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Asset growth and the cross-section of stock returns: evidence from Greek listed firms

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Abstract

Purpose – The purpose of this paper is to examine whether firm-level asset investment effects in returns found for US firms occur within the Greek stock market.
Design/methodology/approach – The paper utilizes portfolio-level tests and cross-sectional regressions.
Findings – The authors find that growth in total assets is strongly negatively related to future stock returns of Greek firms. In fact, the relation remains statistically significant, even when the authors control for other strong predictors of future returns (i.e. market capitalization and book-to-market ratio). Furthermore, the authors find that a hedge trading strategy on asset growth rate consisting of a long (short) position in firms with low (high) balance sheet growth generates positive returns, confirming that investment growth has significant predictive power for future returns of Greek listed firms.
Originality/value – The paper adds to the literature on the generalization of asset pricing regularities attributable to accounting figures in an emerging market.

Keywords Stock returns, Asset growth, Greek stock market

Paper type Research paper

1. Introduction

Financial statements provide investors and financial analysts with significant information concerning a firm's performance in a given period. In fact, the analysis and interpretation of financial statement data are a prerequisite for assessing the future performance of a firm. According to the efficient market hypothesis, stock prices reflect all relevant and available information and, accordingly, change in order to incorporate any new information that becomes available. Therefore, in an efficient market, the returns an investor can earn should be proportionate to the risk they are willing to take on. In other words, an investor should not consistently achieve higher returns, through analysis of financial statements, than those that correspond with his exposure to risk, because that would, by definition, contradict the efficient market hypothesis. However, a large number of researchers in accounting and finance, including Basu (1977), Lakonishok *et al.* (1994) and Hirshleifer *et al.* (2004), have found that several accounting variables and financial ratios, such as net operating assets or book-to-market ratio, are strong predictors of future stock returns and that investors can take advantage of the predictive power of these variables in order to make risk-free profit (which is not possible in an efficient market).

Previous accounting literature focuses on the predictive power of individual balance sheet items for future stock returns. This literature can be divided into three categories: the

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studies that focus on accruals (Sloan, 1996), the studies that focus on capital expenditure (Titman *et al.*, 2004) and the studies that focus on external financing (Richardson and Sloan, 2003). The results from these papers show that there is a negative relation between these variables, which are components of asset growth from either the left or the right side of the balance sheet, and future stock returns. However, according to more recent studies, this negative relation with future stock returns is observed not only for the components of asset growth, but also for total asset growth. In fact, the annual percentage change in total assets has been found to have even greater predictive power for future stock returns than its individual components. This negative relation between the annual percentage change in total assets and future stock returns is known as the asset growth anomaly.

Cooper *et al.* (2008), whose study we relied on to carry out our research, were the first to investigate the asset growth effect and found that firms with low asset growth rate perform better than those with high asset growth rate. Based on the findings of Cooper *et al.* (2008), many researchers have sought to explain why the asset growth effect on stock returns occurs. According to the existing literature, the asset growth effect is due either to the risk that investors take on when they invest in a firm or to mispricing by investors during the investment-making process.

The purpose of this study is to examine whether the findings of Cooper *et al.* (2008) also apply to Greek firms. As far as we know, this paper is the first study conducted for Greek firms that examines the relation between asset growth and future stock returns of these firms. As described in a later section, Greece has certain characteristics relating to its legal system, its stock market, the cultural background of its people and the earnings opacity of its firms, which motivate us to seek the possible occurrence of the asset growth effect on stock returns.

The main findings of this paper are summarized as follows. Using data for the period 1988-2008 and estimating regressions, we find that asset growth exhibits a statistically significant negative relation with future stock returns. In fact, this relation remains statistically significant even when we include control variables in our regressions that, in previous literature, have been found to be strong predictors of future returns. Furthermore, consistent with Cooper *et al.* (2008), we find that a trading strategy consisting of a long (short) position in firms with low (high) asset growth generates positive returns. These results summarize how balance sheet growth can affect a firm's stock price performance. Such a summary can be valuable to investors when making investment decisions.

The remainder of this paper is structured as follows. Section 2 contains a brief review of the existing literature and includes several interpretations of the asset growth effect. Section 3 develops our testable hypothesis concerning the relation between asset growth and future stock returns of Greek firms. Section 4 provides information about data, sample formation and variable measurement. Section 5 presents descriptive statistics and the results of the empirical analysis and Section 6 contains the conclusions of the study.

2. Interpretation of the asset growth effect

According to the existing literature, the negative relation between asset growth and future stock returns is due to two main reasons. More specifically, the asset growth effect is attributable either to risk or to mispricing. According to standard risk and return models, when investing in a firm investors require a rate of return that is proportionate to the firm's risk. In other words, in order to invest in high-risk firms, investors require higher returns as compensation for the additional risk they take on. Taking into account this positive relation between risk and return and the fact that low asset growth firms yield higher returns than high asset growth firms (according to Cooper *et al.*), one can assume that low asset growth firms are riskier than high asset growth firms (based on a risk-based explanation of the asset growth effect). Berk *et al.* (1999) gave a possible interpretation for this claim. According to the authors,

assets can be divided into two categories, assets in place and options to make profitable investments in the future (growth options), which the authors assumed are inherently riskier than assets in place. When a firm makes new investments (high asset growth firm), the riskier growth options are replaced by less risky assets in place. Therefore, the average risk of the firm decreases and, considering the positive relation between risk and return, the firm exhibits lower stock returns in the future. Conversely, if a firm loses an asset in place (low asset growth firm), its average risk increases, resulting in higher future stock returns.

Regarding the mispricing-based explanation of the asset growth effect, several hypotheses have been put forward by researchers. Chan *et al.* (2008) state that the asset growth effect can be explained by four not mutually exclusive hypotheses, namely, the acquisition hypothesis, the managerial agency cost hypothesis, the extrapolation hypothesis and the market timing hypothesis.

