Stockholm School of Economics
Department of Accounting

Bachelor's Thesis
May 15, 2017

Benjamin Graham's Stock Selection Criteria:

A Study on the Nordic Exchanges

Abstract

The purpose of this thesis is to determine if Benjamin Graham's ten rules for stock selection would have generated abnormal returns on the Nordic stock exchanges between 2001 and 2016. Graham, the father of value investing, considered these rules the most important in finding undervalued companies. Two types of portfolios are simulated: one which uses all ten rules to select stocks, and one which uses only two rules which Graham considered particularly important. Previous studies have tested Graham's rules on other markets and evaluated the returns against less sophisticated asset pricing models, such as CAPM. In contrast, the returns in this study are evaluated against the Fama-French five-factor model, which is one of the most recent advancements in asset pricing theory. We find that the two portfolios result in rates of return of 15.3% and 17.7% per annum, respectively. Despite the high returns, neither of the two portfolios generate statistically significant abnormal returns in the context of the five-factor model.

Authors: Mattias Malmback (23458@student.hhs.se), Björn Pemer (23460@student.hhs.se)

Tutor: Henrik Andersson

Keywords: Value investing, Benjamin Graham, Fama French, Five-factor model, Stock selection

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1. Introduction

From the top tick in 1929 to the bottom tick in 1932, the Dow Jones Industrial Average declined 89%. It seemed to many investors that the stock market was nothing but a casino, where price movements were random and completely disconnected from the underlying asset. Contrary to the view, Benjamin Graham and David L. Dodd argued in their seminal work of 1934, *Security Analysis*, that stocks should be viewed as fractional ownership of companies, and that investors can through rigorous analysis of companies determine the fair value of stocks. As rudimentary as the view may sound, Security Analysis was the first serious attempt to systematise the valuation of securities.

1.1 Graham's 10 Criteria and the Study

Value investing, an investment paradigm established by Graham, can be defined as the strategy where the investor buys securities that trade significantly below their intrinsic value. In 1977, shortly after his passing, Graham's list of 10 criteria for stock selection was published. It summarises the value investing principles that Graham used over his career in financial markets, and is intended to help investors identify stocks with high reward-to-risk ratio. The purpose of this thesis is to construct two types of portfolios (*Graham Portfolios*) and evaluate the returns against the Fama-French five-factor model (FF5), to determine if the two portfolios generate positive abnormal returns, defined as realised return above the expected return. The two portfolios are based on two different strategies derived from Graham's 10: firstly, a portfolio of the stocks with the highest score based on the number of criteria fulfilled, and secondly a portfolio that includes stocks that meet criterion (1) and (6), namely low price-to-earnings ratio and conservative leverage. The portfolios are formed in July each year, with the criteria calculated using the financial statements of the previous year. Thus, this is an ex-ante study, where the investor would have had access to Graham's 10 criteria and the financial data to employ the investment strategies in practice.

1.2 The Fama-French Five-Factor Model

In 1970, Eugene Fama proposed the Efficient Market Hypothesis (EMH). In its semi-strong form, stock prices reflect all publicly available information, and no investment strategy on public information would therefore result in abnormal returns. In other words, if the efficient market hypothesis is an accurate description of financial markets, value investing would not be a profitable endeavour, and one would not expect stock selection based on Graham's 10 criteria to result in abnormal returns. In contrast to this notion, several empirical studies find that certain types of stocks persistently generate abnormal returns, at least as far as CAPM is argued to capture the expected return. Rosenberg, Reid and Lanstein (1985) show that stocks with low price-to-book ratios generate abnormal returns through 1973 – 1984. This tendency for stocks valued at low ratios to outperform is called the value effect. Similarly, Banz (1981) shows that small companies offer abnormal returns relative to CAPM, a phenomenon known as the size effect. Rather than rejecting the EMH, Fama and French (1992) advanced a three-factor asset pricing model with the addition of size and value factors to capture these anomalies. The model explains more of the cross-sectional variation in returns, but the economic justification is generally perceived as less satisfying compared to CAPM. Nevertheless, Fama and French argue that size and value effects are the result of risk, and that "Beta as the sole variable explaining returns on stocks is dead". More recently, Fama and French introduced a five-factor model, with the addition of two factors to capture anomalies related to the profitability and investments of companies (Fama and French, 2015).

