasvu selittää hyvin pitkälti huonot yritysoston jälkeiset ostajatuotot, mutta en voi todistaa, etteikö näillä kahdella ilmiöllä olisi myös eroja. Kiinnostavaa on, että totean anomalian kadonneen 2010-luvulla, mutta että yhteys yritysostajatuottoihin on pysynyt samana johtuen ostajien paremmista tuotoista. Analyysini tukeekin selitystä siitä, että anomalia ei ole kadonnut, vaan omaisuuttaan kasvattavien yhtiöiden on ollut helpompi tehdä tuottovaatimukset kattavia investointeja viimeisen vuosikymmenen korkean likviditeetin ja matalien tuottojen markkinassa. Modernien teknologiayhtiöiden helppo skaalautuminen voi myös olla anomalian häviämisen takana.

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1 Introduction

Few areas of research pique more interest in academics and practitioners alike than anomalies. Finance professionals and theorists are always on the lookout to spot systematic ways in which the stock market behaves predictably. Discovering anomalies leads to a deeper understanding of the inner workings of the generally efficient stock market and provides practitioners with new opportunities in their endless alpha seeking. In fact, more than a few anomalies have sparked a surge in hedge fund capital focused on exploiting the inefficiency. The logic behind anomalies is often based on valuation or stock performance (e.g. momentum, value, market capitalization) or return seasonalities. However, the opportunities are often small enough to yield negligible abnormal returns when taking into account e.g. transaction costs and limits to arbitrage.

1.1 Background

During roughly the last ten years, however, a new anomaly has surfaced in academic research. What's surprising in the anomaly is that it is much larger than the value or momentum effects – which both have historically commanded much of both academics' and practitioners' attention – and that it is based on a simple measure of change in total assets net of cash. Research has shown that increasing a company's assets through investment predicts lower future stock returns, while contracting balance sheets imply high future stock returns. This creates the so-called asset growth effect (e.g. Cooper, Gulen and Schill 2008; Mortal and Schill 2015). The effect provides a substantial opportunity for exploitation in both long and zero-investment portfolios. For instance, Cooper, Gulen and Schill (2008) show that while the lowest asset growth decile returns ca. 18% annually, the highest decile yields only 5%. The effect also provides an interesting problem from a market efficiency point of view: can such high and consistent abnormal returns exist under the Efficient Markets Hypothesis?

Debate on the causes of the anomaly include behavioralistic (Titman, Wei and Xie 2004; Cooper, Gulen and Schill 2008; Polk and Sapienza 2009) and risk-based models (Berk, Green and Naik 1999; Zhang 2005; Xing 2008; Li, Livdan and Zhang 2009). What is apparent regardless of the causes is that higher investment seems to strongly predict lower future returns.

As the pattern is shown in both organic and external investments, it offers a new viewpoint to one of the most studied topics in corporate finance, acquisitions.

On the other hand, extensive literature covers both the low announcement returns and long-run returns of acquiring companies (e.g. Firth 1980; Gregory 1997; Agrawal and Jaffe 2000). The disparity between positive target returns and break-even or negative acquirer returns, called the "acquisition puzzle", is one of the most well-known mysteries of corporate finance research. Why do companies keep acquiring if they know they are unlikely to create value for shareholders? Agency theorists have long proposed that managers make suboptimal decisions based on behavioral biases (see e.g. Hull 1986; Malmendier and Tate 2005) or because they are maximizing private benefits through empire building or entrenchment (see e.g. Mueller 1972; Jensen 1986), while neoclassical theorists suggest e.g. that negative returns can be a result of rational managers taking advantage of overvalued equity (Shleifer and Vishny 2003).

As acquisitions require investment and thus increase the total non-cash assets, the asset growth effect predicts the underperformance of acquirers. This phenomenon is investigated by e.g. Mortal and Schill (2015), who use a calendar-time portfolio approach to find an asset growth effect and determine that the anomaly explains post-deal acquirer returns. But if acquisition returns are no different from returns on organic growth, it would imply that the investment decision between organic and external investment is irrelevant. From this, it can be derived that present explanations for poor acquisition returns are unsatisfactory. Furthermore, it can be derived that mergers and acquisitions altogether receive far too much attention in academia as opposed to general balance sheet growth. If mergers really are benign events, much less effort should be contributed into their research, and allocated towards asset growth studies. Not seeing mergers as events unique to organic growth also helps understand why mergers are pursued and completed despite poor returns to acquirers.

1.2 Research questions and main findings

This thesis aims to shed light on two main areas: the asset growth anomaly and its connection to post-deal acquirer returns. The focus of the thesis will be on the following areas;

1) finding an asset growth anomaly in the US market that can be exploited by ordinary investors, and
2) determining whether this anomaly can explain the poor post-deal returns of acquiring companies.

Using US data from the CRSP database, I construct calendar-time portfolios as a basis for my analysis, which includes comparisons, OLS regressions and asset growth sorts. I also examine how the relationship and the anomaly have changed over time, and whether they still hold up in present day.

I find that an investable asset growth effect exists in the US stock market, yielding annual returns of 11.6% to a zero-investment strategy. The effect is created from the stellar performance of asset shrinkers sporting annual returns of, on average, 16.7% and from the dismal performance of asset growers with annual returns of only 2.4%. I find that the effect is stronger than the value or size effects, even combined, and that the success cannot easily be explained by risk (portfolio volatility is not correspondingly high, risk factors cannot explain returns and the strategies are not prone to crashes). I also find that the anomaly's returns cannot be explained by exposure to common risk factors. However, I also find that the effect seems to have disappeared during the 2010s, but also find evidence supporting the effect's temporary slumber, rather than death.

For my second research question, I find that a portfolio of asset-growth matched non-acquirers explains the poor returns of a portfolio of acquiring companies. I also find that, as suggested by the asset growth effect, acquirers who simultaneously contract their total asset base tend to overperform the market. In a more detailed analysis, I find a downward slope for post-deal returns over asset growth deciles, and that a similar slope is found from the returns of non-acquirers. Lastly, I show that the connection between the two phenomena has not changed during the 2010s, with the slope evening out for both acquirers and non-acquirers. However, even with very persuasive evidence, my results cannot conclude that acquirer returns are based solely on asset growth, as significant differences remain in some asset growth deciles and during some periods.

1.3 Contribution to existing literature

My thesis contributes to existing literature in a multitude of ways. Regarding my first research question, I use a quarterly rebalanced calendar-time portfolio approach with a focus on the investability of the anomaly[1], shedding increased light into the anomaly's viability and strength. My study also yields further proof that the anomaly is stronger than the value or size effects and looks deeper into its riskiness, determining that the anomaly's returns cannot be justified by a propensity for crashing or by other risk factors.

Relating to my second research question, my use of a decile-portfolio approach yields a comprehensive picture of how asset growth affects the subsequent returns of acquirers and non-acquirers alike, revealing a systematic connection between the two phenomena, something that to my knowledge has not been done before. I also add to previous research through my creation of an acquirer risk factor, the returns of which I show to have a clear connection to the asset growth effect.

Finally, I contribute to existing research by discovering the anomaly's disappearance in the 2010s. I go further to investigate why this disappearance could be and arrive at results suggesting a temporary slumber of the anomaly rather than its definite demise. I also show that even during this disappearance, the connection between the two phenomena stays strong.

1.4 Structure of the Thesis

The paper is constructed as follows. Section 2 reviews the relevant literature regarding both the asset growth anomaly and acquirer returns, while Section 3 discusses my main hypotheses and their link to academic literature. Section 4 goes on to describe the data and methodology I use in the Thesis, after which Section 5 reviews the empirical results of my tests. Section 6 will then discuss my findings and their put their implications into a larger corporate finance framework. Finally, Section 7 concludes my Thesis.

[1] As opposed to Mortal and Schill's yearly rebalanced approach which included companies on the first trading day of the year, not taking into account lags in information disclosure

2 Review of relevant literature

While research on asset growth and investments in general have been around for decades, the focus on the asset growth effect is very recent – for instance, in their 2008 paper, Eugene Fama and Kenneth French disregard the predictive power of total assets over stock returns. In this section I will inspect previous research both into the asset growth effect and acquisitions in general, creating a theoretical framework for my thesis.

2.1 The asset growth effect

In 1994, Lakonishok, Shleifer and Vishny ("LSV") found a contrarian effect in the cross-section of stock returns, i.e. that periods of high asset returns are generally followed by periods of low returns. LSV argue that this is based on equity mispricing. In the following decades, especially in the late 2000s and early 2010s, a growing amount of research has shown that, along with the contrarian lines of LSV, there is a large and highly significant negative correlation between company asset growth and subsequent stock returns. This means that events leading to asset expansion[2] tend to forecast low returns, while events leading to asset contraction[3] lead to high returns. (e.g. Mortal and Schill 2015, Cooper, Gulen and Schill 2008) Studies have shown that this exceptionally powerful phenomenon is present in companies of all size groups (Cooper, Gulen and Schill 2008) and in both US and international markets (Watanabe, Yan, Tong and Yu 2013). Explanations for the anomaly include both mispricing and risk-based arguments.

Sceptical to anomalies – and behavioural effects in general – Eugene Fama and Kenneth French took a stance on many of such effects in their 2008 paper 'Dissecting Anomalies'. In this paper, they also discussed the asset growth effect, but found that while it exists for small and mid-sized companies, it is non-existant for large companies which make up ca. 90% of the total market capitalization. This led them to dismiss the asset growth effect. However, later research has shown that their results, while true, come from the exclusion of equity issues for asset growth. These issues account for most of the asset growth for large companies. (e.g. Lipson, Mortal and Schill 2011, Li, Becker and Rosenfeldt 2012)

[2] This includes e.g. acquisitions, greenfield investments or equity and debt issues
[3] This includes e.g. spin-offs, divestments or share repurchases

Before focusing on total asset growth, researchers found return anomalies associated with growth in certain parts of the balance sheet. Back then, anomalies and explanations included growth in accruals as a part of the market's larger mispricing of growth in net operating assets (Fairfield, Whisenant and Yohn 2003), a financing effect through debt and equity issuances (Richardson and Sloan 2003) and growth in shares through seasoned equity offerings, share repurchases and merger effects (Pontiff and Woodgate 2008).

In their 2008 paper Cooper, Gulen and Schill examine the relationship between company total asset growth and subsequent stock returns for US companies from 1968 to 2003 and find a strong negative correlation between total asset growth and following stock returns. When creating yearly-balanced portfolios based on a previous-year asset growth sort, the lowest growth-decile portfolio experiences 18% p.a. returns, while the highest growth-decile portfolio gains only 5% annually. Furthermore, they find that the Sharpe ratio for the value-weighted asset growth spread portfolio is 1.07, while the ratios for book-to-market, size and momentum portfolios were much lower, at 0.37, 0.13 and 0.73 respectively. Cooper, Gulen and Schills' results show that not only is the total asset growth effect more significant than all partial asset growth effects, but also that the total asset growth effect is larger and more significant than both value and momentum effects. Historically these two effects have commanded much attention in financial literature. They find that their results are consistent with behavioural explanations as returns are focused around earnings announcements[4] and the effect is less pronounced during times of higher corporate oversight[5]. Lastly, they find that only growth in external financing (equity and debt) creates a significant return effect, with retained earnings growth having no contribution to the total asset growth effect.

Looking further into the asset growth effect and its drivers, Lipson, Mortal and Schill (2011) find that the asset growth effect is pervasive in all size categories and that evidence against pervasiveness, such as Fama and French (2008), are due to specification choices. They also find that the asset growth effect is linked to a company's idiosyncratic volatility ("IVOL"). Low IVOL companies experience a milder, if any, asset growth effect, while high IVOL companies experience a pronounced effect. This leads them to believe that limits to arbitrage play a role in the anomaly. Lipson, Mortal and Schill also discover that analyst forecasts are systematically

[4] This would imply investor extrapolation of past growth
[5] Low oversight can lead to agency issues and managerialism

biased to strengthen the anomaly, lending credibility to market overextrapolation. Their results lend a lot of credibility to mispricing-based arguments as the cause for the asset growth effect.

The bulk of this growing amount of research supports mispricing-based arguments for the asset growth effect, with arguments such as Fama and French being taken down by further research. This, however, is only the case when reviewing domestic markets in the US. Curiously, international research looking into the asset growth effect in different countries, while also finding a return effect, also finds that developed markets experience a more pronounced effect. More inefficient markets may even experience a positive correlation between asset growth and subsequent stock returns.

For instance, Watanabe et al (2013) find that instead of behavioural drivers[6], their results support rational drivers and optimal investment considerations[7] for the asset growth effect. After making their asset growth-sorted portfolios for each country, they find that even though there is an asset growth effect in most countries, there is a high amount of variation between countries in the intensity and significance of the effect. Surprisingly, more developed markets seem to experience a stronger effect than less efficient markets. As mentioned before, Watanabe et al even find some countries sporting a positive correlation between asset growth and subsequent stock returns. This seems to not support behavioural or mispricing arguments but lend credibility to claims of optimal investment.

Along the same lines, Titman, Wei and Xie (2013) find that there are large differences in the power of the asset growth effect between different countries. The results show that more developed countries experience larger disparities between the future returns of high and low asset growth companies, discrediting mispricing and agency issue arguments. They conclude that, based on their results, managers seem to align their capital expenditures to their cost of capital, as predicted by the Q theory of investments.

[6] Behavioural drivers include e.g. 1) overinvestment and empire building, 2) market timing when raising and retiring external financing, 3) earnings management prior to acquisitions or raising capital or 4) investor overextrapolation

[7] Optimal investment with different discount rates explain different subsequent returns. E.g. 1) firms making large acquisitions are more likely to have lower discount rates than companies with fewer acquisitions, 2) further acquisitions are likely to create decreasing return to scale and have an effect on the discount rate and 3) after realising their growth options, companies have lower risk and expected growth

Other optimal-investment arguments are provided by researchers looking into the value effect, as the two phenomena are closely connected through their link to investment. Berk, Green and Naik (1999) use a dynamic model to show that companies' assets and growth options change in predictable ways. They then show how this predictability affects expected returns and the time-series relation of the book-to-market ratio and stock returns, creating contrarian sequences in short-term stock returns. This explanation can easily be linked to the asset growth anomaly. On the other hand, some of the research into the value effect seems to anticipate a negative asset growth effect, as e.g. Zhang (2005) argues that assets in place are fundamentally riskier than growth options due to costly reversibility and the countercyclical price of risk, leading to companies becoming riskier as they expand their asset base. This reasoning would thus expect positive subsequent returns after asset expansion.

It is still unclear whether the asset growth effect exists more due to behavioural or rational reasons. Lam and Wei (2011) evaluate the two competing hypotheses[8] by conducting cross-sectional regressions on returns of different subsamples of stocks divided by measures of limits-to-arbitrage and investment frictions. They conclude that both hypotheses receive a fair and similar amount of evidence from their tests, with neither explanation rising as a winner.

Breaking ground for the area my Thesis focuses on, Mortal and Schill (2015) have raised the question of whether the choice between organic or non-organic growth matters with respect to future returns. Their hypothesis is that mergers are benign events, and the low long-term returns are completely explained by a larger asset growth anomaly. They conduct their analysis by first doing an event study on long-term merger returns using different size and book-to-market sorted portfolios as control groups. They find that mergers underperform, but that the underperformance disappears when using an asset growth sorted control portfolio. They then use a calendar-time portfolio approach to construct portfolios of acquiring companies and find similar results. The Mortal and Schill paper, however, can be criticized for constructing their portfolios in calendar time, with company inclusion on January 1st. This is problematic as asset growth information is released to the market only after a delay[9], leaving suspicions of market front-running.