According to the acquisition hypothesis, firms acquire other firms in order to expand their assets. However, previous research, such as that of Moeller *et al.* (2005), has shown that firms' acquisitions may have a negative impact on shareholders' wealth. This often occurs because managers engage in acquisitions so as to serve their own interests and not necessarily because these acquisitions are valuable investments for the firm. As a result, the stock price of acquirers tends to decline the years following an acquisition (Loughran and Vijh, 1997) due to the poor business practices of managers. Therefore, the negative relation between asset growth and future stock returns may possibly be due to the underperformance of acquirers.

As mentioned above, managers may engage in acquisitions for personal financial gain. The managerial agency cost hypothesis explains why managers may act in such a way. According to this hypothesis, managers and shareholders have conflicting interests regarding the future of their firm. While shareholders are interested in high profitability and efficiency, managers may have incentives to cause their firms to grow beyond the optimal size at the expense of the firm's efficiency. This is because growth increases managers' power and prestige as it increases the resources under their control. Moreover, growth in firm size is indirectly associated with managers' compensation, since their compensation is positively related to the growth in sales (Jensen, 1986). Consequently, if high asset growth is due to empire-building, which is likely to have a negative effect on future earnings performance, then investors who fail to evaluate managers' true motives will overvalue firms with high asset growth, leading to negative future stock returns for these firms.

The extrapolation hypothesis provides a different perspective on why firms that grow rapidly tend to have a poor performance the years following a large increase in assets. Investors have the tendency to rely on a firm's past performance in order to make predictions for its future earnings performance. In other words, investors assume that firms with high past earnings will maintain their profitability in the future. As a result, investors may overvalue high asset growth firms, since they are more likely to have high past profitability. However, a possible decline in the earnings performance of these firms may surprise investors, who are likely to sell their stocks, resulting in negative future stock returns.

Under the market timing hypothesis, the asset expansion of a firm may occur when managers issue stocks at a time when they believe the stocks are overvalued in order to eliminate market mispricing. In this case, total assets increase either because the firm receives cash from the stock issue or because the firm uses cash received to purchase fixed assets. When a firm issues stocks, investors realize (possibly with a lag) that the firm's stock is overvalued and, thus, sell their stocks to benefit from the mispricing. As a result, high asset growth firms tend to experience negative abnormal returns.

3. Hypothesis development

To the best of our knowledge, this paper is the first that examines the relation between asset growth and future stock returns in the Greek stock market. All the studies mentioned earlier

were conducted for US firms. Therefore, in order to develop our hypothesis concerning the occurrence of the asset growth anomaly in Greece, we had to take into account certain factors that differentiate Greece from other countries and which are likely to affect the relation between asset growth and future returns of Greek firms. At this point, it is worth noting that all the studies that have examined these factors refer to the accrual anomaly and not the asset growth effect. In other words, all the studies that have been conducted examine how certain country-level characteristics affect the relation between accruals and future stock returns. However, as we show in Table II, accruals exhibit a strong positive correlation with asset growth. Therefore, these studies, despite the fact that they refer to the accrual anomaly, are the only ones on which we can rely to develop our hypothesis concerning the occurrence of the asset growth effect in the Greek stock market.

The studies we will mention in this section have contributed to explaining the accrual anomaly in a different way and, more specifically, at country level. According to these studies, each country has certain characteristics relating to its legal system, the cultural background of its people, its stock market and the earnings opacity of its firms, which affect the relation between firms' accruals and future stock returns.

Pincus *et al.* (2007) were the first to examine whether the accrual anomaly that Sloan (1996) found also occurs in countries other than the USA. For this reason, they studied several countries based on certain characteristics, one of which was their legal system. Regarding this characteristic, there are two broad categories of legal systems: the common-law system and the code-law system. Code-law countries have a lower concentration of share ownership and stronger shareholder protection. Pincus *et al.* (2007) show that the accrual anomaly is more likely to occur in common-law countries. Continuing the analysis of the legal system, Leippold and Lohre (2012) were the first to include Greece in their research and classified it as code-law. Thus, under a mispricing (rational) explanation, we anticipate that the asset growth effect on stock returns is less (more) likely to occur in Greece.

However, according to Papanastasopoulos (2014), there are also other country-level characteristics which may affect the relation between accruals – and, by extension, asset growth – and future stock returns. First, he argued that individuals coming from different countries and hence from different cultural backgrounds have differences in behavior and risk preferences. These differences may influence the way investors in each country process and respond to information concerning a firm's performance. The cultural dimensions he included in his research are individualism and uncertainty avoidance. Individualism is related to higher overconfidence and uncertainty avoidance to higher conservatism.

Individuals with higher overconfidence are more likely to analyze information on their own without being influenced by other investors. In addition, these individuals are more likely to react quickly when new information about a firm's performance becomes available. Conversely, individuals with higher conservatism are more likely to react belatedly to new firm-specific information, as a result of which stock prices do not reflect all available information. According to Hofstede (2001), Greece is characterized by low individualism and high uncertainty avoidance. Thus, under a mispricing (rational) explanation, the asset growth effect on stock returns is more (less) likely to occur in Greece.

Another characteristic that Papanastasopoulos (2014) found that affects the relation between accruals and future returns are the barriers to arbitrage. In an efficient financial market, if there are profit opportunities, investors who engage in arbitrage (arbitrageurs) will act in such a way as to quickly eliminate any security mispricing. As a result, barriers to arbitrage can be considered an important factor which contributes to the persistence of security mispricing. Such barriers to arbitrage may be low market liquidity and high transaction costs. Therefore, Papanastasopoulos (2014) suggests that the accrual anomaly should be stronger in countries with stronger barriers to arbitrage, that is with lower market liquidity and higher transaction costs. Taking into account that Greece is characterized by low

market liquidity and high transaction costs, we anticipate that under a mispricing (rational) explanation the asset growth effect on stock returns is more (less) likely to occur in Greece.