1.3 Expected Findings

Value investing strategies, such as Graham's 10, are primarily focused on the value effect to obtain high returns e.g. buying stocks at low ratios such as price-to-earnings or price-to-book. Thus, abnormal returns should be close to zero for Graham's 10 criteria when compared to the expected return of the Fama-French factor models, in theory at least. The evidence on this front is mixed. Xiao and Arnold (2008) study one of Graham's criteria in particular, and find that stocks selected on this criterion yield abnormal returns that cannot be explained by either CAPM or the three-factor model. Lauterbach and Vu (1993), however, find no abnormal returns with an almost identical strategy when controlling for size.

In contrast to previous studies of Graham's 10 criteria, the returns of the portfolios considered in this study are evaluated against the Fama-French five-factor model. The five-factor model explains more of the cross-sectional variation in returns than the three-factor model, and should explain most of the returns of the two portfolios. Therefore, it appears unlikely, although possible, that any of the two portfolios would result in abnormal returns.

1.4 Outline of Thesis

The succeeding sections are arranged as follows: In section two we present the theoretical framework of the study, namely value investing, the efficient market hypothesis, CAPM and the Fama-French three- and five-factor models. We end section two by presenting previous research on Graham's 10 criteria and the expected findings of the study. In section three we state the hypotheses and in section four we describe the methodology, in particular data collection, calculation of the five-factor model and construction of the Graham Portfolios. The empirical findings are presented in section five, which are discussed in section six, where we also consider the limitations of the study and offer suggestions for further research.

2. Theoretical Framework and Earlier Research

2.1 Graham's 10 Criteria

Exhibit 1: Graham's 10 Criteria for Stock Selection (Blustein, 1977)

Criterion	Definition
(1)	Earnings-to-price yield of at least twice the AAA bond yield
(2)	Price-to-earnings ratio of less than 40 percent of the highest price-to-earnings ratio the stock has attained in the past five years
(3)	Dividend yield of at least two-thirds the AAA bond yield
(4)	Stock price of less than two-thirds of tangible book value per share
(5)	Stock price of less than two-thirds of net current asset value (NCAV) per share
(6)	Total debt less than book value of equity
(7)	Current ratio greater than two
(8)	Total debt less than twice NCAV
(9)	Earnings growth over past ten years of at least 7% annually compounded rate
(10)	Stability of growth in earnings, defined as no more than two declines of 5% or more in year-end earnings in the past ten years

The list of 10 criteria (Graham's 10) for stock selection is the result of a collaboration between Benjamin Graham and James Rea, Graham's partner in financial research. First published in Forbes Magazine in 1977, it assesses stocks in two dimensions: a) reward (criterion 1 - 5), and b) risk, or more precisely lack thereof (criterion 6 - 10). Thus, Graham's 10 criteria are intended to be used to identify stocks with the highest reward-to-risk ratio. During his last two years, Graham researched the performance of the criteria for the period 1925 – 1975 on the U.S. market. Criterion (1), (3) and (5) were considered to be the best reward criteria, and criterion (6) was found to be the most useful criterion to determine financial stability. Stocks selected on the combination of criterion (1) and (6) resulted in the highest returns, with annually compounded rates of return of 19%, compared to the return on the Dow Jones Industrial Average of 7.5%, including dividends. Graham was confident that stocks selected on criterion (5) result in high returns and did not research this criterion (Blustein, 1977). James Rea used these principles in practice as the fund

manager of an investment partnership. Supposedly, the partnership was successful, but the rates of return of the partnership are not available to the public.

There are several ways in which one could use the criteria to select stocks, but most previous studies have tested either one criterion or a combination of two or three. This thesis studies two different strategies. Firstly, a portfolio is constructed on all criteria, where each stock is given a score from 0 to 10, based on the number of criteria it fulfils. This portfolio, denoted the *All Criteria Portfolio*, consists of the 30 stocks each year with the highest score. The second portfolio consists of stocks that satisfy criterion (1) and (6), denoted the *1 & 6 Portfolio*. The number of stocks included in this portfolio varies from year to year, depending on how many stocks that pass the two criteria, but never exceeds 30.

2.2 Value Investing

Graham is often praised as the father of value investing, although he did not coin the term value investing himself. Broadly defined, value investing is an investment strategy where the investor selects securities valued below their intrinsic value with a sufficiently wide margin of safety. The investor using this method can through rigorous analysis identify securities that are currently undervalued, and outperform the market as the price adjusts over time, it is argued. Valuation however is not a precise science, and it is rarely possible to determine the exact value of a stock. Therefore, the investor should only buy securities at a price significantly below the fundamental value, i.e. with a margin of safety (Graham, 1934, p. 66).