[8] The two competing hypotheses are 1) Schleifer and Vishny's mispricing hypothesis with limits-to-arbitrage and 2) Li and Zhang's Q-theory with investment frictions
[9] SEC 10-K form deadlines are 60 to 90 days from a year's end

2.2 Poor post-acquisition returns to acquirers

One of the most intriguing disparities emerging from academic research on mergers and acquisitions is that while the targets of mergers and acquisitions undeniably experience great returns across the board (e.g. Jensen and Ruback 1983; Healy, Palepu and Ruback 1992), acquirers are documented to receive much poorer, if not negative returns. For instance, Agrawal, Jaffe and Mandelker (1992) studied the post-merger performance of acquiring firms using a nearly exhaustive sample of mergers and acquisitions between NYSE acquirers and NYSE/AMEX targets. They found that acquirers underperform during the years following an acquisition, resulting in a statistically significant shareholder loss of 10%. The results are robust to market adjusting.

In a collective study of research on acquirer returns, Bruner (2002) worryingly finds that “one-third (13) [of academic papers on acquirer returns] show value destruction; one-third show value conservation (14); and one-third show value creation (17)”. Even more alarmingly, out of his sample of 11 papers studying long-term acquirer returns, eight report negative and significant returns. Since acquiring companies can 1) decide whether to pursue acquisitive growth 2) decide on which companies they are willing to acquire and 3) set their willingness to pay according to their cost of capital, forecasted cash flow and available synergies, poor acquirer returns raise the question of why acquirers are unable to produce better returns and, given this ineptitude, persist in their acquisitive behaviour.

Historically, financial literature has believed that managers act rationally in order to maximise shareholder value. Thus, many researchers have sought out ways to show that managers seek optimal investment. One such theory is popular among neoclassical theorists, who tend to look at corporate investment through the so-called Q theory, advanced by e.g. Tobin (1969). The Q theory suggests that managers aim to maximise the value of the company’s outstanding common equity, causing investment to follow the value of Tobin’s Q – the total market value of the firm divided by the firm’s total asset value[10] – with values over one incentivising investment and values under one curbing it. In theory, the equilibrium is when the value of capital equals its replacement cost, as Q is one. Thus, the theory predicts that buyers with great management and growth opportunities – and thus high Tobin’s Q – acquire wasteful or less efficient companies whose Q is lower. (Tobin 1969.)

[10] Tobin’s Q is essentially the market-to-book ratio

In practice, the poor acquirer returns shown by academic research cast a shadow on optimal investment theories – at least in acquisitive investment. Acquiring firms commonly lose or break even in acquisitions, making it difficult to settle with the supposition that decision makers maximise the value of equity.

Those searching for rational explanations to poor acquirer returns have, however, been successful in finding that overvalued acquirers can use common stock as a means of payment to maximise the returns of their old shareholders even if returns are negative. While there are no similar arguments for negative acquirer returns in cash financed deals, the argument for stock financing is that while the acquirer is more overvalued than the target, the acquisition will benefit old shareholders as the overvaluation dissolves. In their 2011 study, Bi and Gregory find that overvalued companies create value for their old shareholders by engaging in equity financed acquisitions. However, they also find that UK evidence supports the notion that acquisitions are more driven by stock market valuations than the Q theory. (Shleifer and Vishny 2003, Bi and Gregory 2011, Savor and Lu 2009; Loughran and Vijh 1997.)

Like many topics in contemporary financial debate, this issue has received explanations from a behavioural point of view. These are centred on agency issues and biased managerial decision making. In his 1986 paper, Roll explains poor managerial decision making with hubris, which results in value destroying but ambitious projects. Other popular explanations are empire building (Morck, Shleifer and Vishny 1990) and managerialism (Seth, Song and Pettit 2000).

Behaviouristic arguments explain poor acquirer returns through managerial self-serving or psychological biases. Moeller, Schlingemann and Stulz (2004) find that these behaviouristic motives are more likely in larger companies. In line with both non-optimal investment and Moeller et al's findings, Jensen (1986) shows that high free cash flow leads to value destroying acquisitions.

A less generalistic approach to acquirer returns is examining the motives behind individual acquisitions. In this, there are widely recognized determinants of merger success. Motives that lead to positive acquirer returns are often synergistic, while negative returns are created by hubris or agency motives (Berkovitch and Narayanan 1993; Seth, Song and Pettit 2000; Trautwein 1990; Morck, Shleifer and Vishny 1990; Capron and Pistre 2002). Furthermore, another positive motive is driven by the market for corporate control, as illustrated by Manne (1965).

When deducting the motives behind transactions – and explaining why certain transactions perform better than others – many parameters have been used. These include e.g. relatedness (Capron and Pistre 2002), distance (Moeller and Schlingemann 2005; Aw and Chatterjee 2004; Conn, Cosh, Guest and Hughes 2005) and more recently, company age (Arikan and Stulz 2016).

As this glimpse into the field of corporate finance research in acquisitions shows, a massive amount of effort has been poured into the debate between different determinants of acquisition success and rationale. Although investment in general has also received attention – e.g. the Q theory is a comprehensive theory of investment activity – acquisitions and acquirer returns have been picked apart and examined by a much larger horde of academics. If it turns out that acquisitions are not a unique form of investment, or that a large part of it can be explained by similar effects in organic investment, much of this focus can be deemed inefficient at best, misdirected at worst.

3 Main hypotheses

Based on previous literature, I construct my main hypotheses around the existence of a significant asset growth effect and its explanatory power over poor post-deal acquirer returns.

3.1 Existence of an asset growth anomaly in the US stock market

As recent academic literature concludes (e.g. Mortal and Schill, 2015; Cooper, Gulen and Schill 2008), the data on stock returns suggests that the change in total assets of a company is a strong predictor of future stock returns. Without taking a stance on the roots of the anomaly[11], I hypothesize that my data will show a clear disparity between the future returns of companies whose assets contract and companies which expand their assets. I use US stock data to determine whether an actual anomaly exists by constructing an investment strategy based on the asset growth effect. I expect to find that there exists a zero-cost investment strategy which is investable[12] and profitable. My first main hypotheses are thus as follows:

> *H_{1A}: Asset growth has significant predictive power over a company's twelve-month stock return*
>
> *H_{1B}: This asset growth effect creates an investable opportunity to create fully levered returns for investors*

As my focus is on the existence and investability of the anomaly, I will also examine the development of the effect over time and in the extraordinary[13] market of the 2010s. I hypothesize that

> *H_{1C}: The asset growth effect persists over my sample period and is stronger than the size or value anomalies during this time*

[11] Whether the anomaly is due to risk-based or behavioral reasons is left outside the scope of this Thesis

[12] An investor can, without incurring extra costs, acquire all the information needed to employ the strategy in real time and there are no constraints on investing in the strategy

[13] The decade after the financial crisis of 2008 has been characterized by very low interest rates and high market liquidity

3.2 Asset growth explains poor acquirer returns

As one of the most researched areas in corporate finance literature, poor acquirer returns have been widely documented in both announcement day- and long-term studies. For instance, Agrawal, Jaffe and Mandelker's (1992) study using an exhaustive sample of US acquisitions shows a 10% shareholder loss over the years following an acquisition. The reasons, both risk-based and behavioural, have also been the focus of a large swath of research.

Following recent research mainly by Mortal and Schill (2015), I expect to find that rather than reasons unique to a merger or mergers in general, it is in fact the change in a company's total assets that explains much of the poor post-deal returns. As a company's assets often increase due to an acquisition, I expect to find that acquirers on average experience poor stock returns and that acquisitions leading to larger asset growth will result in poorer returns. Furthermore, I expect to find that acquiring companies whose assets contract will not experience poor returns. From this I derive my second main hypothesis:

> H_{2A}: *Acquisitions are non-unique events in that corresponding organic investment will result in similar returns*

In order to see if the relationship holds over time, I examine the similarities of post-acquisition acquirer returns and the returns of organically investing companies in all of my sample period decades.

> H_{2B}: *The connection between the asset growth effect and post-deal acquirer returns persists over my sample*

It is worth noting that, should my hypotheses be correct and there is a strong, exploitable asset growth effect in the market which explains post-deal acquirer returns, there are two main implications for academia and the financial markets. First, confirmation of previous studies finding a stable and strong anomaly will cast a questionable light on the efficiency of the financial markets – especially in developed economies – and potentially offer investors an opportunity to exploit the anomaly until the market corrects itself. Second, should acquisitions and organic investments be fundamentally similar, research resources and minds would be more efficiently allocated if the focus on acquisitions as a unique area of research would be alleviated and redirected to more general theories of research.

4 Data, methodology and company acquisitiveness

4.1 Data and lifecycle effects in company acquisitiveness

For the needs of my thesis, I use two main datasets: SDC Mergers and Acquisitions and CRSP-Compustat. Due to incentives to file acquisitions, the SDC database is a nearly exhaustive record of all US merger activity after 1980 (Barnes, Harp and Oler 2014). CRSP-Compustat is a joined database of CRSP, an exhaustive record of US stock data, and Compustat, which holds an exhaustive record of listed US companies' financial data. In addition to these two databases, I use data provided by Kenneth French on his website.

My main dataset includes all US listed companies and their acquisitions from year 1982 through to year 2017. I chose 1982 as the beginning of the sample due to the start of SDC's exhaustive record and the amount of listed companies[14]. I collect data on total assets and other financial data from Compustat on a quarterly basis. A quarter is chosen as the interval due to it being the shortest interval at which updates on asset growth are reliably available for all listed companies. In calculating asset growth from the data, I use the word "total assets" when talking about the actual total assets minus cash. I deduct cash in calculation of asset growth for two reasons: 1) asset growth achieved through an increase in cash does not require any actual investment and thus does not have a meaningful impact on returns (Cooper, Gulen and Schill 2008) and 2) the impact an acquisition has on the amount of a company's operating assets can be distorted by large cash holdings. From this information, I calculate a rolling asset growth based on the last four quarters:

$$LTM^{15}\ asset\ growth - \%_t = \frac{Total\ assets_{Q(t)} - Cash\ \&\ cash\ equivalents_{Q(t)}}{Total\ assets_{Q(t-4)} - Cash\ \&\ cash\ equivalents_{Q(t-4)}}$$

[14] While exhaustive SDC records start in 1980, during decile portfolio formation (explained in 4.2) it became clear that during years 1980-1981 some portfolios had no companies in them. This was due to multiple allocation criteria, including acquisition activity and asset growth deciles.

[15] LTM denotes Last Twelve Months

I then use monthly stock return data[16] from CRSP to calculate quarter returns for each stock over the sample period[17]. Before this, however, I clean up the data by excluding penny stocks, which I define as stocks which see their price reduced to under 4$. Penny stocks are excluded because some institutional investors are not allowed to invest in them, potentially adding noise to the long-term returns, especially for equally weighted portfolios. For companies whose shares stop trading publicly for any reason, I primarily use the de-listing return provided in CRSP. If a de-listing return is missing, however, I use an estimate of -30% based on the research of Shumway (1997). This adjustment is used to account for de-listings during a portfolio's holding period, as they represent an unforeseen event and may have a significant effect on portfolio returns. This adjustment thus significantly increases this study's robustness regarding investability. I also clear my sample of all companies in the financial sector (with SIC industry codes starting with 6) due to the unique nature of this area, especially regarding assets. After these adjustments, I end up with 670,907 quarters of company asset growth and price data.

I define a company as an acquirer if it has conducted an acquisition in the previous four quarters. I gather US acquisition data for the years of the sample period, starting a year before the main sample period to allow the past four quarters' acquisitions to affect the classification to acquirers and non-acquirers at the start of the main sample period. Using SDC's definitions of deal type, my sample includes acquisitions, acquisitions of assets, acquisitions of majority interest, acquisitions of certain assets, mergers and exchange offers. All acquisitions in the sample are for majority ownership of the target. As small acquisitions can easily add noise to the sample, I only include acquisitions that have a significant impact on the acquirer's balance sheet. I do this using the two following measures.

First, I employ a hard lower bound for deal value of acquisitions of $2m. Second, in order to reduce noise in the acquisitions made by larger companies, I only include deals where the deal value is over 5% of the total assets of the acquirer. This eliminates deals that do not have a meaningful impact on the acquirer's business. These kinds of acquisitions are not expected to have long-term effects on stock returns. Furthermore, this cut-off will make my results regarding the returns of acquirers with contracting assets more robust, as it shows the co-effect

[16] I use total return, meaning price changes including dividends and share repurchases
[17] In calculating quarter returns, I exclude missing monthly returns. Due to the large effects of outlier returns (such as a 4,200% quarterly return) on the quarterly returns of some portfolios, especially decile portfolios, I cap the quarter return at a maximum of 400%

of considerable acquisitions and shrinking asset base. In using the measure of acquirer total assets instead of market capitalisation as a benchmark for the cut-off, I am employing a rare strategy which I have not encountered in any other papers. For the purposes of the asset growth setting of my thesis, target size to acquirer balance sheet is more important than target size to acquirer market capitalization. In the end, my data set consists of a healthy 12,726 acquisitions, amounting to 39,862 acquirer quarters and 631,045 non-acquirer quarters.

In addition to SDC, Compustat and CRSP, I use Kenneth French's data on monthly Fama & French three-factor returns and the risk-free rate in my analysis when benchmarking and analysing the asset growth effect and in my OLS regressions.

Table 1 shows the amount of quarterly data points my data set includes after categorizations. Acquirer data on the lower end of the asset growth spectrum is logically relatively sparse, leading to some decile portfolios having a considerably lower number of companies in them during some quarters.

Table 1: *Number of quarterly observations after categorization and company acquisitiveness*

Panel 1 shows the amount of quarter data points left in each category after cleaning operations. Full sample is all company quarters with a known quarter stock return. Other categories also include the requirement of an existing quarterly stock return. Cursive amounts denote the number of quarterly observations which also have market capitalization, allowing for value weighted analysis.

Panel 1: Amount of quarter data by category

Full sample	670 907	
	659 872	
	Lowest decile	Highest decile
Asset growth	78 681	90 729
	77 054	*90 181*
Acquirers	39 862	
	39 770	
	Lowest decile	Highest decile
Asset growth & acquirers	2 101	14 643
	2 089	*14 615*

4.2 Acquirer post-deal performance and the asset-growth anomaly – methodology

In order to both create an investable trading strategy and to determine the uniqueness of acquisitive growth, I construct calendar time portfolios of different sets of companies based on their acquisition activity and asset growth. I chose the calendar time portfolio-approach over a long-run BHAR[18] event study because – while it is slightly more complicated – it captures the long-run returns of groups of companies as well as the BHAR method while not being as susceptible to statistical problems (a problem noted by Mitchell and Stafford (2000)).

Before portfolio formation, I allocate each company quarter[19] into asset growth deciles, which are calculated separately for each quarter from Q1 1982 to Q4 2017. I then form a total of 54 portfolios. For the first hypothesis, I calculate a low-asset growth and high-asset growth portfolio, based on which I create a zero-cost portfolio strategy. For the needs or the second hypothesis, I form an acquirer portfolio of all acquirers and an asset growth-matched control portfolio of all non-acquirers, and then separately form ten acquirer portfolios and ten non-acquirer control portfolios based on asset growth deciles. All portfolios are formed as both equal weighted and value weighted.