The last characteristic we will mention in this paper which may affect the relation between asset growth and future stock returns is earnings opacity. The earnings opacity of a country, as defined by Bhattacharya *et al.* (2003), is "the extent to which the distribution of reported earnings in that country fails to provide information about the distribution of the true, but unobservable, economic earnings in that country." According to Bhattacharya *et al.* (2003), there are at least three factors that can affect earnings opacity: incentives of managers to manipulate earnings, flexibility in accounting standards and how rigorously they are enforced. Therefore, earnings opacity may reflect managers' motives to manipulate earnings. Additionally, it may reflect opportunities to manage earnings when a country's accounting standards are flexible or when a country's accounting standards are rigorous but their application is not enforced. Thus, based on the above analysis, the accrual anomaly should be stronger in countries with higher earnings opacity, because in these countries reported earnings do not reflect the actual performance of the firms. As a result, investors with limited attention who fixate on earnings may be misinformed and led to erroneous decisions. Given that Greece is characterized by high earnings opacity, we anticipate that under a mispricing (rational) explanation the asset growth effect on stock returns is more (less) likely to occur in Greece.

Taking into consideration the above characteristics of Greece and the impact they may have on the asset growth anomaly, we conclude to the following hypothesis:

H1. Under a mispricing explanation, the negative relation between asset growth and future stock returns is expected to occur in Greece.

In order to test the above hypothesis, we estimate cross-sectional regressions of future stock returns on asset growth as well as on certain asset pricing control variables. In addition, based on the study of Cooper *et al.* (2008), we examine whether a trading strategy taking a long (short) position in firms with low (high) asset growth generates positive abnormal future returns.

4. Data, sample selection and variable measurement

4.1 Data and sample formation

The data we used to conduct our study were obtained from the Datastream International and Worldscope databases. The sample covers all firms listed on the Greek stock market and spans 21 years from 1988 to 2008. To avoid survivorship bias, we select listed firms from both active and defunct research files of Datastream International and Worldscope. We exclude financial firms from our sample, since the demarcation between operating and financing activities is not clear-cut for these firms. We also exclude trusts, closed-end funds, REITs, ADRs, units of beneficial interest, other financial institutions and foreign firms. Finally, we eliminate firm-year observations with negative book value of equity or with insufficient data to compute the primary variables used in our tests.

4.2 Measurement of accounting variables

Asset growth is defined as the annual change in a firm's total assets. Since the magnitude of total assets, as well as the magnitude of the other variables, varies with the overall size of a firm's balance sheet, we follow Cooper *et al.* (2008) and scale each item by lagged total assets (total assets at the beginning of each period). Thus, our main variable of interest, the annual asset growth rate of a firm, reflects the year-by-year percentage change in total assets and is calculated as follows:

$$AGR_{(t)} = \frac{\text{Total Assets}_{(t)} - \text{Total Assets}_{(t-1)}}{\text{Total Assets}_{(t-1)}}$$

Earnings (item W18150) are defined as income from continuing operations scaled by lagged total assets, while cash flows are defined as earnings minus total accruals. Total accruals, in turn, are defined as annual change in net operating assets[1] scaled by lagged total assets. Total equity (item W03501) and total debt (item W03255) are calculated by dividing a firm's total equity and total debt, respectively, by lagged total assets.

4.3 Measurement of asset pricing control variables

To examine the predictive power of asset growth for future stock returns to a greater extent, we use two control variables, which in previous studies (e.g. Fama and French, 1996) have been proven to be strong predictors of future returns. The first control variable is firm's size or market capitalization, which is defined as the market value of common equity. Market capitalization (SIZE) is measured as the closing price per share multiplied by the number of common shares outstanding. Note that market capitalization is measured six months after the financial year-end to make sure that financial statement data are available to investors. The second control variable is book-to-market ratio (*B*/*M*), which is defined as the ratio of the financial year-end book value of equity to the market capitalization.

By including firm size and book-to-market ratio as control variables in our tests of return predictability, we will be able to evaluate whether the relation between asset growth and future returns is statistically significant even in the presence of these two control variables. Consistent with previous research, all variables are winsorized at the top and bottom 1 percent of their distribution in order to eliminate the effect of outliers on our regression results.

The annual one-year ahead raw stock returns (FRET) are calculated using compounded 12-month buy-hold returns, which include dividends and other distributions. The 12-month return cumulation period begins six months after the financial year-end. We calculate abnormal returns using the matching return approach to a benchmark portfolio (i.e. characteristic-based benchmark approach) to control for return premia associated with size and book-to-market. Following this approach, returns are adjusted for size and book-to-market effects. One-year ahead size-adjusted returns (FSRET) are calculated as follows. Each year firms are sorted into ten portfolios (deciles) based on their market capitalization. The matching return is the annual one-year ahead weighted average return of all firms in each resulting portfolio. The size-adjusted return for a firm (FSRET) is the difference between the raw return (FRET) and the matching return of the benchmark portfolio to which the firm belongs and, in essence, reflects the annual one-year ahead return after removing the effect of firm size. Similarly, the size and book-to-market-adjusted one-year ahead returns (FSBMRET) are calculated as follows. Each year, firms are first sorted into four portfolios (quartiles) based on their market capitalization. Each of the resulting portfolios is then sorted into four additional quartiles based on the book-to-market ratio. The matching return is the annual one-year ahead weighted average return of all firms in each of the 16 resulting portfolios. Thus, the size and book-to-market-adjusted return for a firm (FSBMRET) is the difference between the raw return (FRET) and the matching return of the benchmark portfolio to which the firm belongs.