2.2.1 Value Investing: Under- and Overvaluation

What causes the price to deviate from the intrinsic value? Graham states that:

"The market is not a *weighing* machine, on which the value of each issue is recorded by an exact and impersonal mechanism, in accordance with its specific qualities. Rather should we say that the market is a *voting* machine, whereon countless individuals register choices which are the product partly of reason and partly of emotion." (Graham, 1934, p. 70)

He suggests that prices deviate from value because of three primary reasons: 1) exaggeration, 2) oversimplification, and 3) neglect (Graham, 1934, p. 669). More recent research finds evidence for these and their role in mispricing of securities.

Daniel, Hirshleifer and Subrahmanyam (1998) advance a theory based on investors overconfidence and variations in confidence arising from biased self-attribution, to explain under- and overreactions in the stock market. An overconfident investor is defined as someone who overestimates the precision of his own information, and according to attribution theory, individuals tend to credit themselves for successful outcomes, while failures are seen as noise or sabotage. Daniel et al. assert that as a result, new information that confirms the investor's view will make him more confident about his trade, while information of the opposite nature does little or nothing to decrease his confidence. Thus, the arrival of new public information is likely to increase confidence among investors, which creates an overreaction, or in Graham's words exaggeration. In the long run however, Daniel et al. argue, similar to Graham, that the market normally corrects.

Lee and Swaminathan (2000) show that stocks with lower trading volume exhibit characteristics of so-called value stocks. High volume stocks on the other hand exhibit characteristics of so-called glamour stocks. Specifically, lower trading volume is associated with higher book-to-market ratios, while higher volume implies the opposite. In addition, lower volume tends to result in less analyst coverage, and the analysts' earnings forecasts are generally more pessimistic, despite that low-volume stocks outperform their high-volume counterparts in long-term earnings growth. This concurs with Graham's view that neglect from the investor community can result in undervaluation.

2.2.2 Value Investing: How to Invest According to Graham

How can the value investor profit from the mistakes of the market? Graham argued that the intrinsic value should be determined through "simple and definite arithmetical reasoning from statistical data" (Graham, 1973, p. 520). One example of a metric that Graham used in his valuations is NCAV (current assets less total liabilities and preferred equity):

"It always seemed, and still seems, ridiculously simple to say that if one can acquire a diversified group of common stocks at a price less than the applicable net current assets alone - after deducting all prior claims, and counting as zero the fixed and other assets - the results should be quite satisfactory." (Graham, 1973, p. 391)

The NCAV rule and Graham's 10 criteria epitomise Grahamite value investing: buying companies that are valued at very low levels relative to earnings and assets, but are at the same time financially

stable and conservatively leveraged. Naturally, few stocks pass Graham's high requirements, but the ones that do have limited downside and significant upside, in Graham's view. The benefit of Graham's quantitative rules for investing, such as Graham's 10, is that they can be applied purely mechanically and thereby leave themselves to statistical testing.

2.3 Random Walk Theory and The Efficient Market Hypothesis

In contrast to Graham, academia traditionally views the market as an efficient mechanism where prices accurately reflect available information. The idea of efficient markets and the role of prices to disperse information among market participants can be traced back to the 1940s and Hayek, although it was only later that the theory was explicitly applied to financial markets. In 1965, Eugene Fama presented evidence of the random walk theory, namely that future movements of stock prices are random and independent of previous movements (Fama, 1965). Subsequently, no investor should be able to persistently achieve abnormal returns through the analysis of historical prices. The theory is the foundation of the Efficient Market Hypothesis (EMH), which can be described in terms of three stylised forms of market efficiency: 1) weak form of efficiency: only information conveyed by historical price movements is reflected in the price, 2) semi-strong form of efficiency: both historical prices and all publicly available information, and 3) strong form of efficiency: in addition to aforementioned, non-public information (Fama, 1970). The weak form is widely accepted as an accurate description of price movements, supported by studies on random walks. The semi-strong form is naturally more debated. Fama acknowledges that the hypothesis is extreme and that it is unlikely to hold true at all times, but he asserts that there is no significant evidence against the semi-strong form of market efficiency (Fama, 1970). In this context, no investment strategy based on public information, such as selecting stocks on Graham's 10 criteria, will result in persistent abnormal returns, at least not if the strategy is known to a sufficiently larger number of investors.