4.2.1 The asset growth anomaly as an investable trading strategy

I seek to create an investable zero-investment trading strategy, which creates abnormal returns using the predictive power of company asset growth. For this purpose, I create portfolios of the rolling 1st and 10th asset growth decile, called "LAG" (Low Asset Growth-portfolio) and "HAG" (High Asset Growth-portfolio), respectively. A zero-cost portfolio CME (Contracting Minus Expanding) is created by taking a long position in LAG while shorting HAG. These positions are then rebalanced on a quarterly basis.

[18] BHAR is short for "Buy-and-hold abnormal returns"
[19] My data and analysis is based on quarter data, and I refer to data points as "company quarters", "acquirer quarters" etc.

Companies are included in LAG and HAG based on their LTM asset growth[20] in the past four quarters. Portfolio rebalancing is done quarterly in a rolling fashion, dropping out companies who have not met the criteria for the past four quarters. Companies qualifying for both portfolios[21] are excluded from both. I choose a quarterly interval – as opposed to Mortal and Schill's annual rebalancing – to match rebalancing to the shortest investable interval for investors, as the strategy only requires quarterly reports on total assets for decision-making on an LTM basis. A rolling LTM approach will track the company's asset growth profile much more precisely than an annual approach. Additionally, I further divert from Mortal and Schill's methodology in not including companies in the portfolio on the first trading day of the new quarter. Listed US companies have 40-45 days to report their quarterly financial data[22], which means that a portfolio including the companies on the first trading day of Q_t is uninvestable due to investors not having the needed LTM asset growth information for company classification. I correct for the lagged disclosure by classifying companies in portfolios in Q_{t+1}, after three months. This means that should a company's LTM asset growth be classified as low (belonging in the 1st asset growth decile) in Q_{t-1}, it is included in LAG for three quarters from Q_{t+1} to Q_{t+3}, skipping Q_t. This adjustment makes sure my results are not the result of market front running and further ensures the strategy's investability.

As the zero-cost strategy is fully levered, it employs a net zero of capital. Thus, as calculating actual return on investment is impossible, I calculate an illustrative return on an individual leg of the strategy. If there is no asset growth effect, this return should not significantly differ from zero[23]. LAG and HAG returns are calculated for each quarter and CME returns – a fully levered strategy which is long in LAG and short in HAG – is derived from these with the following formula:

$$Quarter\ Return_{Levered} = Quarter\ Return_{Long} - Quarter\ Return_{Short} \qquad (1)$$

The portfolio returns of all portfolios[24] are then calculated normally as follows:

[20] Asset growth is calculated based on a quarterly measure of last twelve months' ("LTM") asset growth in order to smooth out quarterly asset volatility so that companies more consistently qualify for portfolios, reducing the trading needed to maintain positions
[21] Companies with volatile assets can qualify for both HAG and LAG simultaneously
[22] SEC 10-Q report deadlines are 45 days for small companies with a public float of less than $75M (non-accelerated filers) and 40 days for larger companies (accelerated or large accelerated filers) with a public float of over $75M
[23] Non-zero returns could surface if they are based on a separate, simultaneous anomaly, such as the size effect.
[24] Including SMB and HML returns, which are based on Kenneth French's monthly three factor dataset

$$Return\ of\ portfolio\ P\colon \left[\prod_{Q1\ 1982}^{Q4\ 2017}(Quarter\ Return_P + 1)\right] - 1 \quad (2)$$

I then analyse portfolio returns and compare them to other portfolios, including SMB (size effect), HML (value effect) and acquirer portfolios. In addition to doing the analysis for the full sample, I also divide the sample to four decades, the 1980s, 1990s, 2000s and 2010s[25]. I do this in order to see whether my results are being distorted by short periods of very high returns.

In order to see whether my strategy produces alpha that cannot be explained by risk factors, I perform OLS regressions of the CME quarter returns against both CAPM and Fama & French risk factors. The regressions are defined as follows:

$$R_{CME,Qt} = \alpha + \beta_1\left(R_{MKT,Qt} - R_{f,Qt}\right) + \varepsilon_{Qt} \quad (3)$$

$$R_{CME,Qt} = \alpha + \beta_1\left(R_{MKT,Qt} - R_{f,Qt}\right) + \beta_2 SML_{Qt} + \beta_3 HML_{Qt} + \varepsilon_{Qt} \quad (4)$$

In these regressions, $R_{CME,Qt}$ means CME return in quarter t, while $R_{MKT,Qt}$ denotes the market return during the same time. $R_{f,Qt}$ denotes the risk-free rate. SML and HML refer to Fama-French risk factors of the small-company effect (SML) and the value effect (HML).

4.2.2 Post-deal returns in an asset growth context

For the other part of my study, I seek to show that poor post-deal acquirer returns can be explained by the acquirers' asset growth instead of merger-specific factors (e.g. relatedness or distance between parties). For this reason, I first construct a full acquirer portfolio from the sample. I classify a stock as an acquirer if it has conducted an acquisition in the past four quarters – similarly as in 4.2.1. – but instead of waiting a full quarter after an acquisition before including companies in the portfolio, I include them from Q_t to Q_{t+3}. This is due to a negligible effect of lagged information disclosure on investability[26].

[25] The first and last decade are shorter due to the sample starting in 1982 and ending in 2017.
[26] Unlike asset growth, acquisitions are reported after they happen instead of after the end of a quarter. Furthermore, the SEC deadline for disclosure of 8-K forms is four days, considerably shorter than the deadlines for 10-Q reports

After calculating portfolio returns for the acquirer portfolio ("AP") using the formula (2), I run OLS regressions (3) and (4) on the AP returns. Furthermore, I add a third OLS regression, using my CME returns as a risk factor for asset growth. Using this self-created risk-factor, I am able to determine whether the general performance of an asset-growth based strategy explains merger returns.

$$R_{AP,Qt} = \alpha + \beta_1 (R_{MKT,Qt} - R_{f,Qt}) + \beta_2 SML_{Qt} + \beta_3 HML_{Qt} + \beta_4 CME_{Qt} + \varepsilon_{Qt} \qquad (5)$$

I conduct a similar analysis by constructing an "acquirer risk factor" AMNA by using the formula (1) with an acquirer portfolio as the long leg and a non-acquirer portfolio as the short leg. I can then run regressions on CME returns using this risk factor to see the other side of the relationship.

$$R_{CME,Qt} = \alpha + \beta_1 (R_{MKT,Qt} - R_{f,Qt}) + \beta_2 SML_{Qt} + \beta_3 HML_{Qt} + \beta_4 AMNA_{Qt} + \varepsilon_{Qt} \qquad (6)$$

After analysing the total sample of mergers, I analyse the predictive power of asset growth on a more detailed scale. I use the previously calculated quarterly decile breakpoints to divide acquirers into asset growth deciles for each quarter. I then create decile portfolios so that a company is included in a portfolio from Q_{t+1} to Q_{t+3} after it is assigned to a particular decile. The lagged inclusion is made not because of investability, but to keep the analysis clear of possible noise from front running the market. This approach also means that companies can be included in multiple portfolios simultaneously.

For a control group, I use an asset growth sorted sample of all US non-acquiring companies[27]. Dividing the control group into asset growth deciles quarterly using the same breakpoints, I arrive at decile portfolios which have the same asset growth breakpoints as the acquirer portfolios. I use the same asset growth breakpoints for acquirer and control portfolios to ensure the similarity of the asset growth profile of the two sets of decile portfolios. From measuring the differences in returns between corresponding decile portfolios, I determine the extent to which the asset growth effect explains the poor post-deal returns.

[27] Non-acquiring companies are companies not before classified as acquirers – i.e. companies who have not completed an acquisition in the past four quarters

5 Results

In this section, I show the results of my statistical tests for each of my hypotheses. Starting by examining the asset growth effect present in the US market and a potential investment strategy exploiting this effect, I will then determine the extent to which the asset growth effect explains post-deal returns of acquirers. Finally, I show how the asset growth effect and its connection to post-deal acquirer returns have changed over time.

5.1 Existence of the asset growth effect and its viability as an investment strategy

A summary of results regarding the asset growth-based portfolios is included in Table 2. Panel A shows the annual returns, standard deviations and Sharpe ratios of the Low Asset Growth (LAG), High Asset Growth (HAG) and the zero-investment Contracting Minus Expanding (CME) portfolios. Also, market returns from both my own sample (Full sample) and Kenneth French's own data base (Market) are included. French's market returns are considerably higher than the ones in my own data set, which I conclude to be due to specification differences. To ensure comparability in e.g. OLS analysis, I use the Full sample as the total market.

As is evident from the results, a strong asset growth effect can be seen in the US stock market during the years 1982 to 2017. The LAG portfolio generates very high returns (equal and value weighted annual returns of 12.4% and 17.3%, respectively), a phenomenon which is further accentuated with the dismal returns of the HAG companies (equal and value weighted annual returns of 1.5% and 2.4%, respectively). The full sample performs, as expected, between these two, at 9.3% and 8.5% for equal and value weighted portfolios. A very lucrative investment strategy is thus creating the CME zero-investment portfolio. CME returns are very high, at 7.9% and 11.6% for equal and value weighted portfolios, considerably higher than e.g. SMB or HML portfolios (see Table 3).

Furthermore, looking at the risk-adjusted returns through the Sharpe coefficient[28], there seem to be abnormal returns to be achieved through the asset growth effect. The Sharpe ratios for LAG and CME portfolios are high, at 0.97 and 1.12 for LAG and 1.52 and 1.40 for CME.

[28] The Sharpe ratio is calculated from average annual returns and standard deviations, using an average risk-free rate over 1982-2017 of 4,7% based on Kenneth French's data

Table 2: Portfolio returns of asset-growth based portfolios, the full sample and the market

LAG, HAG and CME portfolios are based on a quarterly sort on previous four-quarter asset growth. Companies are included in LAG (HAG) after a full quarter lag, if their previous four-quarter asset growth is in the bottom (top) decile. Inclusion lasts for three quarters. CME is a zero-cost portfolio, taking equally large positions long in LAG and short in HAG. All these portfolios are held for a quarter, after which they are rebalanced. Returns for CME are calculated from quarterly returns of each leg, which are then compounded and annualized. Full sample is my entire US sample of CRSP-Compustat companies, while Market is based on data from Kenneth French from US companies. Panel A shows returns, standard deviation and Sharpe coefficient calculated from 1982-2017. Sharpe coefficient is calculated from aggregate returns – not quarterly. Panel B shows the average size of the long and short legs of the strategy.

Panel A: Asset-growth based portfolio returns		EW	VW
LAG	Annual return	12,0 %	16,7 %
	Standard deviation	8,0 %	11,2 %
	Sharpe coefficient	0,9405	1,0875
HAG	Annual return	1,5 %	2,4 %
	Standard deviation	11,0 %	11,5 %
	Sharpe coefficient	-0,2790	-0,1891
CME	Annual return	7,9 %	11,6 %
	Standard deviation	5,2 %	8,3 %
	Sharpe coefficient	1.5192	1.3976
Full sample	Annual return	9,0 %	8,2 %
	Standard deviation	8,6 %	8,0 %
	Sharpe coefficient	0,5177	0,4612
Market	Annual return		12,5 %
	Standard deviation		8,1 %
	Sharpe coefficient		0,9778

Panel B: Size of portfolios		LAG	HAG
	Average number of stock per quarter	595,2	645,1

My market index shows coefficients of 0.53 and 0.48, while HAG has the lowest Sharpe ratios at -0.29 and -0.19. However, the Kenneth French market index beats my Full sample considerably, while still falling short of LAG and CME with a Sharpe coefficient of 0.98.

The results show that value weighted portfolios exhibit a stronger asset growth effect than equally weighted portfolios. This goes against what Fama and French argued in 2008, because the asset growth effect does not seem to affect exclusively small companies. On the contrary, my results imply that the asset growth's effect is stronger in large companies. Also, asset growth seems to have implications on both total risk and returns, with HAG returns demonstrating poor returns and higher standard deviations. This shines a questionable light on risk-based explanations for the effect, as many rely on the altered risk-structure of the company[29] (see 2.2).

Panel B shows the average size of LAG and HAG portfolios (and thus the two legs of CME). The amount of stocks for LAG varies between 185 and 899, while the amount of stock in HAG varies between 193 and 935. The amount of companies in each portfolio is not equal due to the trailing nature of inclusion. The higher amount of companies in HAG implies that companies typically have short bursts of asset growth, qualifying them for the top decile for the next four quarters, while decreasing assets are more of a trend. This implication is in line with the logic of high asset growth through mergers and other large investments, while depreciation is behind decreasing assets more often than large one-time asset sales.

As can be seen from Table 3, the annual CME returns by far outstrip the annual SMB and HML returns, especially on a value-weighted basis. This would imply that the asset growth anomaly is much larger than the value or size anomalies. The HML returns in Table 3 are somewhat low due to the fact that I calculate returns similarly to CME returns, but use the monthly return data set (which in Kenneth French's data gives lower annualized returns than the annual data set). CME t values of 5.22 and 4.58 also show that the anomaly is statistically very significant.

Table 3: *Asset growth effect against the value and size effects*

Returns are calculated from the total 1982 – 2017 time period. CME portfolio describes the asset growth effect. Small minus Big (SMB) describes the size effect, while High minus Low (HML) describes the value effect. Annual returns for SMB and HML portfolios are calculated from Kenneth French's monthly data on Fama French three factor returns by using (2) in 4.2.1. There, SMB is calculated as the average return of three small portfolios minus the return of three large portfolios[30]. Similarly, HML is the average return of two value portfolios minus the return of two growth portfolios[31]. t values are available for CME in parentheses. SMB and HML t values not available due to the format of the original data.

	CME		SMB	HML
	EW	VW	VW	VW
Annual return	7,9 %	11,6 %	1,3 %	1,8 %
Standard deviation	5,20 %	8,30 %	4,84 %	6,77 %
t value	*(5,0227)*	*(4,5792)*		

[29] Higher systematic risk could still be an explaining factor. As can be seen from Table 4, however, CME systematic market risk is low, indicating there to be no large differences in the betas of individual legs

[30] SMB = 1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Big Value + Big Neutral + Big Growth)

[31] HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth).

5.1.1 OLS regression analysis of the asset growth effect

I test whether the over performance of the asset growth anomaly holds up against other risk factors in an OLS analysis. As explained in Section 4, I use three separate regressions for both equal and value weighted portfolios. The results are shown in Table 4, in which regressions (1) and (2) are used in hypothesis H_1 but regression (3) relates to H_2, and is analysed later in Section 5.2.

The reason for the OLS analysis is that even if returns seem high on an absolute basis, they might be the result of correlation with other risk factors. This would show as an insignificant intercept and significant coefficients, while a significant asset growth effect would show as significant intercepts. CAPM and Fama & French three-factor regressions are run separately to see the differences in coefficients.

Panel A in Table 4 shows the resulting coefficients and their significance. As can be expected, the equally weighted CME portfolio is highly correlated with most risk factors, which are all value weighted, producing highly significant coefficients for the market and the size effect[32], while the value coefficient is less pronounced. In EW regressions, the strategy is negatively correlated with the market and size effects, and positively with the value effect. Regardless of the highly significant coefficients, the portfolio still produces very significant and high intercepts of 3.1% and 2.9% (ca. 12.8% and 11.9% p.a.) for CAPM and Fama French regressions.

Value weighted regressions can be expected to produce coefficients which are more informative, since their underlying strategies are similarly weighted to VW CME. When looking at the resulting coefficients, this effect becomes very apparent. VW (1) and VW (2) show much lower, insignificant coefficients for market and size risk factors while retaining highly significant intercepts of 3.3% and 2.8% (13.7% and 11.8% p.a.) for CAPM and Fama French regressions. Interestingly, while market and size coefficients are insignificant in VW regressions, the value coefficient is more significant in VW than in EW regressions.