5. Results

5.1 Descriptive statistics

Table I reports the mean and median values for asset growth, earnings, accruals and cash flows of each asset growth portfolio. To calculate these values, firms were ranked annually by asset growth and sorted into ten portfolios. Every year, for each portfolio, we calculated the mean and median values of each variable. Thus, the mean and median values reported in Table I are the time series average of the annual means and medians of the variables for each portfolio. Asset growth varies from about a mean of −14 percent of lagged total assets in the first decile (namely, the lowest asset growth portfolio) to about 102 percent in the last

	AGR	EARN	TACC	CF
Panel A: mean (median) values of accounting variables				
Portfolio 1	−0.1403	0.0161	−0.0736	0.0865
	−0.1151	0.0234	−0.0618	0.0696
Portfolio 2	−0.0240	0.0294	0.0109	0.0175
	−0.0231	0.0283	0.0004	0.0236
Portfolio 3	0.0213	0.0442	0.0344	0.0099
	0.0215	0.0413	0.0301	0.0050
Portfolio 4	0.0596	0.0448	0.0528	−0.0080
	0.0599	0.0437	0.0551	−0.0125
Portfolio 5	0.1021	0.0725	0.0885	−0.0162
	0.1017	0.0699	0.0914	−0.0229
Portfolio 6	0.1547	0.0592	0.1092	−0.0503
	0.1551	0.0523	0.1120	−0.0539
Portfolio 7	0.2156	0.0642	0.1311	−0.0669
	0.2184	0.0606	0.1369	−0.0715
Portfolio 8	0.3001	0.0686	0.1788	−0.1042
	0.2963	0.0642	0.1866	−0.1158
Portfolio 9	0.4585	0.1043	0.2672	−0.1608
	0.4542	0.0949	0.2853	−0.1716
Portfolio 10	1.0239	0.1326	0.6030	−0.4719
	0.9030	0.1283	0.5420	−0.4193

Notes: Table I reports the mean (median) values for asset growth, earnings, accruals and cash flows of decile portfolios formed on the magnitude of asset growth. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. Asset growth (AGR) is defined as the year-on-year percentage change in total assets. Earnings (EARN) are defined as income from continuing operations scaled by lagged total assets, while cash flows (CF) are defined as earnings minus total accruals (TACC). Total accruals, in turn, are defined as annual change in net operating assets (operating assets less operating liabilities) scaled by lagged total assets

Table I.
Univariate statistics of accounting variables for portfolios sorted by asset growth

decile (namely, the highest asset growth portfolio). Similarly, the median value of asset growth varies from about −12 percent of lagged total assets in the first decile to about 90 percent in the last decile. These results indicate that firms with high asset growth have experienced recent rapid growth, which may have led investors to overestimate the sustainability of this growth.

As shown in Table I, firms with lowest asset growth (decile 1) have, on average, the lowest earnings, whereas firms with highest asset growth (decile 10) experience the best earnings performance in the ranking year. Regarding the earnings components, the mean and median values of total accruals increase monotonically across deciles, whereas the mean and median values of cash flows decrease monotonically. These results are expected, since a firm's assets consist primarily of accruals (both operating and investing), which measure the deviation between accounting profitability and cash profitability. Consequently, it is reasonable for firms with high asset growth to have high total accruals and low (in this case negative) cash flows. Similarly, firms with low asset growth are expected to have low total accruals and high cash flows.

Table II presents pairwise correlations (both Pearson and Spearman) between asset growth, which is the variable of interest, and various earnings performance measures. As might be expected from the above analysis of the mean and median values, asset growth is positively correlated with total earnings performance using either Pearson or Spearman correlations. In addition, as shown in Table II, asset growth is strongly positively correlated with total accruals and negatively correlated with cash flows.

5.2 Cross-sectional regression results

In this section, we estimate regressions, both pooled (for all the years of the sample) and year-by-year (i.e. Fama and MacBeth, 1973), in order to examine whether the variable of interest, namely, asset growth, exhibits a statistically significant negative relation with future stock returns.

5.2.1 Pooled regression results. First, we estimate an aggregate regression of one-year ahead raw returns (FRET) on asset growth (univariable regression). According to the results reported in Panel A of Table III, the coefficient on asset growth is −0.192 ($t = -6.395$). In other words, asset growth exhibits a statistically significant negative relation with future raw returns. However, the magnitude of these returns is due not only to a firm's asset growth, but also to its size and book-to-market ratio. For this reason, it was deemed appropriate to calculate future size-adjusted returns (FSRET), as well as future size and book-to-market-adjusted returns (FSBMRET). More specifically, these adjusted returns are more likely to reflect the impact that asset growth has on a firm's future return above and beyond risk that is captured by these two variables.

	AGR	EARN	TACC	CF
AGR	1.000	0.404***	0.811***	−0.724***
EARN	0.351***	1.000	0.306***	−0.015
TACC	0.730***	0.260***	1.000	−0.948***
CF	−0.617***	0.084***	−0.910***	1.000

Notes: Table II reports Pearson (upper diagonal) and Spearman (lower diagonal) correlations for asset growth, earnings, accruals and cash flows. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. All variables are defined in Table I. *,**,***Significant at 10, 5 and 1 percent levels, respectively, one-tailed

Table II. Pearson (Spearman) correlations between asset growth and accounting variables

	Intercept	AGR
Panel A: regression of FRET on asset growth		
Coefficient	0.067254***	−0.192143***
t-statistic	4.772845	−6.394997
Panel B: regression of FSRET on asset growth		
Coefficient	−0.009881	−0.037979*
t-statistic	−0.869528	−1.567340
Panel C: regression of FSBMRET on asset growth		
Coefficient	0.005032	−0.040363**
t-statistic	0.494498	−1.860058