2.4 The Debate of Value Investing and Market Efficiency

Advocates of value investing point out that there are several examples of value investors who, in their view, consistently achieve abnormal returns. In 1984, Columbia University arranged a contest between Michael Jensen, a devotee of the efficient market school, and Warren Buffett, perhaps the most well-known value investor, to celebrate 50th anniversary of the publication of

Security Analysis. Jensen likened the superior performance of some fund managers to a coin-flipping competition - given a sufficiently large number of contestants, a handful of coin-flippers may appear to be able to beat the game as they continue to win in each round, while it is the merely luck. His view is shared by others in academia. Merton Miller explains that "if there are 10,000 people looking at the stocks and trying to pick winners, well 1 in 10,000 is going to score, by chance alone, a great coup, and that's all that's going on." In their view, it is not instructive to study the profitability of value investing with regards to a few successful examples such as Graham and Buffett, and their returns alone cannot be considered evidence of market inefficiency. Buffett responded to Jensen's argument:

"You will find that a disproportionate number of successful coin-flippers in the investment world came from a very small intellectual village that could be called Graham-and-Doddsville. A concentration of winners that simply cannot be explained by chance can be traced to this particular intellectual village." (Buffett, 1984)

In support of Buffett's claim, Price and Kelly (2004) find that the returns of Warren Buffett cannot be dismissed as a statistical anomaly. However, this does not imply that it is easy or possible for most investors, even professional asset managers, to achieve abnormal returns. Berkshire Hathaway, Buffett's investment vehicle, is a rare and extraordinary example, with a higher Sharpe ratio than any mutual fund with more than 30 years of history (Frazzini, Kabiller and Pedersen, 2013). Moreover, mutual fund managers do not on average outperform the market, and examples of fund managers with returns in excess of the market for more than ten years are exceptionally rare (Malkiel, 2015, p. 175). Shortly before he died, even Graham appears to have changed his view on market efficiency:

"I am no longer an advocate of elaborate techniques of security analysis in order to find superior value opportunities. This was a rewarding activity, say, 40 years ago, when Graham and Dodd was first published; but the situation has changed… [Today] I doubt whether such extensive efforts will generate sufficiently superior selections to justify the cost… I'm on the side of the 'efficient market' school of thought." (Malkiel, 2015, p. 184)

In summary, it could be argued that pockets of market inefficiency sometimes arise, but the vast majority of investors, including professional asset managers, appear unable to locate and exploit such opportunities. Furthermore, financial literature has thus far failed to establish a ubiquitous

measurement of expected returns, and it is therefore unclear to what extent the returns of value investors such as Buffett's returns can be described as abnormal.

2.5 The Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), Lintner (1965) and Mossin (1966), represents a significant step in quantifying expected return in an efficient market. Most if not all asset pricing models are extensions or modifications of CAPM. It rests upon the two ways in which investors are compensated: the time value of money (r_f), and the amount of risk of the asset that cannot be diversified (systematic risk), captured by β. The expected excess return (the return above the risk-free rate) is the product of beta (β) multiplied by the market risk premium. Consequently, the investor can only achieve higher expected return at higher systematic risk.

CAPM is supported by attractive economic intuition, but has received substantial critique in academic literature. Black, Jensen and Scholes (1972) show that the model tend to under- and overestimate returns for low and high β-values. Fama and French (1992) find that the central prediction of CAPM, that expected return is a linear function of β, is not supported by their data for the period 1941 – 1990. In addition, researchers have identified several anomalies, defined as deviations of a stock's realised return from the expected return given by CAPM. Some of the most important examples relate to price-to-book, market value and leverage.

2.6 Value, Size and Leverage Effect

A large body of research indicates that value stocks (stocks that are valued at low ratios such as price-to-book or price-to-earnings) generate abnormal returns relative to CAPM. One of the earliest examples of the value effect is Nicholson (1960), who finds that stocks valued at low price-to-earnings ratios outperform stocks valued at high price-to-earnings, studying the period 1934 – 1954. Basu (1977) finds the same phenomenon through the simulation of portfolios sorted on price-to-earnings for companies listed on NYSE between 1957 – 1971. The return on low price-to-earnings portfolios resulted in positive abnormal returns of 2 – 4.5% annually, while high price-to-earnings portfolios yielded negative abnormal returns of 2.5 – 3% annually, relative to CAPM.