[32] The size effect's pronounced coefficients are logical, since an EW strategy has a higher weight on small companies than a VW strategy.

Apart from very high alphas, the connection to the value effect is the most interesting thing to take away from Table 4. The value effect explains a chunk of 0.43% of the intercept found in VW (1). The HML coefficient is also very large compared to what is shown by EW (2) (0.144 against 0.502 for EW (2) and VW (2), respectively). This would imply that the asset growth effect and value effect are similar and have similar causes, meaning the asset growth effect is not a completely separate anomaly. This connection can be explained by the contrarian nature of both of these anomalies – high run-ups in valuation or assets result in lower subsequent stock returns.

Table 4: *OLS regressions for CME*

Panel A includes the OLS regression factor loadings for the three regressions specified in 4.2.1, where also the CME portfolio is specified. t-values are in parentheses. The data sample is from 1982 to 2017. SMB and HML are based on value-weighted portfolios. AMNA is based on similar weighing as CME. Origin data and thus the table numbers are in decimal format. t-values for significance of individual intercepts and coefficients are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: CME factor loadings	EW			VW		
Independent variable	(1)	(2)	(3)	(1)	(2)	(3)
Intercept	0,0306***	0,0286***	0,0182***	0,0326***	0,0283***	0,0253***
	(8,9798)	*(8,7206)*	*(5,7891)*	*(4,6663)*	*(4,3508)*	*(3,8175)*
$R_m - R_f$	-0,4312***	-0,3365***	-0,1555***	-0,1368	-0,0186	0,0325
	(-10,515)	*(-7,4585)*	*(-3,3946)*	*(-1,6059)*	*(-0,2024)*	*(0,3427)*
SMB		-0,2476***	-0,1547**		-0,1117	-0,0663
		(-3,3950)	*(-2,4339)*		*(-0,7417)*	*(-0,4389)*
HML		0,1440***	0,0782*		0,5019***	0,4391***
		(3,0521)	*(1,8954)*		*(5,1693)*	*(4,3172)*
AMNA			-0,7903***			-0,3003*
			(-7,2931)			*(-1,9044)*
Adj. R^2	0,4338	0,4928	0,6409	0,0109	0,1576	0,1731

5.1.2 Sub-period analysis of the asset growth anomaly

Due to the increasing amount of research on different anomalies, it would be logical that the market would correct itself for any behavioural or other anomalies through capital flowing into exploiting any certain anomaly large enough to yield abnormal returns. Furthermore, the nature and situation of the financial markets changes considerably as decades pass. This is why I perform a sub-period analysis based on four decades – the 1980s, 1990s, 2000s and 2010s – on my data to control for both the potential dilution of the asset growth effect and possible distorting effects any short periods of time might have on my overall results. This considerably improves the robustness of my results.

Conducting the sub-period analysis yields very interesting results, somewhat changing the picture shown by the full sample analysis. Table 5 shows how the different asset growth-based portfolios performed in different sub periods, with Panels A through D showing results for LAG, HAG, CME and the full sample for the four separate decades. The results show that there are considerable differences in the returns yielded by these strategies over time. While the asset growth effect persists through the years 1982-2010, yielding annual returns of 11.8% to 17.8% in value weighted terms (6.4% to 15.9% on equal weighted terms), the years 2010 to 2017 stand out from the sample: as shown in Table 5 Panel D, the asset growth effect is close to non-existent in the bull market of 2010-2017 with returns of 1.1% and 0.0% p.a. for EW and VW CMEs.

The apparent disappearance of the asset growth effect in the latest decade would at first glance imply that the market has corrected itself – the dismal returns of the CME are not due to an individual leg of the strategy changing, but due to the fact that both legs are performing in line with the general market. VW LAG returns of 14.8%, while high, are not substantially higher than the returns 14.4% of the HAG portfolio and fail to beat the 14.9% returns of the full sample. This lack of an asset growth effect is unique to the latest decade, as in each previous period a considerable asset growth effect is demonstrated by the data. The 2010s also stand out when looking at the returns on a risk-adjusted basis. LAG portfolios outperform the market in terms of the Sharpe coefficient, while HAG portfolios underperform in every period from 1982 to 2009. However, during the final period, both portfolios slightly underperform the market, nullifying any abnormal returns from an asset growth-based strategy.

Table 5: *Portfolio returns of asset growth-based portfolios, sub-period analysis*

LAG, HAG and CME portfolios are based on a quarterly sort on previous four-quarter asset growth. Companies are included in LAG (HAG) after a full quarter lag, if their previous four-quarter asset growth is in the bottom (top) decile. Inclusion lasts for three quarters. CME is a zero-cost portfolio, taking equally large positions long in LAG and short in HAG. Acquirer portfolio includes all companies that have made an acquisition during the past four quarters. All these portfolios are held for a quarter, after which they are rebalanced. Full sample is my entire US sample of CRSP-Compustat companies. Sharpe coefficient is calculated from aggregate returns – not quarterly.

Panel A: Asset-growth based portfolio returns, 1982-1989		EW	VW
LAG	Annual return	15,1 %	18,0 %
	Standard deviation	11,8 %	11,5 %
	Sharpe coefficient	0,6070	0,8786
HAG	Annual return	-1,7 %	-0,2 %
	Standard deviation	13,0 %	11,3 %
	Sharpe coefficient	-0,7370	-0,7186
CME	Annual return	15,9 %	17,8 %
	Standard deviation	3,6 %	5,2 %
	Sharpe coefficient	2,1962	1,8892
Full sample	Annual return	10,3 %	11,4 %
	Standard deviation	10,9 %	8,4 %
	Sharpe coefficient	0,2216	0,4238
Acquirers	Annual return	7,0 %	4,2 %
	Standard deviation	11,8 %	11,1 %
	Sharpe coefficient	-0,0757	-0,3325

Panel B: Asset-growth based portfolio returns, 1990-1999		EW	VW
LAG	Annual return	13,8 %	19,6 %
	Standard deviation	6,2 %	7,9 %
	Sharpe coefficient	1,4350	1,8467
HAG	Annual return	2,9 %	4,9 %
	Standard deviation	9,4 %	10,9 %
	Sharpe coefficient	-0,2116	-0,0030
CME	Annual return	9,0 %	11,8 %
	Standard deviation	4,8 %	7,5 %
	Sharpe coefficient	0,8580	0,9144
Full sample	Annual return	9,2 %	9,8 %
	Standard deviation	7,2 %	6,8 %
	Sharpe coefficient	0,6024	0,7134
Acquirers	Annual return	7,5 %	8,3 %
	Standard deviation	10,0 %	10,4 %
	Sharpe coefficient	0,2569	0,3194

Panel C: Asset-growth based portfolio returns, 2000-2009		EW	VW
LAG	Annual return	9,7 %	16,1 %
	Standard deviation	7,4 %	15,1 %
	Sharpe coefficient	0,7553	0,7923
HAG	Annual return	-1,9 %	-5,4 %
	Standard deviation	12,9 %	14,3 %
	Sharpe coefficient	-0,4683	-0,6725
CME	Annual return	6,4 %	16,7 %
	Standard deviation	7,0 %	11,5 %
	Sharpe coefficient	0,3161	1,0939
Full sample	Annual return	6,7 %	0,8 %
	Standard deviation	9,3 %	9,5 %
	Sharpe coefficient	0,2684	-0,3575
Acquirers	Annual return	-1,1 %	-6,9 %
	Standard deviation	12,4 %	11,8 %
	Sharpe coefficient	-0,4253	-0,9429
Panel D: Asset-growth based portfolio returns, 2010-2017		EW	VW
LAG	Annual return	9,8 %	12,8 %
	Standard deviation	5,3 %	8,3 %
	Sharpe coefficient	1,6054	1,3903
HAG	Annual return	7,3 %	12,5 %
	Standard deviation	7,6 %	7,8 %
	Sharpe coefficient	0,7840	1,4327
CME	Annual return	1,1 %	0,0 %
	Standard deviation	3,6 %	6,0 %
	Sharpe coefficient	-0,0579	-0,2254
Full sample	Annual return	10,4 %	12,9 %
	Standard deviation	6,5 %	6,3 %
	Sharpe coefficient	1,3999	1,8384
Acquirers	Annual return	10,0 %	13,1 %
	Standard deviation	7,5 %	7,4 %
	Sharpe coefficient	1,1560	1,6038

A similar picture can be seen when comparing CME returns to SMB and HML returns from Kenneth French's data. Table 6 shows that, during the four decades, the size effect is systematically low while the value effect fluctuates heavily, yielding 6% to 7% annually during the 1980s and 2000s but only -4.9% to -0.2% during the 1990s and 2010s. The asset growth effect is shown to be stronger than both size and value effects during all decades but the 2010s, when the strategy yields negligible returns. The connection between value and the asset growth anomalies shown in 5.1.1 could explain the simultaneous disappearance of the CME and HML returns in the 2010s[33]

Table 6: *Asset growth effect against the value and the size effect, sub-period analysis*

CME portfolio is an approximation of the volume of the asset growth effect, as described previously. Small minus Big (SMB) describes the size effect, while High minus Low (HML) describes the value effect. Annual returns and standard deviations for SMB and HML portfolios are calculated from Kenneth French's data on Fama French three factor coefficients. There, SMB is calculated as the average return of three small portfolios minus the return of three large portfolios. Similarly, HML is the average return of two value portfolios minus the return of two growth portfolios.

Panel A: Asset growth effect and other anomalies, 1982-1989	CME		SMB	HML
	EW	VW	VW	VW
Annual return	15,9 %	17,8 %	-1,3 %	6,1 %
Standard deviation	3,65 %	5,22 %	4,01 %	4,90 %

Panel B: Asset growth effect and other anomalies, 1990-1999	CME		SMB	HML
	EW	VW	VW	VW
Annual return	9,0 %	11,8 %	-0,7 %	-4,9 %
Standard deviation	4,77 %	7,52 %	5,41 %	7,45 %

Panel C: Asset growth effect and other anomalies, 2000-2009	CME		SMB	HML
	EW	VW	VW	VW
Annual return	6,4 %	16,7 %	1,6 %	7,0 %
Standard deviation	6,96 %	11,45 %	5,64 %	8,27 %

Panel D: Asset growth effect and other anomalies, 2010-2017	CME		SMB	HML
	EW	VW	VW	VW
Annual return	1,1 %	0,0 %	0,1 %	-0,2 %
Standard deviation	3,6 %	6,0 %	3,1 %	4,5 %

[33] However, it does not explain the 1990s, when CME returns are high at 11,8% while HML returns are heavily negative at -4,9%

5.1.3 Propensity to market crashes

High CME returns could be justified by an increased likelihood of suffering large crashes e.g. in times of high market uncertainty or strong down-turns. Even though this argument is somewhat dulled by the fact my data shows no such crashes – largest incurred quarter and rolling four quarter losses are both at ca. -16.8% – I analyze here how the strategy has held up in the latest two large market crashes, the Dotcom bubble of the early 2000s and the Financial Crisis of 2008.

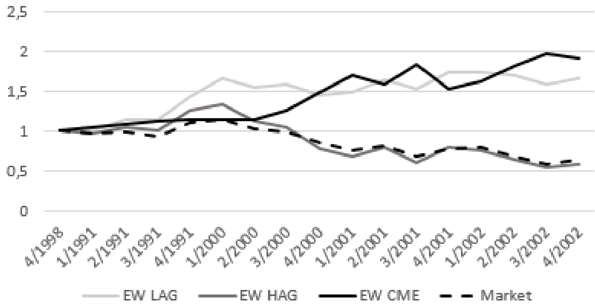
As can be seen from Figure 7, there seems to be no indication of CME strategy crashing during times of market distress. During the Dotcom crash, the market lost around half of its capitalization, while the LAG and CME portfolios seemed to do very well, multiplying in value in both equal and value weighted strategies. Noteworthy here is that the HAG portfolio seems to perform in line with the market, while LAG seems to overperform strongly.

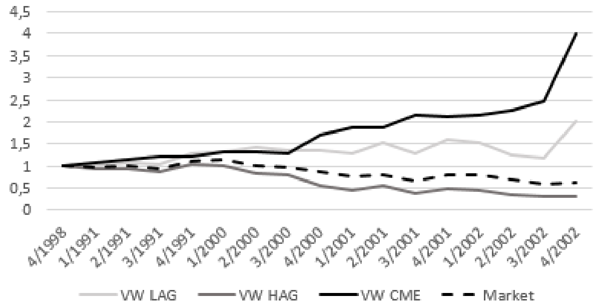
During the financial crisis of 2008 the CME strategy does not produce large excess returns, but exhibits somewhat countercyclical properties. The CME strategy seems to profit from the quick market downturn and lose some of those returns during the phase of fast recovery, before returning to normal performance. The difference between the two crashes leads me to suspect that an asset pricing bubble can benefit the strategy greatly, while a crash which affects the real economy would be less profitable. However, high asset growers seem to be more cyclical than asset contractors, giving the strategy some counter cyclicality. This can be seen as an additional selling point for the strategy, as it does well in market downturns, giving investors a hedge for the market. Interestingly, this counter-cyclicality and hedging nature of the strategy only seems to appear during times of market distress, as OLS regressions do not show significant coefficients for market risk.

Figure 7: *CME returns in market downturns*

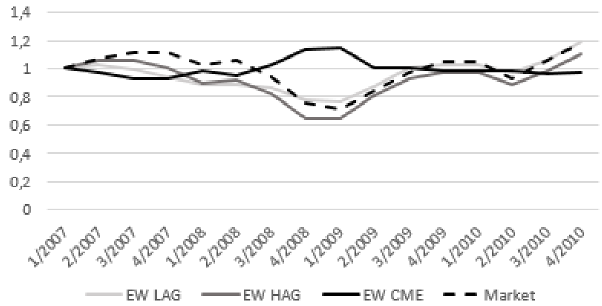
The graphs show the performance of asset-growth based portfolios and the market during times of market distress. EW stands for equally weighted while VW stands for value weighted.

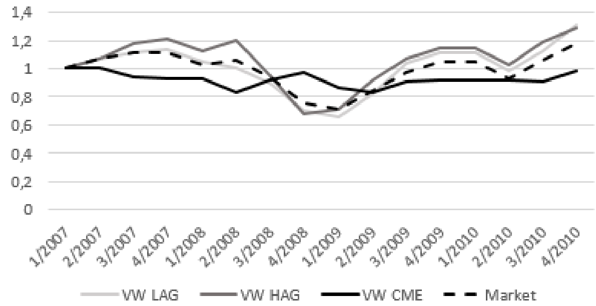
The Dotcom crash





The Financial Crisis of 2008





5.1.4 The 2010s and the disappearance of the anomaly

As the latest decade of my data set shows no signs of an asset growth anomaly, it is interesting to study why it has disappeared. Two potential reasons for the disappearance are the following:

1) The market has corrected itself, incorporating changes in asset growth into stock prices on announcement, and no longer yields long-term returns based on past asset growth
2) The 2010s are a distinctive period, when the anomalies do not function normally due to e.g. prolonged periods of low interest rates or high liquidity

I attempt to show that the disappearance of the asset growth effect is not due to the markets' increased ability to price changes in asset growth by studying my data set and the way the market reacts to the announcement. I do this in a simplistic way by constructing portfolios in an opposite manner as before: I take advantage of the SEC disclosure deadlines and include companies in my portfolios only for the first quarter to capture the effect the disclosure of asset growth numbers has on stock prices. If the market would have improved and it would incorporate the asset growth effect in to prices immediately, the first quarter returns would capture the entire asset growth effect. This would also mean that the effect should be more pronounced in the 2010s.