Notes: Table III presents the results from pooled regressions of future stock returns on asset growth. We report the parameter coefficients along with their associated *t*-statistics. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. The annual one-year ahead raw stock returns (FRET) are calculated using compounded 12-month buy-hold returns, which include dividends and other distributions. The 12-month return cumulation period begins six months after the financial year-end. The size-adjusted future returns (FSRET) are measured by subtracting the annual weighted average return of all firms that belong to the same portfolio based on their size from their raw return (FRET). The size and book-to-market-adjusted future returns (FSBMRET) are calculated by subtracting the annual weighted average return of all firms that belong to the same portfolio based on their size and book-to-market ratio from their raw return (FRET). Asset growth (AGR) is defined in Table I. *,**,***Significant at 10, 5 and 1 percent levels, respectively, one-tailed

Table III. Pooled regressions of future stock returns on asset growth

As a result, we estimate two more pooled regressions with the same independent variable (asset growth) as that of the regression estimated above, but with different dependent variables. The dependent variable of the first regression is a firm's one-year ahead size-adjusted return, while the dependent variable of the second regression is a firm's one-year ahead size and book-to-market-adjusted return. The results shown in Panels B and C of Table III reveal that the coefficient on asset growth is −0.038 ($t = -1.567$) for the first regression and −0.040 ($t = -1.86$) for the second one, indicating that the variable of interest exhibits a statistically significant negative relation with adjusted future returns.

Subsequently, we estimate pooled regressions including two asset pricing control variables as independent variables, besides asset growth (multivariable regressions). Following the existing literature, we include the natural logarithm of market capitalization and the natural logarithm of book-to-market ratio as standard asset pricing controls in these regressions.

Panel A of Table IV reports the results of the regression of one-year ahead raw stock returns (FRET) on asset growth and the control variables. The coefficient on asset growth is −0.226 ($t = -7.542$), the coefficient on the natural logarithm of firm size is 0.013 ($t = 1.445$) and the coefficient on the natural logarithm of book-to-market ratio is −0.088 ($t = -6.754$). Based on the results, we conclude that asset growth exhibits a statistically significant negative relation with future raw returns, even after controlling for size and book-to-market ratio.

Panel B of Table IV presents the results of the regression of one-year ahead size-adjusted stock returns (FSRET) on asset growth and the asset pricing control variables. The coefficient on asset growth is −0.046 ($t = -1.891$). In Panel C of Table IV we report the results of the pooled regression of one-year ahead size and book-to-market-adjusted stock returns (FSBMRET) on asset growth and the control variables. The coefficient on asset growth is −0.046 ($t = -2.082$). The results in Panels B and C reveal that asset growth has a strong negative relation with adjusted future returns, even after controlling for size and book-to-market ratio.

	Intercept	AGR	Ln(SIZE)	Ln(*B*/*M*)
Panel A: regression of FRET on asset growth and asset pricing variables				
Coefficient	−0.115583	−0.226125***	0.013077*	−0.087869***
t-statistic	−1.175852	−7.541765	1.445252	−6.754317
Panel B: regression of FSRET on asset growth and asset pricing variables				
Coefficient	0.138639**	−0.046132**	−0.015700**	−0.057842***
t-statistic	1.733091	−1.890609	−2.132062	−5.463441
Panel C: regression of FSBMRET on asset growth and asset pricing variables				
Coefficient	−0.064686	−0.045739**	0.006063	−0.006108
t-statistic	−0.898111	−2.081987	0.914485	−0.640780

Notes: Table IV reports the results from pooled regressions of future stock returns on asset growth, after controlling for size (natural logarithm of market capitalization) and book-to-market (natural logarithm of book-to-market ratio). We report the parameter coefficients along with their associated *t*-statistics. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. Asset growth (AGR) is defined in Table I. FRET, FSRET and FSBMRET are defined in Table III. Market capitalization is measured as the closing price per share six months after the financial year-end multiplied by the number of common shares outstanding. Book-to-market ratio is measured as the ratio of the financial year-end book value of equity to the market capitalization. *,**,***Significant at 10, 5 and 1 percent levels, respectively, one-tailed

Table IV.
Pooled regressions of future stock returns on asset growth and asset pricing variables

5.2.2 Fama and MacBeth (1973) cross-sectional regression results. Panel A of Table V reports the results of the Fama and MacBeth (1973) cross-sectional regressions of one-year ahead raw returns (FRET) on asset growth. The values of the parameter coefficients represent the time series averages of the values of the coefficients obtained from the annual regressions. The reported *t*-statistics (in parenthesis) are based on the time series averages of the means and standard deviations of the parameter coefficients obtained from the annual cross-sectional regressions and show the statistical significance of the results. According to the values of the coefficient on asset growth (−0.119) and the corresponding *t*-statistic (−2.67), we conclude that asset growth is a strong negative predictor of stock returns in the cross-section.

Panel B of Table V presents the results of the Fama and MacBeth (1973) regressions of one-year ahead size-adjusted returns (FSRET) on asset growth. The coefficient on the variable of interest is −0.042 and the corresponding *t*-statistic is −1.335. This result suggests that, after removing the effect of firm size on future stock returns, asset growth still exhibits a statistically significant relation with future returns.

In Panel C of Table VI, we report the results of the Fama and MacBeth (1973) annual regressions of one-year ahead size and book-to-market adjusted returns (FSBMRET) on asset growth. The values of the coefficient on asset growth (−0.055) and the corresponding *t*-statistic (−1.889) indicate that the negative relation between asset growth and future stock returns remains statistically significant even after removing the effect of firm size and book-to-market ratio on future returns.