Similar effect arises with price-to-book (Rosenberg, Reid and Lanstein, 1985) and price-to-cash flow (Lakonishok, Shleifer and Vishny, 1994).

Banz (1981) finds that smaller companies, measured by market value, have higher returns compared to larger companies when controlling for expected return of CAPM, and that the phenomenon is persistent for the period 1936 – 1975. The size effect is the largest for the smallest companies, but whether size per se is the cause for this difference or if it is the result of one or more unknown risk factors related to size could not be determined.

Bhandari (1988) identifies yet another anomaly known as the leverage effect. He finds that returns are positively related to the debt-to-equity ratio, after controlling for CAPM and firm size in his study of stocks on NYSE for the two sub-periods of 1948 – 1949 and 1980 – 1981. These results are insensitive to the choice of market proxy and the technique to estimate β.

2.7 The Fama-French Factor Models

2.7.1 The Fama-French Three-Factor Model

In light of these anomalies, Fama and French (1992) extended the one factor CAPM to a three-factor model (FF3), with the addition of a size factor based on market capitalization and a value factor based on book-to-market. Fama and French's conclusions of the three-factor model can be summarised as follows: the relation between size and returns, and price-to-book and returns are captured by the size and book-to-market factors respectively, and the two factors combined seem to capture the effect of leverage and price-to-earnings. FF3 explains c. 90% of cross-sectional variation in returns, compared to merely c. 70% of CAPM.

Fama and French (1993) find that smaller firms suffered from prolonged depression in earnings following the recession of 1980 – 1982, to a greater extent than large firms, which the authors argue suggests that small firms are exposed to a form of risk unique to their size. Similarly, they show that low book-to-market companies, irrespective of the economic cycle, generate higher earnings for at least the next five years. Conversely, companies with high book-to-market ratios generate lower earnings for at least the next five years. Thus, Fama and French argue that CAPM is flawed, and that size and value factors are important extensions to account for risk not captured by CAPM.

The three-factor model has received its fair share of critique. Black (1993) and Malkiel (2003) claim that the size and value effects are the result of data mining. In their view, the

anomalies are likely to have been discovered by chance in a dataset of every conceivable variable. The risk is aggravated by the weak foundation in economic theory for the additional factors. In support of the claim, Kothari, Shanken and Sloan (1995) analyse a different dataset and find that while beta and the size effect explain returns, the value effect is at best weakly related to returns. However, Fama and French refute the critique. The anomalies are present in a number of countries (Fama and French, 1998) and have existed in the U.S. market since at least 1929 (Davis, Fama and French, 2000). Thus, it appears unlikely that the anomalies are products of data mining.

Lakonishok, Schleifer and Vishny (1994) share Fama and French's view that the value effect is a persistent phenomenon in financial markets, but their interpretation of the anomaly is different. Lakonishok et al. compare the returns of value portfolios against glamour portfolios on NYSE and AMEX for the period 1968 – 1990. Glamour (value) stocks are defined as stocks with low (high) book-to-market, cash flow-to-market or earnings-to-market. They find that the value portfolios outperform the glamour portfolios in both shorter and longer periods, and over all five-year horizons in the 22-year sample. Therefore, they argue that value stocks are not associated with higher risk. Rather, the value effect is the result of suboptimal behaviour of investors. Although Fama and French (1992) do not agree with the interpretation, they acknowledge that the value effect could be the result of inefficient markets, where securities are temporally under- or overvalued, but over time regress toward the mean.

2.7.2 The Fama-French Five-Factor Model

More recent research (Novy-Marx, 2013, Titman, Wei and Xie, 2004) shows that the three-factor model fails to capture cross-sectional variation in returns related to profitability (measured by gross profit over total assets) and investments (measured by capital expenditure over sales), whereby Fama and French (2015) extended the three-factor model to a five-factor model (FF5). The authors base their analysis on the dividend discount model and the theory of Modigliani and Miller (1961) and show that higher expected earnings imply a higher expected return, and higher expected growth in book equity, or higher investments, implies a lower expected return. In line with their theory, companies with high operating profitability yielded higher average returns than companies with low operating profitability, and average returns for companies with low investments (measured as change in total assets from previous year) were higher than the returns of companies with high investments. The results indicate that FF3 is less effective when applied

to portfolios of companies with high profitability and high investments, as these companies show largest improvement of the intercept, i.e. an alpha or abnormal return closer to zero, when comparing FF3 and FF5. The revised model is estimated to explain between 71% and 94% of the cross-section variance of expected returns, and as such, FF5 is an improvement relative to FF3.