The results of the simplified sub-period announcement effect analysis can be seen in Table 8. The asset growth announcement effect seems to behave much in the same way as the value effect: high in the 1980s and 2000s, but low in the 1990s and 2010s. The main takeaway here is that the anomaly returns have not moved to the announcement period, as CME returns in the 2010s are not higher than in other periods – they are, in fact, strongly negative at -4.7% for the value weighted CME portfolio. This yields credibility to my argument that the asset growth effect has disappeared from the market not due to its increased efficiency or the dilution of the underlying causes for the anomaly, but due to other – perhaps macroeconomic – effects unique to the decade. The disappearance of the effect due to increased market efficiency is hard to reconcile with the fact that there is a negative asset growth effect during the period over the disclosure of asset information. On the contrary, it would suggest that the fundamentals causing the effect simply do not work in the same way during this decade than the previous ones.

The simultaneously low value effect could imply that the disappearance is due to some larger disappearance of contrarian sequences from stock returns. Potential explanations could be the prolonged period of low interest rates during the post-financial crisis era, which leads to exceptionally profitable asset expansion (and high opportunity cost of asset contraction). A second explanation could be that for these years, market liquidity has been exceptionally high due to monetary policy, e.g. the quantitative easing programs used by some central banks. High liquidity could temporarily overwhelm limits to arbitrage, causing the effects to disappear from the market.

5.1.5 Transaction costs

As a robustness check, I study whether the transaction costs incurred by the CME strategy, a common limit to arbitrage, are enough to explain the returns of the zero-investment strategy. As the portfolio is rebalanced quarterly, the transaction costs incurred can be high if a large part

Table 8: *Announcement quarter returns of asset growth-based portfolios, sub-period analysis*

LAG, HAG and CME portfolios are based on a quarterly sort on previous four-quarter asset growth. Companies are included in LAG (HAG) on the first trading day of a quarter if their previous four-quarter asset growth is in the bottom (top) decile. CME is a zero-cost portfolio, taking equally large positions long in LAG and short in HAG. All these portfolios are held for a quarter, after which they are rebalanced. Full sample is my entire US sample of CRSP-Compustat companies. Sharpe coefficient is calculated from aggregate returns – not quarterly.

Panel A: Asset-growth based portfolio returns, 1982-1989		EW	VW
LAG	Annual return	12,29 %	21,51 %
	Standard deviation	11,52 %	11,67 %
	Sharpe coefficient	0,3814	1,1671
HAG	Annual return	0,82 %	0,69 %
	Standard deviation	13,50 %	12,31 %
	Sharpe coefficient	-0,5235	-0,5852
CME	Annual return	9,80 %	18,92 %
	Standard deviation	4,60 %	7,94 %
	Sharpe coefficient	0,4154	1,3877

Panel B: Asset-growth based portfolio returns, 1990-1999		EW	VW
LAG	Annual return	10,61 %	11,62 %
	Standard deviation	5,59 %	8,52 %
	Sharpe coefficient	1,0159	0,7860
HAG	Annual return	6,33 %	8,81 %
	Standard deviation	10,30 %	12,28 %
	Sharpe coefficient	0,1366	0,3168
CME	Annual return	1,90 %	-0,69 %
	Standard deviation	5,69 %	9,75 %
	Sharpe coefficient	-0,5313	-0,5756

Panel C: Asset-growth based portfolio returns, 2000-2009		EW	VW
LAG	Annual return	8,64 %	8,98 %
	Standard deviation	7,01 %	13,05 %
	Sharpe coefficient	0,6377	0,3684
HAG	Annual return	-4,91 %	-8,93 %
	Standard deviation	13,61 %	15,79 %
	Sharpe coefficient	-0,6675	-0,8298
CME	Annual return	9,56 %	14,77 %

	Standard deviation	8,19 %	9,81 %
	Sharpe coefficient	0,6575	1,0794
Panel D: Asset-growth based portfolio returns, 2010-2017		EW	VW
LAG	Annual return	7,91 %	13,83 %
	Standard deviation	4,78 %	7,60 %
	Sharpe coefficient	1,3771	1,6440
HAG	Annual return	6,04 %	17,08 %
	Standard deviation	8,42 %	8,92 %
	Sharpe coefficient	0,5602	1,7660
CME	Annual return	0,30 %	-4,11 %
	Standard deviation	4,76 %	6,80 %
	Sharpe coefficient	-0,2150	-0,7997

of the portfolio is turned over each quarter (this effect is mitigated by the fact that companies qualifying for a portfolio are held for multiple quarters). The results of the study are presented in Table 9, which shows that the turnover of the LAG portfolio is higher than that of HAG. This is especially true for value weighted portfolios, where LAG turnover is 43,0% and HAG turnover is 32,8%. The resulting CME turnover is slightly higher for value weighted portfolios (74,1% against 75,8%). The annual transaction costs stay rather low, under 1% annually for each leg, producing annual transaction costs of 1,5% for equally and value weighted CME portfolios.

These results show that, in line with my hypothesis, there is an asset growth effect in the market that is not explained by transaction costs, a major limit to arbitrage. As CME returns in the full sample vastly exceed the annual transaction costs (11,6% annual value weighted CME returns against 1,5% of transaction costs), this limit to arbitrage does not explain away the high returns. The transaction costs also cannot explain the alphas produced by the zero-investment portfolio, with three-factor alphas of 11.9%% and 11.8% p.a. for equally and value weighted CME portfolios. Thus, I can conclude that my results are robust for transaction costs.

Table 9: *Transaction costs of asset growth based strategies*

Quarterly turnover denotes the amount of stocks bought or sold against the size of the total holdings. CME turnover is calculated in proportion to one of its equally large legs. Annual transaction costs are calculated from quarterly turnover by using an estimate for one-way transaction costs of 0.5%[34].

	Average quarterly turnover		Annual transaction costs	
	EW	VW	EW	VW
LAG	0,3798	0,4304	0,0076	0,0086
HAG	0,3613	0,3280	0,0072	0,0066
CME	0,7411	0,7584	0,0148	0,0152

5.2 Post-deal returns from an asset growth perspective

For the second part of my thesis's results, I start my study by looking at acquirer returns as a whole and seek to prove that their underperformance disappears when comparing their performance to an asset growth adjusted control index. As can be seen from Table 5, acquirers underperform the market considerably during the years 1982 to 2009. The magnitude of the underperformance ranges from 7.7% in the 2000s to 1.5% during the 1990s. Also, the acquirer portfolio overperformed the HAG, which represents companies of extreme asset growth, during these decades. This is in line with the hypothesis that the two phenomena are connected.

The results of the comparison test can be seen in Table 10, which shows that while acquirers experience statistically significant underperformances of 4.24% and 4.73% for equal and value weighted portfolios, respectively, the underperformance disappears when using an asset growth adjusted control. When the acquirers are compared to a portfolio of companies in the same asset growth decile[35], the underperformance disappears – there the difference is reduced to 0.00% for equal weighted portfolios and to a -1.46% underperformance for value weighted portfolios.

Neither of the remaining differences are statistically significant. By magnitude[36], the AG matched control explains all of the difference for EW portfolios and ca. 69.1% of the difference

[34] This estimate is conservative to leave safety margin. According to Novy-Marx and Velikov (2016), 0,5% is a round-trip cost. Frazzini, Israel and Moskovitz (2018) find much lower costs, but only for institutional investors.
[35] Pairing is done at a portfolio level. The median asset growth of the acquirer portfolio is used to designate the portfolio to an asset growth decile, and to a non-acquirer portfolio in the same asset growth decile
[36] Calculated from the absolute value of the initial difference. For instance, Table 10 shows that asset growth explains 1-(0,0009/0,0424) = 0,9788 of the underperformance of an acquiring portfolio

Table 10: *Post-deal acquirer portfolio returns against non-acquirer returns*

Acquirer portfolio invests in companies that have completed an acquisition in the past four quarters, rebalancing quarterly. Control portfolio includes all other CRSP companies. AG sorted control is created by sorting the non-acquirers into asset growth deciles quarterly, and pairing the acquirer portfolio’s median asset growth to the corresponding non-acquirer decile return. The difference is calculated for annual returns and standard deviation. The data sample is from 1982 to 2017. t-statistic for difference in returns is included in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

		Acquirer portfolio	Control portfolio	*Difference*		AG matched control	*Difference*	
EW	Annual return	0,0547	0,0971	*-0,0424***	*(2,3394)*	0,0538	*0,0009*	*(0,4514)*
	Standard deviation	0,1072	0,0857	*0,0216*		0,0974	*0,0099*	
VW	Annual return	0,0394	0,0868	*-0,0473***	*(2,1455)*	0,0540	*-0,0146*	*(0,6230)*
	Standard deviation	0,1053	0,0781	*0,0272*		0,0992	*0,0061*	

for VW portfolios. In general, these results support Mortal and Schill’s findings from a similar test with additional book-to-market and size-based sorts.

Consistently with my hypotheses, also the difference in total risk seems to follow the asset growth sorted control. Acquirer portfolios, while failing to reach market returns, are also riskier than non-acquirers in general, with differences in volatility of 2.16% and 2.72% for equal and value weighted portfolios, respectively. This difference is reduced dramatically when comparing to an asset growth sorted control – to 0.99% and 0.61%. The similar return and risk profiles lend compounding credibility to the hypothesis of asset growth as a primary driver for post-deal returns.

5.2.1 Sub-period analysis of post-deal returns

Table 5 shows the sub-period returns of the acquirer portfolio. Earlier in 5.1.3 I noted that the asset growth effect has disappeared from the market during the extraordinary market of the 2010s. Later I also showed evidence towards this being due to market conditions and not a fundamental disappearance of the anomaly. Analysing the pattern shown by the acquirer returns, I find evidence for both a similar hypothesis regarding the anomaly and its level of connetion to post-deal returns.

Since I showed before that CME returns during the 2010s are effectively non-existent, if post-deal returns are connected to the anomaly, acquirer returns should not underperform the market during this time. In line with this reasoning, the acquirer portfolio overperforms the market by 0.3% p.a. during the 2010s after decades of underperformance. Firstly, this provides evidence for the hypothesis that the two are indeed strongly linked: as the acquirer portfolio overperforms all other portfolios[37], the simultaneous disappearance of the underperformance of HAG and acquirer portfolios is strong evidence for my hypothesis. Second, the results provide evidence for my reasoning regarding the disappearance of the effect: high returns for acquisitions are in line with my reasoning regarding the market conditions. The 2010s have been an exceptionally easy time to create shareholder value through excessive investing due to low costs of capital and low volatility market.

Table 11 divides the analysis in Table 10 into a sub-period context, showing how the asset-growth matched control portfolios explain post-deal returns. The analysis shows that the results shown by Table 10 do not give the whole picture. In the 2010s, the general control portfolio explains the results better than the asset-growth sorted benchmark, which can be explained by the lack of a meaningful asset growth effect during the time. Also, during other decades, the AG matched control's difference to acquirer returns can be significant, and may change direction – for EW portfolios, the seemingly full explanatory power of the AG match is caused by slight positive differences in the 1980s, 1990s and 2010s and by a large negative difference in the 2000s.

However, the AG matched control explains a large part of the differences between returns of acquirers and non-acquirers. By magnitude, the AG match explains ca. 64.2%, 46,8% and 27.6% of the difference between VW acquirer returns and an un-sorted control portfolio in the 1980s, 1990s and 2000s, respectively. In the 2010s, the difference is increased considerably. On the risk-side, the AG match shows a systematic reduction in differences to benchmarks in volatility during all decades. Interestingly, however, even as return differences decrease by magnitude when using an AG matched control, the t values of the differences often increase, especially in the 1990s and 2010s.

[37]However, acquirer returns do not set in between HAG and LAG returns as would be implied by the asset growth effect, since these two represent the two extremes of asset growth with acquirers in between

Table 11: *Post-deal acquirer returns against non-acquirer returns, sub-period analysis*

Acquirer portfolio invests in companies that have completed an acquisition in the past four quarters, rebalancing quarterly. Control portfolio includes all other CRSP companies. AG sorted control is created by sorting the non-acquirers into asset growth deciles quarterly, and pairing the acquirer portfolio's median asset growth to the corresponding non-acquirer decile return. The difference is calculated for annual returns and standard deviation. The data sample is from 1982 to 2017. t-statistic for difference in returns is included in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: Acquirer returns vs. non-acquirer returns, 1982-1989		Acquirer portfolio	Control portfolio	*Difference*		AG matched control	*Difference*	
EW	Annual return	0,0700	0,1054	*-0,0354*	*(1,4308)*	0,0419	*0,0280*	*(1,6130)*
	Standard deviation	0,1183	0,1086	*0,0098*		0,1158	*0,0025*	
VW	Annual return	0,0422	0,1177	*-0,0755**	*(1,7614)*	0,0691	*-0,0270*	*(0,6227)*
	Standard deviation	0,1105	0,0828	*0,0277*		0,0993	*0,0112*	
Panel B: Acquirer returns vs. non-acquirer returns, 1990-1999		Acquirer portfolio	Control portfolio	Difference		AG matched control	*Difference*	
EW	Annual return	0,0749	0,1006	*-0,0258*	*(0,6700)*	0,0625	*0,0124*	*(1,0836)*
	Standard deviation	0,0997	0,0724	*0,0273*		0,0874	*0,0123*	
VW	Annual return	0,0826	0,0981	*-0,0156*	*(0,0358)*	0,0742	*0,0083*	*(0,2884)*
	Standard deviation	0,1043	0,0667	*0,0377*		0,0984	*0,0060*	
Panel B: Acquirer returns vs. non-acquirer returns, 2000-2009		Acquirer portfolio	Control portfolio	Difference		AG matched control	*Difference*	
EW	Annual return	-0,0111	0,0792	*-0,0903***	*(2,6247)*	0,0323	*-0,0433**	*(1,7070)*
	Standard deviation	0,1241	0,0918	*0,0323*		0,1066	*0,0175*	
VW	Annual return	-0,0693	0,0202	*-0,0895***	*(2,3591)*	-0,0045	*-0,0648***	*(2,0232)*
	Standard deviation	0,1178	0,0928	*0,0250*		0,1108	*0,0069*	
Panel B: Acquirer returns vs. non-acquirer returns, 2010-2017		Acquirer portfolio	Control portfolio	Difference		AG matched control	*Difference*	
EW	Annual return	0,1004	0,1070	*-0,0066*	*(0,2314)*	0,0886	*0,0118*	*(0,8078)*
	Standard deviation	0,0754	0,0641	*0,0113*		0,0697	*0,0058*	
VW	Annual return	0,1313	0,1288	*0,0024*	*(0,2968)*	0,1021	*0,0292*	*(0,7287)*
	Standard deviation	0,0736	0,0623	*0,0113*		0,0788	*-0,0052*	

5.2.2 Regression analysis of AMNA and CME

If post deal acquirer returns can be explained by the asset growth effect, this should mean that they have significant explanatory power over each other in an OLS regression analysis. I analyse this by treating CME as a risk factor for asset growth, similarly to Fama and French's treatment of the SMB and HML portfolios. Similarly, I treat the zero-investment AMNA portfolio as an 'acquisition risk-factor'. I seek to show that the two risk factors have explanatory power over each other.