Overall, the above results reveal that asset growth is a strong negative predictor of future stock returns of Greek firms (a finding that is consistent with the asset growth effect that Cooper *et al.* (2008) found for US firms), as a result of which we accept our hypothesis.

Table VI reports the results of the multivariable Fama and MacBeth (1973) cross-sectional regressions. In Panel A, we report the results of the annual regressions of one-year ahead raw returns (FRET) on asset growth and the natural logarithms of firm size and book-to-market ratio. The coefficient on asset growth is −0.087 ($t = -1.932$). Panel B of Table VI reports the results of the Fama and MacBeth (1973) regressions of one-year ahead size-adjusted returns (FSRET) on asset growth and the control variables. The coefficient on asset growth is −0.07 ($t = -1.487$). Panel C of Table VI presents the results of the Fama and

	Intercept	AGR
Panel A: regressions of FRET on asset growth		
Coefficient	0.187567***	−0.118995***
t-statistic	10.491765	−2.669783
Panel B: regressions of FSRET on asset growth		
Coefficient	−0.106028***	−0.042494*
t-statistic	−5.651674	−1.335465
Panel C: regressions of FSBMRET on asset growth		
Coefficient	−0.034631***	−0.055317**
t-statistic	−3.310560	−1.888727

Notes: Table V presents the results from Fama and MacBeth (1973) annual regressions of future stock returns on asset growth. We report the time series averages of the parameter coefficients along with their associated *t*-statistics. The reported *t*-statistics are based on the time series averages of the means and standard deviations of the parameter coefficients obtained from the annual cross-sectional regressions. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. Asset growth (AGR) is defined in Table I. FRET, FSRET and FSBMRET are defined in Table III. *,**,***Significant at 10, 5 and 1 percent levels, respectively, one-tailed

Table V.
Fama and MacBeth (1973) annual regressions of future stock returns on asset growth

	Intercept	AGR	Ln(SIZE)	Ln(*B*/*M*)
Panel A: regressions of FRET on asset growth and asset pricing variables				
Coefficient	0.567494***	−0.086935**	−0.042503***	−0.119489***
t-statistic	4.309787	−1.931809	−3.341654	−5.454238
Panel B: regressions of FSRET on asset growth and asset pricing variables				
Coefficient	0.137946	−0.069508*	−0.028243**	−0.074753***
t-statistic	1.019468	−1.487120	−2.162604	−3.361075
Panel C: regressions of FSBMRET on asset growth and asset pricing variables				
Coefficient	−0.284378***	−0.061307**	0.023209***	0.015500*
t-statistic	−3.614985	−2.002545	3.117591	1.386853

Notes: Table VI reports the results from Fama and MacBeth (1973) annual regressions of future stock returns on asset growth, after controlling for size (natural logarithm of market capitalization) and book-to-market (natural logarithm of book-to-market ratio). We report the time series averages of the parameter coefficients along with their associated *t*-statistics. The reported *t*-statistics are based on the time series averages of the means and standard deviations of the parameter coefficients obtained from the annual cross-sectional regressions. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. Asset growth (AGR) is defined in Table I. FRET, FSRET and FSBMRET are defined in Table III. Market capitalization and book-to-market ratio are defined in Table IV. *,**,***Significant at 10, 5 and 1 percent levels, respectively, one-tailed

Table VI.
Fama and MacBeth (1973) annual regressions of future stock returns on asset growth and asset pricing variables

MacBeth (1973) cross-sectional regressions of one-year ahead size and book-to-market-adjusted returns (FSBMRET) on asset growth and the asset pricing control variables. The coefficient on asset growth is −0.61 ($t = -2.003$). The most important conclusion drawn from these results is that the negative relation between asset growth and future returns remains statistically significant in the presence of the control variables. Consequently, the ability of asset growth to predict returns is incremental to the other well-known predictive variables. Thus, based on these results, we again are able to accept our first hypothesis.

5.3 Stock return results

In this section, we seek to confirm the negative relation between asset growth and future stock returns that we found in the regressions by examining whether a trading strategy consisting of a long (short) position in firms with the lowest (highest) asset growth generates positive returns. For this reason, we rank firms annually based on the magnitude of asset growth and then allocate them into ten equally sized portfolios (deciles) based on their ranking. Subsequently, we calculate average one-year ahead raw stock returns (FRET), as well as average one-year ahead size-adjusted (FSRET) and one-year ahead size and book-to-market-adjusted returns (FSBMRET), for each portfolio separately. Finally, we compute the hedge returns for the trading strategies consisting of a long position in the first decile, namely, in firms with the lowest asset growth, and a short position in the tenth decile.

Panel A of Table VII reports the average one-year ahead raw returns (FRET) for each portfolio and the hedge return of the strategy taking a long (short) position in firms with the lowest (highest) asset growth. The first portfolio has the fourth highest average future return (22.6 percent), while the tenth portfolio has the second lowest (12.2 percent). As a result, the trading strategy generates an average return of 10.4 percent ($t = 1.48$), which is statistically significant. It is worth noting that the strategy generates positive returns in 14 of the 21 years examined (see Figure 1), suggesting that the relation between asset growth and one-year ahead raw returns is fairly stable over time. These results are consistent with