2.8 Earlier Research on Graham's 10 Criteria

2.8.1 Evidence in Favour of Graham's 10 Criteria

The first study of Graham's 10 criteria was by Graham himself, on the U.S. market for the period 1925 – 1975. The combination of criterion (1) and (6) yielded the highest return of close to 19% annually compounded, followed by the combination of criterion (3) and (6) of 18.5%, compared to the Dow Jones Industrial Average of 7.5% including dividends. The calculations were largely performed by hand with several unspecified simplifications and the returns are not risk adjusted in any way (Blustein, 1977).

Further studies on Graham's 10 have verified the high returns on various markets, and the returns have been evaluated against different measures of expected return. Oppenheimer (1981), one of the earliest examples, shows that employing a set of principles stated in the various editions of Graham's *The Intelligent Investor,* similar to Graham's 10, results in superior returns relative to the market portfolio. In addition, portfolios of large companies with dividend payments and conservative leverage yielded abnormal returns of 3 – 3.5% p.a. relative to CAPM for the U.S. market in the period 1956 – 1975.

Oppenheimer (1984) tests different combinations of Graham's 10 criteria on NYSE and AMEX for the period 1974 – 1981 and finds that the combination of criterion (1) and (6) results in abnormal returns after controlling for risk and size. Portfolios formed on criterion (1), (3) and (6), and (3) and (6) provided mixed results. Adding criterion (9) to the different sets of criteria resulted in a slight improvement in returns. Klerck and Maritz (1997) use an approach similar to Oppenheimer (1984) and study the combinations of criterion (1) and (6), (3) and (6), and (1), (3) and (6) on the Johannesburg Stock Exchange for the period 1977 – 1994. All combinations result in abnormal returns relative to the CAPM, and the combination of criterion (1) and (6) has the best statistical significance.

Vu (1988) presents evidence that the strategy of buying stocks that trade below the net current asset value (NCAV) per share (similar to criterion (5)) resulted in abnormal returns in the

1970s and 1980s for the U.S. market, relative to CAPM. Bildersee, Cheh and Zutshi (1993) find that companies with high NCAV-to-market generated abnormal returns in their study of the Japanese stock market for the period of 1975 – 1988, relative CAPM and controlling for value effect as measured by the price-to-earnings. Xiao and Arnold (2008) study criterion (5), stock price less than two-thirds of NCAV, on stocks listed on the London Stock Exchange between 1981 and 2005. They find that companies selected solely on criterion (5) resulted in positive abnormal returns over a holding period of 5 years. Neither CAPM nor the three-factor model could explain the returns.

Singh and Kaur (2014) study the performance of all ten of Graham's criteria combined on the Bombay Stock Exchange for the period 1996 – 2010. The authors construct different portfolios based on companies that satisfy a high number of the criteria and portfolios of companies that satisfy a low number of the criteria. They find that portfolios of high scores yielded higher returns than portfolios of low scores, and that the portfolios of companies fulfilling at least five criteria yielded returns above the overall market by a wide margin. Moreover, portfolios of high scores generated abnormal returns when controlling for size and book-to-market ratio. Criterion (1), (4), (5), (6) and (10) are found to be the most important.

2.8.2 Evidence Against Graham's 10 Criteria

Ma and Whittred (1981) study the returns of two portfolios, one constructed on criterion (5) and one on the combination of criterion (1), (3) and (6) on the Australian market. Both portfolios resulted in impressive returns in the first 2 - 3 years, but did not generate abnormal returns of statistical significance. Lauterbach and Vu (1993) re-examined the performance of the NCAV rule studied by Vu (1988). Two methods for size adjustment are tested, and the authors find that the abnormal returns are close to zero when controlling for size with both forms of size adjustment.

2.8.3 Conclusion from Previous Research on Graham's 10

Previous studies of Graham's 10 criteria indicate that various strategies generate abnormal returns relative to CAPM, and some studies show that abnormal returns persist after controlling for size and value. Therefore, this study evaluates Graham's criteria against the five-factor model, in order to contribute with original research to previous findings.