In Section 4, I outlined the OLS regressions used in this analysis, namely CME (3) and the AMNA regressions. CME (3) includes the FF three-factor model and the AMNA risk factor, while the AMNA regressions include AMNA (1) against only CME, AMNA (2) against the market and CME and AMNA (3) against the three-factor model and CME. Table 4 in Section 5.1 shows the results for CME (3). As I hypothesized, the acquisition risk factor has a negative, significant factor loading in the regression. This is logical, since CME is short in asset growers, while AMNA is long in acquirers. Also, in line with my hypothesis, adding the acquisition risk factor to the regression considerably decreases the CME alpha, explaining ca. 4.5% and 1.3% of annual three factor alphas for equal and value weighted regressions. However, even after adding the acquirer risk factor, CME produces OLS intercepts of 1.8% and 2.5% (ca. 7.5% and 10.5% p.a.) for equal and value weighted regressions.

Table 12 includes the results of the AMNA regressions. As is apparent for AMNA (1) and (2), the asset growth risk-factor seems to be strongly connected to acquiring activity, with significant and negative coefficients produced by the regression. The exception, EW AMNA (3) shows an insignificant negative factor loading, which can be explained by the value weighted nature of the risk factors. Supporting this explanation, VW AMNA regressions exhibit a strong, significant CME factor loading which persists in AMNA (3). Interestingly, VW AMNA (3) also shows that acquirer returns are connected to market returns and have a significant positive connection to the size effect.

The results of the regressions between CME and AMNA both ways, while indicating a significant correlation, seem to imply that the two phenomena are not the strongest predictors of each other's behaviour. Back in Section 5.1, Table 4 shows that while market risk and the size effect do not have a significant impact on the performance of the asset growth anomaly, the value effect seems to be the best predictor, with both a higher coefficient and a higher level of significance[38]. Similarly, also Table 12 shows that while CME has a significant effect on AMNA returns, market, size and value factors also have an effect. The main difference to CME regressions is that acquirer returns seem to strongly correlate with the general market, with higher returns being received during bull markets.

Table 12: *OLS Regressions for AMNA*

This table presents the OLS regression factor loadings for the three regressions specified in 4.2.1, where also the ANMA portfolio is specified. The market, SMB and HML are based on value-weighted portfolios. CME is based on similar weighing as AMNA. Origin data and thus the table numbers are in decimal format. t-values are in parentheses. The data sample is from 1982 to 2017. t-statistic for difference in returns is included in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	EW			VW		
Independent variable	(1)	(2)	(3)	(1)	(2)	(3)
Intercept	0,0022	-0,0030	-0,0032	-0,0034	-0,0071	-0,0075*
	(1,1077)	*(-1,2916)*	*(-1,3640)*	*(-0,8487)*	*(-1,8921)*	*(-2,0660)*
$R_m - R_f$		-0,3701***	-0,3502***		-0,1383**	-0,0847*
		(-8,2104)	*(-7,2931)*		*(-3,2916)*	*(-1,9044)*
SMB			0,1112***			0,1685***
			(3,6692)			*(3,4883)*
HML			0,0309			0,1417*
			(0,7171)			*(1,7847)*
CME	-0,4889***	0,1170***	-0,0381	-0,1682***	0,2298***	-0,1668***
	(-13,7630)	*(3,9844)*	*(-1,1852)*	*(-3,6986)*	*(5,3424)*	*(-2,9922)*

[38] In the analysis of co-movements, I mostly use the results of value weighted regressions as these are the most relevant ones due to the risk factors also being value weighted. Due to this difference between equally weighted regressions and the risk factors, the factor loadings of equally weighted portfolio returns are systematically high and significant

5.2.3 Dynamics of the co-movements in an asset-growth decile setting

For my final analysis, in order to add to previous research, I look deeper into the level of connection between asset growth and post-deal returns by dividing acquirers and non-acquirers into asset growth deciles. Conducting a similar study to what is shown in Table 10, I can get a more detailed picture of how post-deal acquirer returns are explained by asset growth and how both affect subsequent stock returns in different magnitudes of asset growth. Table 13 and Table 14 show the results of the analysis in the following way: Table 13 compares the acquirer decile portfolios

to a single control portfolio of all non-acquiring CRSP companies. Table 14 compares the acquirer decile portfolios to AG sorted decile control portfolios. Figure 15 is a graphical representation of Tables 13 and 14.

The analysis shows that the acquirer portfolios and AG-sorted non-acquirer portfolios follow each other over the asset growth cycles. Compared to a single control portfolio, both sets of decile portfolios overperform the control in low asset growth deciles and underperform in high asset growth deciles. Figure 15 shows, however, that the slope for acquiring companies is much less smooth than for non-acquirers, most likely due to a much lower amount of data points of acquiring companies. Also, volatility in acquiring decile portfolios is consistently higher than for AG sorted control portfolios. This is also likely due to a large disparity in the number of data points, as is shown by the difference in standard deviation becoming smaller as we move to higher deciles, where acquiring companies are more common.

As the AG sorted decile portfolios systematically explain acquirer returns better than a single benchmark of CRSP non-acquirer companies, I conclude that my results yield credibility to port-deal acquirer returns being driven mostly by a general asset growth effect. Some of the decile portfolios (e.g. the 8^{th} VW decile), however, lead me to question whether the asset growth effect explains all acquirer returns, as the differences in returns can be significant (-6,38% for the 8^{th} VW decile).

In Exhibits A to D, I show the sub-period results for the decile-based analysis. The results are in line with the rest of my Thesis, as a clear connection can be seen during all decades. The results also show a non-existent asset growth effect during 2010s, when both acquirers and non-acquirers receive similar returns over the asset growth deciles and are more in line with the single CRSP non-acquirer control portfolio.

Table 13: *Post-deal returns on an asset growth-decile basis*

Acquirers qualify for a decile portfolio[39] for the next four quarters after its asset growth is in a certain decile and they have completed an acquisition in the past four quarters. The inclusion is made with a quarters lag. Control portfolio includes all CRSP companies that have not completed an acquisition in the last four quarters. Portfolios are rebalanced monthly. The data sample is from 1982 to 2017. t-statistic of the difference in returns is included in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

AG decile		Acquirer portfolios		Control portfolio		Difference			
		EW	VW	EW	VW	*EW*	*t value*	*VW*	*t value*
1st	Return	0,1267	0,1460	0,0971	0,0868	*0,0296*	(1,5460)	*0,0592***	(2,4002)
	Standard deviation	0,1203	0,1517	0,0857	0,0781	*0,0346*		*0,0736*	
2nd	Return	0,0994	0,1095	0,0971	0,0868	*0,0023*	(0,5900)	*0,0227*	(1,2746)
	Standard deviation	0,1141	0,1558	0,0857	0,0781	*0,0284*		*0,0777*	
3rd	Return	0,1351	0,1483	0,0971	0,0868	*0,0380***	(2,2259)	*0,0615****	(2,6285)
	Standard deviation	0,1056	0,1080	0,0857	0,0781	*0,0199*		*0,0299*	
4th	Return	0,0780	0,0581	0,0971	0,0868	*-0,0191*	(0,1994)	*-0,0287*	(0,3905)
	Standard deviation	0,1152	0,1144	0,0857	0,0781	*0,0295*		*0,0363*	
5th	Return	0,0732	0,0963	0,0971	0,0868	*-0,0239*	(0,9046)	*0,0095*	(0,8818)
	Standard deviation	0,1016	0,1185	0,0857	0,0781	*0,0159*		*0,0404*	
6th	Return	0,0991	0,0732	0,0971	0,0868	*0,0020*	(0,6413)	*-0,0135*	(0,0192)
	Standard deviation	0,1054	0,1099	0,0857	0,0781	*0,0197*		*0,0318*	
7th	Return	0,0700	0,0378	0,0971	0,0868	*-0,0271**	(1,8008)	*-0,0490*	(1,4614)
	Standard deviation	0,1005	0,1129	0,0857	0,0781	*0,0148*		*0,0348*	
8th	Return	0,0613	0,0009	0,0971	0,0868	*-0,0358**	(1,7698)	*-0,0859***	(2,5908)
	Standard deviation	0,1076	0,1211	0,0857	0,0781	*0,0219*		*0,0430*	
9th	Return	0,0383	0,0098	0,0971	0,0868	*-0,0588****	(3,0383)	*-0,0770*	(1,8947)
	Standard deviation	0,1142	0,1320	0,0857	0,0781	*0,0285*		*0,0539*	
10th	Return	0,0080	0,0086	0,0971	0,0868	*-0,0891****	(3,6619)	*-0,0782*	(1,6867)
	Standard deviation	0,1250	0,1386	0,0857	0,0781	*0,0393*		*0,0605*	

[39] 1st marks the lowest asset growth while 10th marks the highest.

Table 14: *Asset growth-sort and post-deal returns on an asset growth-decile basis*

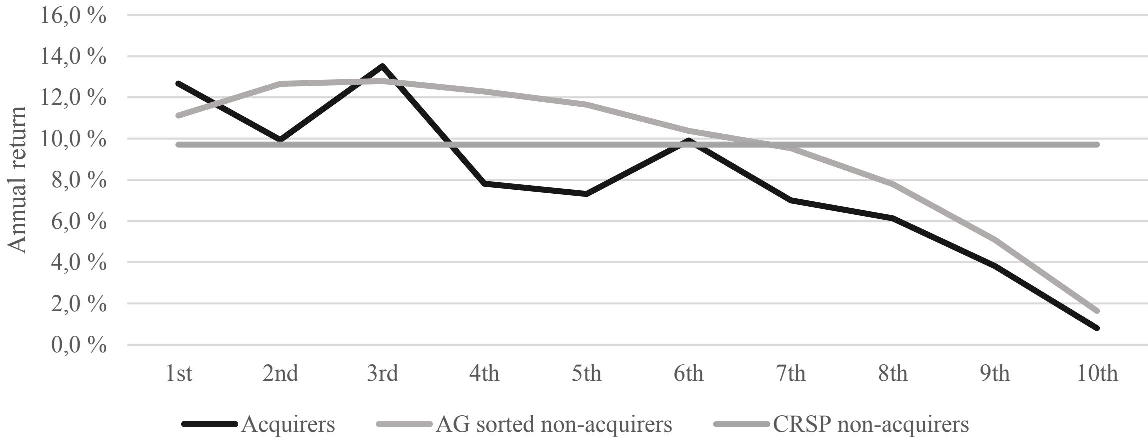
A company qualifies for a decile portfolio for the next four quarters after its asset growth is in a certain decile. The inclusion is made with a quarters lag. Acquirer companies have additionally completed an acquisition in the past four quarters, while Control companies have not. AG sorted control is created by sorting the non-acquirers into asset growth deciles quarterly, and matching the decile controls to corresponding acquirer decile portfolios. Portfolios are rebalanced monthly. The data sample is from 1982 to 2017. t-statistic of the difference in returns is included in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

AG decile		Acquirer portfolios		AG matched control portfolios		Difference			
		EW	VW	EW	VW	*EW*	*t value*	*VW*	*t value*
1st	Return	0,1267	0,1460	0,1111	0,1618	*0,0156*	*(1,1547)*	*-0,0158*	*(0,1842)*
	Standard deviation	0,1203	0,1517	0,0793	0,1135	*0,0410*		*0,0383*	
2nd	Return	0,0994	0,1095	0,1266	0,1269	*-0,0272*	*(0,6456)*	*-0,0174*	*(0,2073)*
	Standard deviation	0,1141	0,1558	0,0807	0,0945	*0,0333*		*0,0613*	
3rd	Return	0,1351	0,1483	0,1279	0,1113	*0,0072*	*(0,7283)*	*0,0370**	*(1,7087)*
	Standard deviation	0,1056	0,1080	0,0814	0,0827	*0,0243*		*0,0253*	
4th	Return	0,0780	0,0581	0,1229	0,1144	*-0,0449*	*(1,0338)*	*-0,0563*	*(1,1680)*
	Standard deviation	0,1152	0,1144	0,0804	0,0735	*0,0348*		*0,0409*	
5th	Return	0,0732	0,0963	0,1165	0,0998	*-0,0433**	*(1,8723)*	*-0,0035*	*(0,4961)*
	Standard deviation	0,1016	0,1185	0,0814	0,0746	*0,0202*		*0,0439*	
6th	Return	0,0991	0,0732	0,1038	0,0890	*-0,0046*	*(0,2868)*	*-0,0158*	*(0,0839)*
	Standard deviation	0,1054	0,1099	0,0826	0,0768	*0,0227*		*0,0331*	
7th	Return	0,0700	0,0378	0,0954	0,0752	*-0,0254**	*(1,8096)*	*-0,0375*	*(0,9515)*
	Standard deviation	0,1005	0,1129	0,0870	0,0806	*0,0136*		*0,0323*	
8th	Return	0,0613	0,0009	0,0780	0,0647	*-0,0167*	*(0,8042)*	*-0,0638***	*(2,0110)*
	Standard deviation	0,1076	0,1211	0,0928	0,0941	*0,0148*		*0,0270*	
9th	Return	0,0383	0,0098	0,0509	0,0565	*-0,0126*	*(0,4950)*	*-0,0468*	*(1,1909)*
	Standard deviation	0,1142	0,1320	0,0990	0,1017	*0,0152*		*0,0302*	
10th	Return	0,0080	0,0086	0,0164	0,0298	*-0,0084*	*(0,0794)*	*-0,0213*	*(0,2529)*
	Standard deviation	0,1250	0,1386	0,1061	0,1142	*0,0189*		*0,0245*	

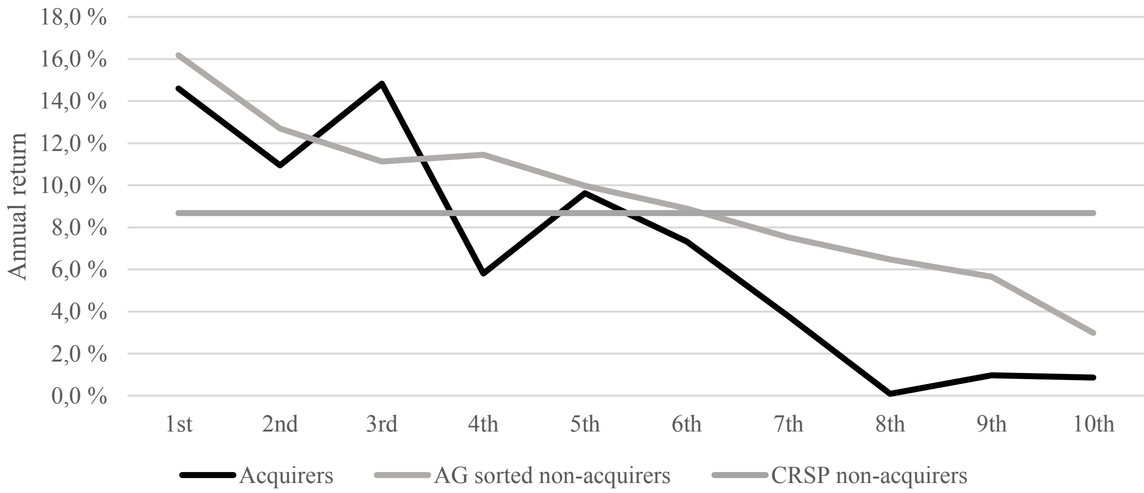
Figure 15: *Relationship of post-deal returns and the asset growth effect*

These graphs are a visual representation of Tables 13 and 14. The first graph denotes EW returns, and the second graph denotes VW returns. The Y-axis tells the annual return, while the X-axis denotes the asset growth decile, from the lowest growth (1st) to the highest growth (10th). The black line marks the acquirers, while the gray line marks non-acquirers. The grey constant is the market return.