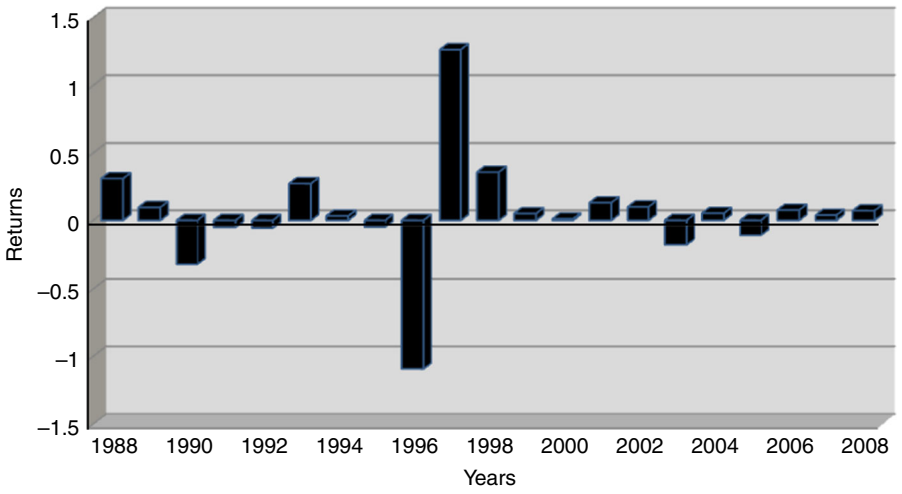
Panel A: FRET for portfolios sorted by asset growth	
Portfolios	FRET
Portfolio 1	0.226026
Portfolio 2	0.085138
Portfolio 3	0.201808
Portfolio 4	0.361774
Portfolio 5	0.256604
Portfolio 6	0.136367
Portfolio 7	0.233552
Portfolio 8	0.144500
Portfolio 9	0.194477
Portfolio 10	0.121727
Hedge return	0.104299*
t-statistic	1.481851
Panel B: FSRET for portfolios sorted by asset growth	
Portfolios	FSRET
Portfolio 1	−0.010526
Portfolio 2	−0.160734
Portfolio 3	−0.024467
Portfolio 4	−0.052730
Portfolio 5	−0.032349
Portfolio 6	−0.054885
Portfolio 7	−0.097286
Portfolio 8	−0.148948
Portfolio 9	−0.164884
Portfolio 10	−0.071296
Hedge return	0.060770*
t-statistic	1.363652
Panel C: FSBMRET for portfolios sorted by asset growth	
Portfolios	FSBMRET
Portfolio 1	−0.048191
Portfolio 2	−0.018117
Portfolio 3	−0.004172
Portfolio 4	−0.021112
Portfolio 5	−0.050327
Portfolio 6	−0.066278
Portfolio 7	−0.050259
Portfolio 8	−0.028954
Portfolio 9	−0.062194
Portfolio 10	−0.093780
Hedge return	0.045588**
t-statistic	1.887828

Notes: Table VII presents the annual mean values of future stock returns for each portfolio. Firms are ranked annually on asset growth and then allocated into ten equal-sized portfolios (deciles) based on their ranking. Hedge return represents the return to a strategy consisting of a long position in the lowest decile and a short position in the highest decile. The *t*-statistic shows the statistical significance of the hedge return. The sample consists of 2,767 firm-year observations covering all firms listed on the Greek stock market (except financial firms) for the period 1988-2008. The data were obtained from Datastream International and Worldscope. Asset Growth (AGR) is defined in Table I. FRET, FSRET and FSBMRET are defined in Table III. *,**,***Significant at 10, 5 and 1 percent levels, respectively, one-tailed

Table VII.
Future stock returns of portfolios sorted by asset growth

the results of the regressions estimated in the previous sections, as well as with the findings of Cooper *et al.* (2008) for US firms.

Panel B of Table VII presents the average one-year ahead size-adjusted returns (FSRET) for each portfolio and the average return of the hedge strategy. The first portfolio has the highest average return (−1.1 percent), whereas the tenth portfolio has the fifth lowest



Notes: Firms are ranked annually on asset growth and then allocated into ten equal-sized portfolios (deciles) based on their ranking. Asset growth (AGR) is defined in Table I. The annual one-year ahead raw stock returns (FRET) are calculated using compounded 12-month buy-hold returns, which include dividends and other distributions. The 12-month return cumulation period begins six months after the financial year-end. Hedge return represents the return to a strategy consisting of a long position in the lowest decile and a short position in the highest decile

Figure 1.
Hedge portfolio returns (FRET) based on asset growth strategy

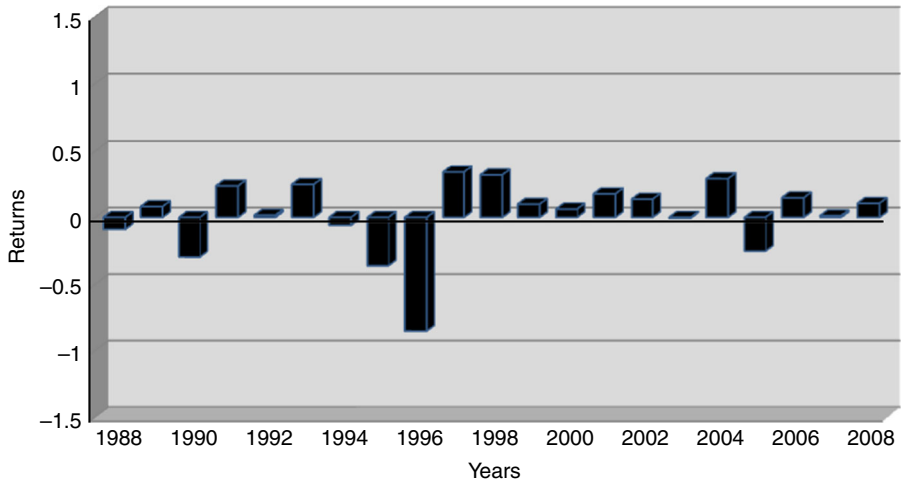
(−7.1 percent). Therefore, subtracting the average return of the tenth portfolio from the average return of the first, we find that the hedge strategy generates a statistically significant average return of 6 percent ($t = 1.36$). The hedge strategy is profitable in 14 of the 21 years examined (see Figure 2). These results confirm the negative relation between asset growth and size-adjusted future returns that we found in the Fama and MacBeth (1973) and pooled regressions.