2.9 Expected Findings

Several of Graham's 10 criteria seek to exploit anomalies that are directly addressed by FF5. Criterion (1) and (2) imply buying stocks that trade at a low price-to-earnings ratio relative to interest rates and the historical average price-to-earnings ratio of the company, respectively. Criterion (4) emphasizes the importance of low price-to-book ratio, while criterion (5) relates the stock price to the net current asset value, which is a measure to some extent similar to price-to-book. Thus, any return premium that results from stock selection on criterion (1), (2), (4) and possibly (5) is expected to be captured by the value factor (HML) or by the factors combined in FF5. Criterion (3), which demands a high dividend yield, is expected to be captured by the investment factor (CMA).

On the other hand, there are some differences between Graham's risk criteria (6 - 10) and FF5. Criterion (6) is based on leverage, while criterion (8), although not a direct measure of leverage, appears related. The anomaly that arises from leverage is captured by the factors of FF3 combined according to Fama and French. However, they suggest that leverage is positively related to returns (Fama and French, 1992), while Graham maintains that low leverage is preferred. In a study by Penman, Richardson, and Tuna (2007) book-to-market ratio is decomposed into an enterprise book-to-market ratio and a leverage component. Their analysis of U.S. data from 1962 – 2001 shows that the leverage component is negatively related to future returns and that the effect cannot be explained by the three-factor model extended with a momentum factor. This suggests that criterion (6) could capture abnormal returns. Criterion (7) (current ratio greater than two), and (9) and (10) (historical earnings growth and stability) are not explicitly addressed by any of the factors in FF5. It is therefore possible that criterion (6 - 10) relate to anomalies that are not explained by FF5.

The findings of previous studies on Graham's criteria are mixed, where some indicate that certain strategies generate abnormal returns after controlling for size and value, while others find that abnormal returns disappear after such adjustments. This gives reason to believe that the application of Graham's 10 criteria to the Nordic market could result in returns that are not explained by FF5. However, it is plausible that we find no abnormal returns with FF5, which captures additional anomalies compared to its predecessor. Thus, we expect to find either relatively small abnormal returns, or no abnormal returns at all. In absolute terms, Graham's criteria are expected to result in returns above the market average, since they should capture the value effect

in particular. Moreover, most if not all previous studies of Graham's 10 criteria show unadjusted returns significantly above the market return.

3. Hypotheses

The purpose of the thesis is to determine if the two portfolios constructed on Graham's 10 criteria for stock selection would have generated abnormal returns between July 2001 and July 2016 relative to the expected return of the Fama-French five-factor model. The returns of each portfolio are tested separately, but the hypotheses for both portfolios are the same and formulated as follows:

H_0: The portfolio results in monthly returns that are not significantly greater than the expected return given by the five-factor model.

H_1: The portfolio results in monthly returns that are significantly greater than the expected return given by the five-factor model.

4. Methodology

4.1 Demarcation of Study

This study is limited to the period 1 July, 2001 to 1 July, 2016 and Sweden, Finland, Denmark and Norway. The exchanges considered are the four main exchanges in the Nordic region, Nasdaq Stockholm, Nasdaq Helsinki, Nasdaq Copenhagen, and Oslo Børs, and First North, an alternative exchange in Stockholm for smaller companies. The benefit of studying four countries is twofold. Firstly, it represents a larger universe of stocks that are screened against Graham's 10 criteria. Secondly, it allows for the estimation of FF5 on a larger sample of stocks. However, as highlighted by Griffin (2002), Fama-French factors can differ between countries, and there is a risk of neglecting any differences in the Fama-French factor returns between the countries. Nevertheless, we argue that the aggregation is necessary to have enough data points to accurately estimate the Fama-French factors.

Financial services companies are excluded from the dataset due to differences in the interpretation of the financial statements. Similarly, companies with fiscal year different from the calendar year are excluded, to ensure that the financial statements of the companies were available

to the real investor at the time of investment on July 1 each year. All returns are calculated without transaction costs and taxes, and are not inflation adjusted.