Decile differences in EW portfolios



Decile differences in VW portfolios



5.2.4 Robustness of the analysis

I take multiple measures to ensure the robustness of my results for all of my hypotheses. Regarding both the existence of an asset growth effect and investors' ability to potentially exploit the effect for higher returns, my analysis accounts for most statistical[40] and logical problems. First, I show that an asset growth effect exists – that LAG overperforms while HAG underperforms – using two different approximations for the relevant index, the full CRSP

[40] The use of a calendar-time portfolio approach dilutes statistical problems, with benefits explained in Section 4

sample and Kenneth French's data on all AMEX, NYSE and NASDAQ stocks. Even though both mine and Mr. French's data originates from a full CRSP sample, our definitions and cut-offs relating to both stock and balance sheet data (from Compustat) result in different indices for his total markets and mine. My results produce an asset growth effect using both of these market returns.

The second main precaution I have made for all hypotheses is to ensure my results are not driven by front running the market. For instance, Mortal and Schill (2015) construct their calendar-time portfolios on 1st January based on last year's asset growth, despite the fact that the information will not be available to the market for a few weeks. My approach, which invests in companies after a lag of one quarter, ensures that my long-run returns are not driven by market front running in the beginning of the investment period.

Third, as the strength of multiple anomalies varies over time (perhaps trending towards lower returns), I have conducted a sub-period analysis to determine whether the returns are driven by a single decade or a short period of high returns. In this analysis, I conclude that the asset growth anomaly yields strong and stable returns until the 2010s, a phenomenon which was briefly discussed, with further elaboration in Section 6.

Fourth, as I have not included a stock beta-based analysis of e.g. buy-and-hold abnormal returns in my analysis, one could conclude that the asset growth effect could be simply due to higher average beta of asset contractors. This would show as a higher expected return due to their higher share of market risk. However, my OLS regressions on CME returns show that the market risk factor is insignificant. Thus, I can conclude that the market and the omission of stock-level betas from my analysis do not undermine the validity and robustness of my results.

In addition, I have made certain to minimize the amount of noise the effect of missing data points in my sample by e.g. using a -30% approximation for non-available data on delisting returns, capping my return data at 400% quarterly returns and by disregarding all acquisitions that don't have a considerable impact for their acquirers. Furthermore, my use of total assets instead of market capitalization, a relatively rare approach, makes sure that my cut-off is relevant to the functioning of the asset growth effect.

My results are not driven by either the value or the size effect, as is demonstrated by the sheer volume of the asset growth effect exhibited by the data and by the OLS regressions ran on CME returns. Furthermore, even combined the value and size effects would not be able to explain CME returns. Finally, as value weighted portfolio returns seem to be higher than equally weighted ones, I can conclude that my results are not driven by the small companies in my sample.

6 Discussion

My results reveal multiple interesting patterns in both the workings of the asset growth effect and the nature of the difference between organic and acquisitive investment. They have implications for academia, financial market professionals and companies. A multitude of potential future research subjects are also revealed. In the following, I will discuss my results on the existence and implications of the asset growth effect and its explanatory power over post-deal acquirer returns. After this, I will discuss the reasons for and the implications of the asset growth effect's dismal performance in 2010s, which stands out in the analysis as a turning point where the anomaly seems to have disappeared.

6.1 There is an asset growth effect in the US stock market – so what?

My results, and those of academics before me, show that there is a clear asset growth effect in the US stock market (e.g. Mortal and Schill 2015). Companies who invest into assets or acquisitions see their future stock returns plummet, while those that contract their assets have consequently stellar returns. The effect is quite large, with an average disparity of 11.6% in annual returns[41]. This makes it considerably stronger than either the value or size effects, which have been a focus in financial research on anomalies. The focus on these two anomalies has been due to their – especially the value effect's – sufficient stability and size for investor exploitation.

My results imply that the asset growth anomaly is connected to – or at least correlated with – the value effect. Even if the value effect cannot explain the anomaly due to its size, my OLS regressions show that the HML risk factor has a significant effect on CME returns. This is not surprising, as in essence both the asset growth effect and the value effect belong to the same family of contrarian investment beliefs – a belief in the mean-reversion of returns. Be it in assets, valuation or regarding past returns[42], these contrarian investment beliefs state that periods of overperformance by a company seem to cause future returns to be poor. Conversely, companies with poor development in assets or valuation see their future profits rise. (E.g. Lakonishok, Shleifer and Vishny 1994.)

[41] This figure takes into account the 2010s, when the effect is non-existant
[42] Assets, valuation and past returns refer to the asset growth effect, the value effect and the classic mean reversion of stock returns, respectively

The connection to the value effect can be elaborated through the book-to-market ("B/M") ratio and the Q theory of investment. The value effect predicts that value companies that have high B/M ratios overperform growth companies with low B/M ratios. The Q theory predicts that low B/M (high Tobin's Q) companies invest more because their marginal return on capital is higher, while companies with very low (under 1) Tobin's Qs will contract their asset base (Tobin 1969). This leads to growth companies growing their asset base while value companies contract their assets, which connects the value and asset growth effects. This fundamental connection helps understand the significant (if insufficient) correlation between the two effects.

While supporting contrarian views, my results do not necessarily constitute evidence against momentum. Though my research looks into mid-term returns (three to twelve month returns) and finds a contrarian cross-sectional trend, momentum may be the originator of the market over- and under reactions that create the starting point for contrarian effects. For instance, the market may over extrapolate on past asset growth or overestimate the marginal returns on capital, creating a cycle where a period of momentum returns precedes a period of contrarian returns.

My results of significant asset growth alphas yield further credibility to arguments on investors' predisposition to see trends in a series of random, or ultimately mean-reverting, values, which leads to overextrapolation and to over or undervaluation. As the lack of a trend comes apparent, the over or undervaluation is dissolved through mean reversion. This behavioural affinity to trends is widely documented and persistent (e.g. Lakonishok, Shleifer and Vishny 1994; Hirshleifer, Hou, Teoh and Zhang 2004). I cannot conclude that the effect is solely due to behavioural biases and not optimal investment arguments, such as timing the cost of capital or realising real options, as these would similarly show as a negative correlation between investment and subsequent stock returns. This correlation, however, would also have implications for risk-structure, which should lead to lower alphas against common risk factors.

If there are optimal investment arguments for the presence of an asset growth effect, why is it puzzling that asset growth alpha exists? There are a few reasons, all of which pertain to the EMH. The first reason is its simplicity. How can the simple measure of change in total assets deducted by cash have meaningful predictive power over stock returns? Common sense would lead to an expectation that there could potentially be a positive correlation between asset growth and subsequent returns, as value-maximizing managers would only make investments that create shareholder value. An underperformance of investing companies is much harder to explain with EMH and the supposition that managers are rational.

The second curious thing about the anomaly is its persistence over decades. A trick to generate abnormal returns that is this effortless and reliable would seem obvious to alpha-hungry professionals seeking to exploit any strategies generating abnormal returns, especially as they do not seem to be subjecting themselves to any excess risk in terms of volatility, other risk factors or the likelihood of crashes. Furthermore, limits to arbitrage should be modest, as a fully levered strategy does not have large capital requirements and, as value weighted strategies perform best, short-selling should be readily available for the creation of each leg. Thus it should be easy to exploit the effect out of the market. Finally, it is curious that the market seems to be very slow in reacting to news of asset expansion and contraction, with contrarian returns available to investors on the move months after disclosure.

6.2 What do post-deal acquirer returns and the asset growth effect tell us?

When using Bruner's (2002) findings that papers on acquirer returns can be divided into three equally large groups showing either value-creation, value-preservation or value-destruction, my results fall into the last group. Acquisitions seem to destroy a considerable amount of shareholder value due to their dismal returns (underperformance of 4,4% and 4,9% over four quarters on an equal and value weighted basis when compared to non-acquirers), and higher risk profile (2,2% and 2,7% higher volatility on an equal and value weighted basis when compared to non-acquirers and positive and significant market coefficient for AMNA). Furthermore, this underperformance does not take into account the announcement effect[43], but is related only to longer term performance.

This post-deal underperformance implies that acquirers fail in the integration of the acquisition or in the achievement of promised synergies or growth. If the acquirers would perform according to market expectations, the announcement effect would include all over- or underperformance of the acquisition. This implies that acquirers generally fail to meet market expectations, or conversely are able to originally sell the acquisition to their shareholders with

[43] Announcement returns are also a subject of debate as shown by Bruner (2002)

higher expected returns (this is unlikely due to dismal average announcement returns). On the flip side, this means that the market tends to overestimate a company's marginal return on capital.

Why, then, do acquirers fail to decline acquisitions with negative net present value? In fact, why do companies keep acquiring if they are expected to destroy shareholder value? These two questions have potential answers in both rational and behavioural explanations. Explanations range from managerial seeking of private benefits through entrenchment or empire building to investment considerations of a low cost of capital or the dilution of acquirer overvaluation through stock financed acquisitions. While being outside the scope of my thesis, these considerations provide an interesting backdrop to my results in how central the debate around acquisitions has been in the academic community.

What I present in my thesis is that the returns for acquirers are not due to unique or specific qualities of company acquisition or acquisitiveness, but are a part of a larger picture of underperformance in investment activity. In line with previous research by e.g. Mortal and Schill (2015), I suggest that regardless of whether a company exploits its internal or external growth opportunities, the effect on shareholder returns is the same. This means that the investment activity of a company would automatically lead to stock underperformance.

Based on my results, I cannot fully discard the uniqueness of acquisitions, as CME alphas are not explained away by an acquirer risk factor[44]. However, all my results point to the direction that the two phenomena are linked. This link, persisting even as asset growth's predictive power over stock returns has diminished, implies that the investment decision between organic and inorganic growth is irrelevant. Thus, I argue that the academic community should direct more resources into examining this link and wider theories of investment. Furthermore, I would encourage companies to evaluate each investment against their required return on equity, as presently investment activity on average seems to destroy shareholder value. However, as investments are the source of growth, I argue that while companies should not inhibit their investing, academics should delve into what makes investment activity successful.

[44] It is logical that the acquirer risk factor cannot completely explain asset growth alpha, as the acquirer risk factor does not represent the extremes of asset growth. The remaining alpha for CME, however, is high enough to question whether the link is comprehensive.

6.3 Is the anomaly dead?

My results show that during the 2010s, the asset growth anomaly has disappeared from the market. The disappearance appears to be due to increased returns to asset growers and acquirers, a phenomenon I argue could be due to a lower cost of capital during the latest decade. If the effect is due to managers' inability to refuse negative net present value investments, the low-return environment would make more of these investments profitable. The gradual disappearance of anomalies also makes sense as understanding of how they work and can be exploited is increased through research.

My results of a disappeared asset growth anomaly are very much in line with a larger backdrop of diluting anomalies. In their 2014 study, Chordia, Subrahmanyam and Tong find that in the high liquidity and trading activity market of the last years, a majority of stock market anomalies have attenuated. This attenuation is considerable, as Chordia et al. find that anomaly strength has halved during these years. Similarly, Green, Hand and Zhang (2017) recently found that after 2003, the return predictability of most company characteristics that had been independent determinants until then. These papers and my results form an interesting picture of how anomalies have developed over the recent decades. If the attenuation of these anomalies is due to market conditions, we will see whether the asset growth anomaly is dead or merely dormant as the next business cycle unfolds and the world eventually returns to a more high-yield environment.

A second reason for the disappearance of the anomaly could be a fundamental change in how companies invest. I argue that more profitable average investments could be possible due to the rise of technology companies. As tech companies have multiplied their share of the total market in the US, their share of total investment has likely also increased. With their almost infinitely scaling platforms, a tech-heavy economy may be able to keep the marginal return on capital high enough to increase HAG returns. If this is true, one can expect a return of the asset growth anomaly as this industry eventually matures.

Regardless of the state of the anomaly and its returns, the connection to post-deal returns holds also during the 2010s. My results indicate that the return slope over asset growth deciles has evened out for both acquirers and organic expanders. Even if significant differences remain between some decile portfolios, and acquirer risk-factors fail to nullify CME alpha, my results lead me to conclude that my second hypothesis is true and returns on acquisitions are a part of a larger investment effect instead of a unique event separate from other investing. I invite other academics to continue in studying the extent to which this connection holds, and whether (and in which cases) acquisitive growth can be unique from organic growth.

7 Conclusion

In my Thesis, I have studied the asset growth effect and its connection to post-deal acquirer returns in the US market. My aim is to find out whether 1) the anomaly presents an investable opportunity to produce alpha and whether 2) the anomaly explains the poor returns of acquiring companies. I find that a strong, investable asset growth effect exists in the US market until the 2010s, when it is no longer visible. I also find that the returns of organically growing companies explain a great deal of acquirer returns, which leads me to conclude that acquirer returns are, to a large extent, due to a larger investment effect rather than a unique trait of acquisitive behaviour or motives behind individual acquisitions.

I use CRSP-Compustat data from 1982 to 2017 consisting of 670,907 data points on quarterly stock returns and 12,726 acquisitions in order to construct 54 calendar-time portfolios including portfolios based on asset growth, acquisitive behaviour and these both on an asset-growth decile basis. I then analyse these portfolios for the total time period and based on decades by using different control portfolios and OLS regressions.

My results give strong credibility to my hypothesis that a strong, investable asset growth effect exists in the US market. Periods of strong asset growth are followed by poor subsequent stock returns, while periods of asset contraction are rewarded with high subsequent returns. I find that the anomaly allows for a zero-investment strategy that yields annual returns of 11.6% over my total sample period, and that the strategy's returns cannot be explained by market, size, value or acquirer risk factors. These returns are not concentrated to any individual decade, but disappear during the 2010 to 2017 period.

An analysis of first quarter returns suggests that this disappearance would not be due to increased market efficiency, but potentially due to a lower-yield market allowing easier value creation from investment activity. This would suggest that the anomaly is not dead, but merely dormant. Another potential explanation can be a fundamental change in how companies invest, with technology companies being able to keep their marginal return on capital high and create value on their investments due to easier scaling. In this case, the market would be unlikely to experience a strong asset growth anomaly in the coming years (until technology companies mature and their returns on investment sink).

I find that there is a strong connection between the asset growth anomaly and post-deal returns to acquiring companies. The returns of non-acquiring companies experiencing similar asset growth to acquiring companies experience similar returns. Furthermore, acquirers with negative total asset growth subsequently overperform the market.

My results have implications for both practitioners and academics alike. Practitioners may want to examine the effects arbitrage opportunities and make up their mind about its demise or slumber. While the effect shares its roots with the value effect, it has proven to be a much stronger effect. Furthermore, even as the asset growth anomaly doesn't produce meaningful returns now, historical data shows that the value effect has also suffered from similar periods of slumber e.g. during the 1990s.

Academics may want to further examine the link between the anomaly and acquisition returns, perhaps taking into account announcement returns as a part of the analysis. They should also look further into the reasons behind the anomaly and its risk-based and behavioural explanations, as present evidence is, at best, ambiguous. But most importantly, they may want to re-evaluate the focus on acquisitions, a staple-area of research in financial literature, and perhaps divert some effort towards more general behavioural and risk-based models of investment. After all, if asset growth-sorted non-acquirer returns explain the returns of acquiring companies, the acquisition puzzle is in fact an investment puzzle.

Future academics may want to look deeper into what I have studied, and fill in gaps left by and questions uncovered by my Thesis. Areas of research should include a study of how the asset growth anomaly has generated returns on a yearly or quarterly level instead of a decade-based analysis, in order to discover how stable the return profile is. Second, I would welcome future academics to 1) seek out insight on the apparent disappearance of the effect, and 2) further elaborate on the level in which the asset growth effect explains acquirer returns – and especially when it does not.