Finally, in Panel C of Table VII we report the average one-year ahead size and book-to-market-adjusted returns (FSBMRET) for each portfolio and the average return of the hedge strategy. The first portfolio has the fifth highest average return (−4.8 percent), whereas the tenth portfolio has the second lowest (−9.4 percent). Thus, based on these returns, we find that the hedge strategy generates a statistically significant average return of 4.6 percent ($t = 1.89$). The strategy is profitable in 13 of the 21 years examined (see Figure 3), but for half of the years in which the hedge return is negative the value is very close to 0. The results are consistent with the results of the regressions mentioned earlier.

Overall, we conclude that the negative relation between asset growth and future stock returns found in the regressions estimated in the previous sections is confirmed by the stock returns of the portfolios. The trading strategy taking a long (short) position in firms with low (high) asset growth generates positive returns in the majority of the years examined, suggesting that this negative relation is fairly stable over time.

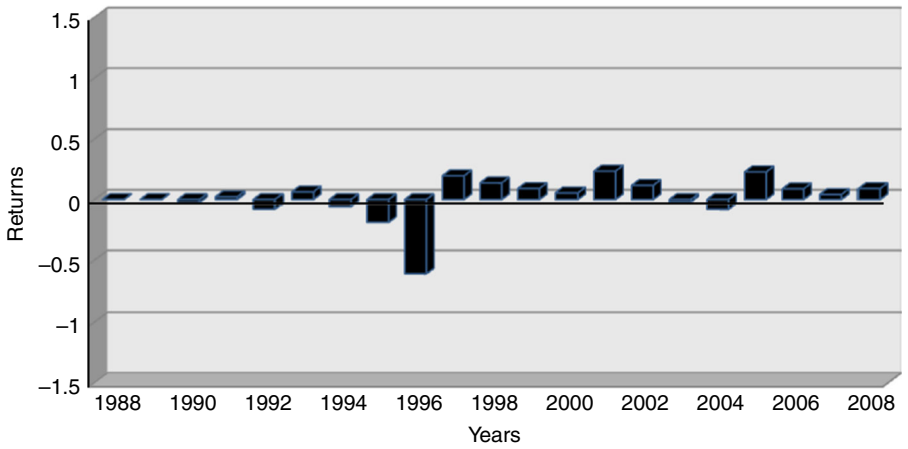
6. Conclusion

Several studies have been performed to examine the relation between various balance sheet items and future stock returns. While most studies have analyzed the relation between individual components of asset growth and future returns, this paper focuses on total asset growth and its impact on future returns, which was first studied by Cooper *et al.* (2008).



Notes: Asset growth is defined in Table I. Firms are ranked annually on asset growth and then allocated into ten equal-sized portfolios (deciles) based on their ranking. Asset growth (AGR) is defined in Table I. The size-adjusted future returns (FSRET) are measured by subtracting the annual weighted-average return of all firms that belong to the same portfolio based on their size from their raw return (FRET). Hedge return represents the return to a strategy consisting of a long position in the lowest decile and a short position in the highest decile

Figure 2.
Hedge portfolio returns (FSRET) based on asset growth strategy



Notes: Firms are ranked annually on asset growth and then allocated into ten equal-sized portfolios (deciles) based on their ranking. Asset growth (AGR) is defined in Table I. The size and book-to-market-adjusted future returns (FSBMRET) are calculated by subtracting the annual weighted-average return of all firms that belong to the same portfolio based on their size and book-to-market ratio from their raw return (FRET). Hedge return represents the return to a strategy consisting of a long position in the lowest decile and a short position in the highest decile

Figure 3.
Hedge portfolio returns (FSBMRET) based on asset growth strategy

Cooper *et al.* (2008) found that asset growth exhibits a strong negative relation with future stock returns of US firms, which is known as the asset growth effect. More specifically, they observed that high (low) asset growth firms exhibit negative (positive) abnormal returns up to five years beyond the asset growth ranking year. Furthermore, they found that asset growth has the greatest predictive power compared to other well-known determinants of future stock returns, such as book-to-market ratio and firm capitalization.

In this paper, we examine the relation between asset growth and future stock returns of Greek firms and we corroborate the findings of the study of Cooper *et al.* (2008). In particular, we find that asset growth exhibits a statistically significant negative relation with future returns, even when we include book-to-market ratio and firm capitalization as control variables in our regressions. In order to verify this negative relation between asset growth and future returns, we ranked firms annually by asset growth and sorted them into ten portfolios and found that a trading strategy consisting of a long (short) position in firms with low (high) asset growth generates positive returns.

The findings of our study raise several issues for future research. It would be worth studying the reasons behind the occurrence of the asset growth effect in the Greek stock market. It is worth noting that our hypothesis concerning the occurrence of the asset growth effect on stock returns in Greece is developed under a mispricing-based consideration. In the paper, we mentioned several studies conducted for US firms which have offered certain mispricing interpretations for the asset growth anomaly. Therefore, it would be useful to conduct a research on what drives the effect of balance sheet growth on stock returns in Greece. In this way, we can achieve a deeper understanding of this phenomenon.

Note

1. Net operating assets are defined as operating assets minus operating liabilities. Operating assets are calculated as total assets minus financial assets and operating liabilities are equal to total assets minus financial liabilities and equity:

$$\text{Operating Assets}_t = \text{Total Assets}_t - \text{Cash}_t - \text{Short-Term Investments}_t$$

$$\text{Operating Liabilities}_t = \text{Total Assets}_t - \text{Short-Term Debt}_t - \text{Long-Term Debt}_t - \text{Common Equity}_t - \text{Preferred Stock}_t - \text{Minority Interest}_t$$

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Further reading

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