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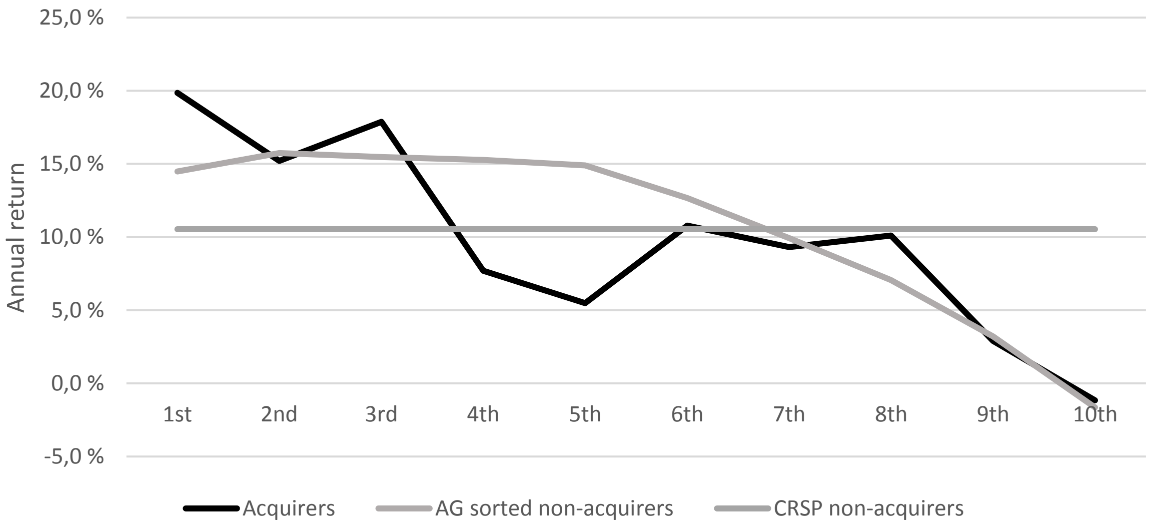
Exhibits

Exhibit A: *Relationship of post-deal returns and the asset growth effect, 1982-1989*

These graphs are a visual representation of a sub-period analysis of the decile portfolios. The first graph denotes EW returns, and the second graph denotes VW returns. The Y-axis tells the annual return, while the X-axis denotes the asset growth decile, from the lowest growth (1^{st}) to the highest growth (10^{th}). The black line marks the acquirers, while the gray line marks non-acquirers. The grey constant is the market return.

Decile differences in EW portfolios



Decile differences in VW portfolios

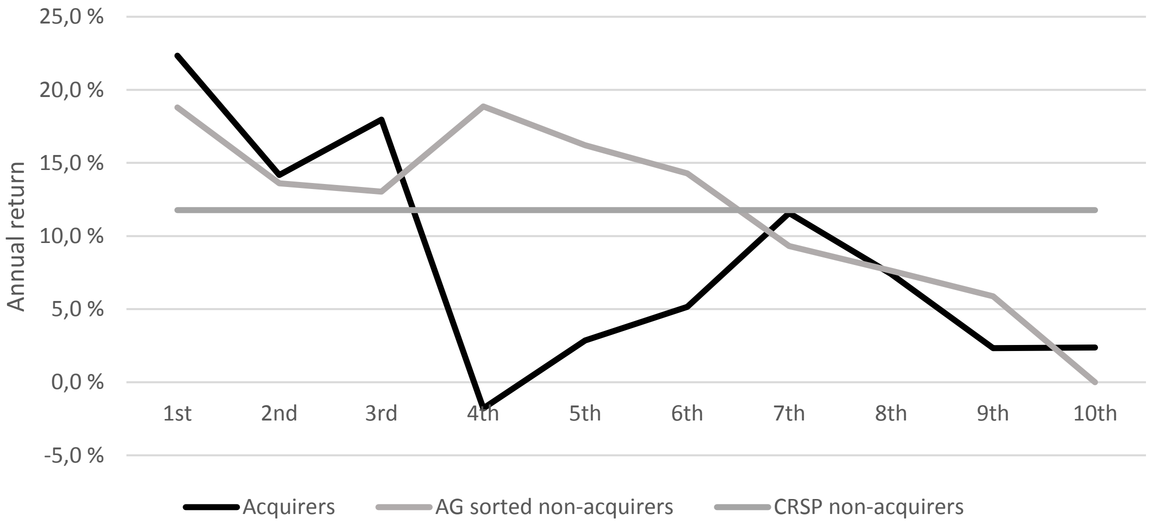
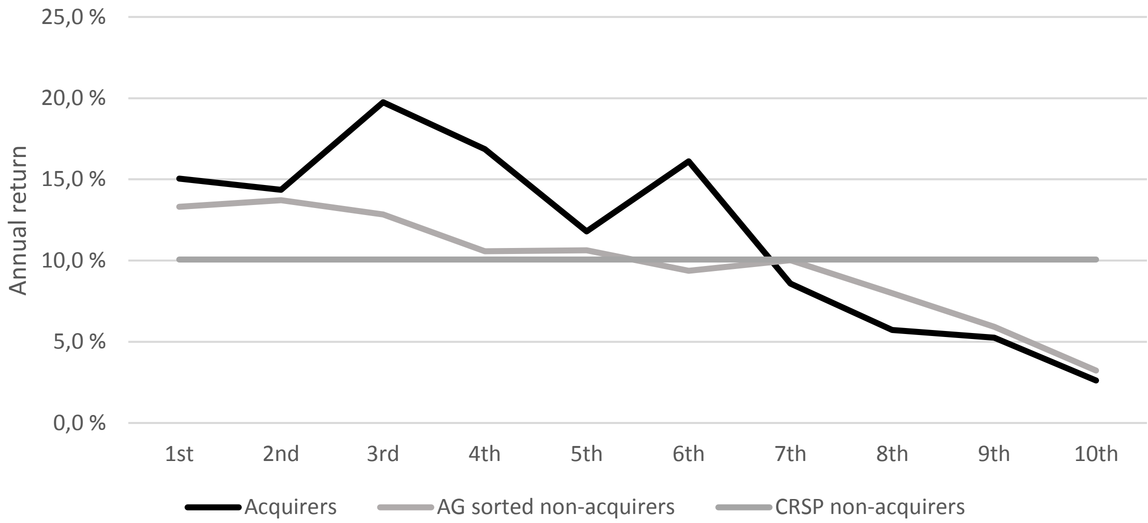


Exhibit B: *Relationship of post-deal returns and the asset growth effect, 1990-1999*

These graphs are a visual representation of a sub-period analysis of the decile portfolios. The first graph denotes EW returns, and the second graph denotes VW returns. The Y-axis tells the annual return, while the X-axis denotes the asset growth decile, from the lowest growth (1st) to the highest growth (10th). The black line marks the acquirers, while the gray line marks non-acquirers. The grey constant is the market return.

Decile differences in EW portfolios



Decile differences in VW portfolios

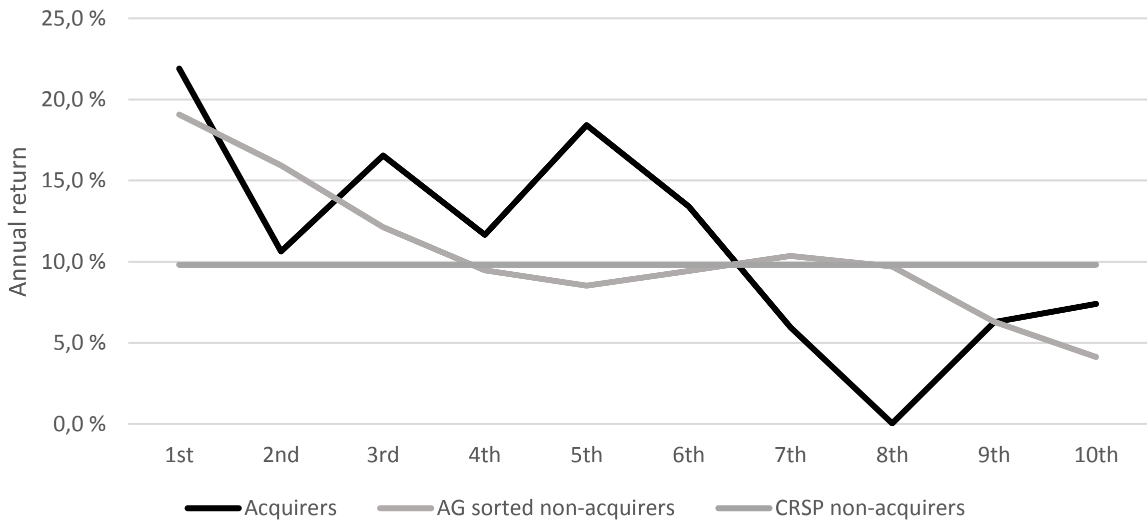
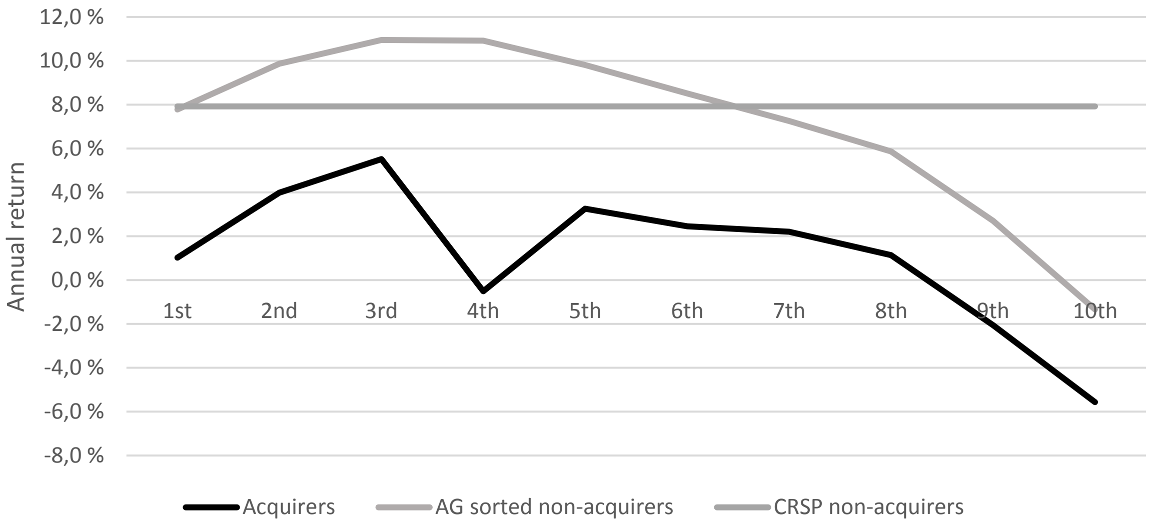


Exhibit C: *Relationship of post-deal returns and the asset growth effect, 2000-2009*

These graphs are a visual representation of a sub-period analysis of the decile portfolios. The first graph denotes EW returns, and the second graph denotes VW returns. The Y-axis tells the annual return, while the X-axis denotes the asset growth decile, from the lowest growth (1^{st}) to the highest growth (10^{th}). The black line marks the acquirers, while the gray line marks non-acquirers. The grey constant is the market return.

Decile differences in EW portfolios



Decile differences in VW portfolios

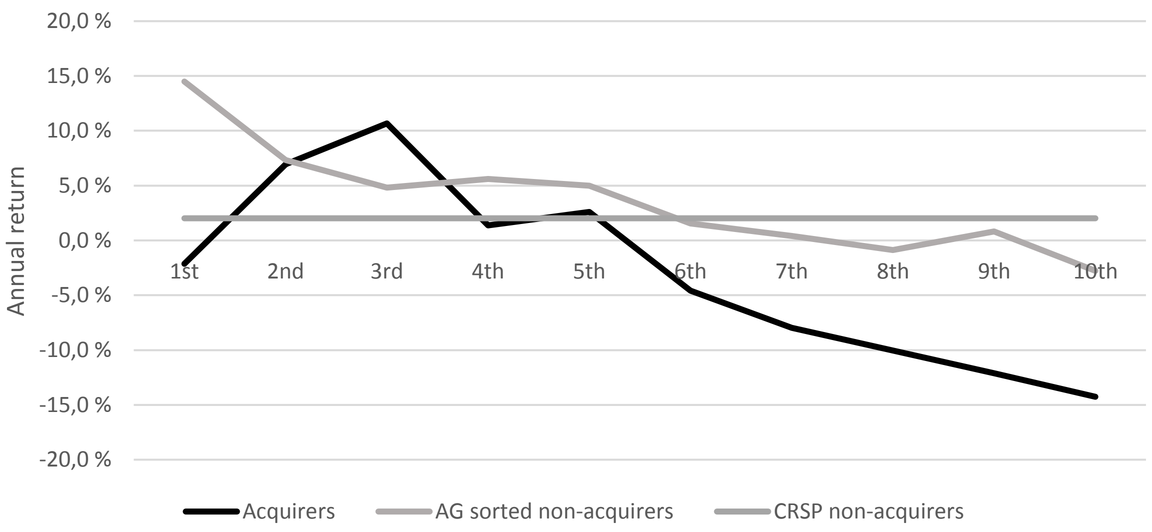
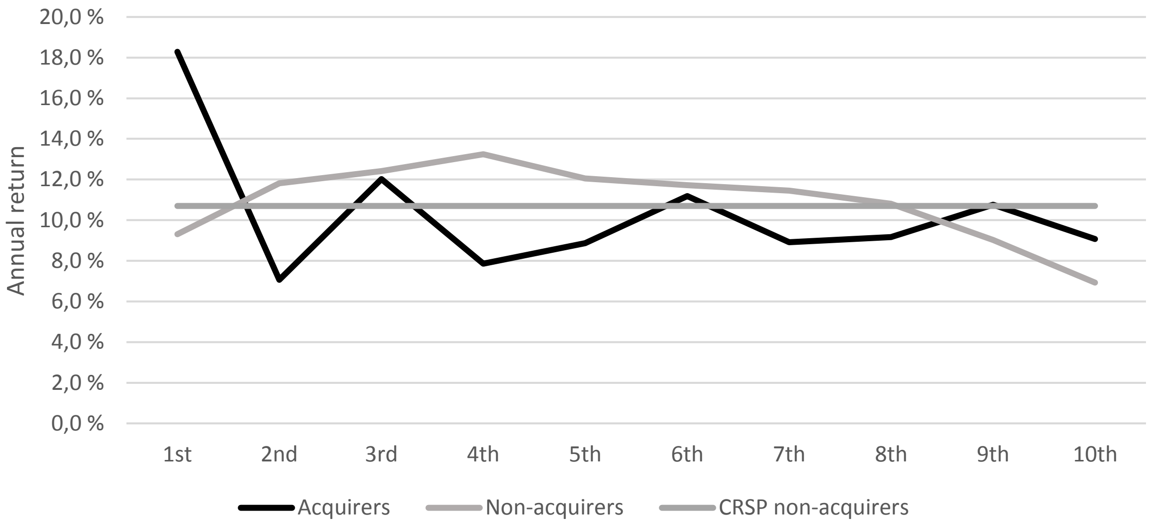


Exhibit D: *Relationship of post-deal returns and the asset growth effect, 2010-2017*

These graphs are a visual representation of a sub-period analysis of the decile portfolios. The first graph denotes EW returns, and the second graph denotes VW returns. The Y-axis tells the annual return, while the X-axis denotes the asset growth decile, from the lowest growth (1st) to the highest growth (10th). The black line marks the acquirers, while the gray line marks non-acquirers. The grey constant is the market return.

Decile differences in EW portfolios



Decile differences in VW portfolios