4.2 Data

Thomson Reuters Datastream is the primary data source. The database provides the list of stocks that were available to investors each year on the five exchanges considered in the study. The list includes c. 800 stocks each year, after excluding financial services companies and companies with fiscal year different from calendar year. However, this number varies from year to year, as new stocks are listed, while others are delisted. Accounting data on the companies are retrieved for the period of 1990 – 2014, while return calculations are retrieved from July 1 (or closest trading day), 2001 to July 1, 2016 for each stock. Accounting data are converted to Swedish Krona (SEK) using exchange rates from World Market Reuters Series, while return calculations are based on local currency. Lastly, Datastream is used to retrieve 10-year Swedish government bond yields as a proxy for the AAA bond in Graham's 10 criteria, and yields on the Swedish one-month treasury bill as the risk-free rate in the calculation of excess returns. The data source indicates when a company is delisted, but provides limited, if any, insight into the reason for the delisting, or the return to shareholders. Therefore, stocks that were delisted for any reason in the last twelve months preceding July 1 each year are excluded from the period in the estimation of the factors of FF5. The reason for delisting of companies included in the Graham Portfolios is determined with alternative data sources. If the company was liquidated, the return for the month is estimated to -100%, and if the company was delisted as a result of a merger or acquisition, the shareholder proceeds per share are estimated to the last quoted stock price.

4.3 Method

The regression approach developed by Jensen (1968) is used to test our hypotheses and determine if the two Graham Portfolios result in abnormal returns. The monthly excess returns of each portfolio are regressed against the five-factor model:

$$R_{it} - R_{Ft} = \alpha_i + b_i MRP_t + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + \varepsilon_{it}$$

The model describes realised portfolio returns (R_{it}) in excess of the risk-free rate (R_{Ft}) as a function of the following terms: the intercept (α_i), the market risk premium (MRP_t), the size

premium (SMB_t), the value premium (HML_t), the profitability premium (RMW_t), the investment premium (CMA_t), and the random error term (ε_{it}) with an expected value of zero. The five factors are defined in section 4.4. Excess portfolio returns that are not explained by market risk premium, size premium, value premium, profitability premium and investment premium are estimated by the intercept, alpha (α_i), the abnormal return.

Returns are calculated based on a total return index, which shows the theoretical return on investment, given that all dividends are reinvested in the stock on the ex-dividend date. The return index is calculated as:

$$RI_t = RI_{t-1} \times \frac{P_t}{P_{t-1}}$$

Where RI_t = return index on day *t* and P_t = adjusted closing price on day *t,* and *t-1* is the day before. However, when *t* = ex-dividend date, the total return index is calculated as:

$$RI_t = RI_{t-1} \times \frac{P_t + D_t}{P_{t-1}}$$

Where D_t = dividend payment associated with the ex-dividend date.
The excess return between *t-1* and *t* is calculated as:

$$Excess\ return = \frac{P_t}{P_{t-1}} - R_{Ft} - 1$$

Where R_{Ft} = yield for the period on the Swedish one-month treasury bill.
However, when *t* = ex-dividend date, the excess return is calculated as:

$$Excess\ return = \frac{P_t + D_t}{P_{t-1}} - R_{Ft} - 1$$

4.4 Definitions of Variables in the Five-Factor Model

MRP (Market Risk Premium) is the value-weighted return of all companies in the sample less the risk-free rate. **SMB** (Small Minus Big) is the difference between returns on the portfolios of small companies (low market capitalisation) and the portfolios of large companies (high market capitalisation). **HML** (High Minus Low) is the difference between returns on the portfolios of companies with high book-to-market ratio (B/M) and the portfolios of companies with low B/M. We calculate B/M using book value per share at end of fiscal year *t - 1* divided by price per share

at end of fiscal year *t - 1*. **RMW** (Robust Minus Weak) is the difference between the portfolios of companies with robust (high) profitability and the portfolios of companies with weak (low) profitability. Operating profitability (OP) is defined by Fama and French (2015) as revenues less cost of goods sold, selling, general and administrative expenses and interest expense, all divided by book value of equity *t - 1*, based on the year-end financial reporting for year *t - 1*. We calculate OP as EBITDA less interest expense on debt, divided by common equity for the fiscal year *t - 1*. **CMA** (Conservative Minus Aggressive) is the difference between returns on the portfolios of conservative companies (low investments) and the portfolios of aggressive companies (high investments). Investment (INV) is calculated as the change in total assets from fiscal year end *t - 2* to *t - 1*, divided by total assets *t - 2*.

4.5 Construction of Factors in the Five-Factor Model

The five factors are calculated according to the 2 x 3 portfolio sorting (see Exhibit 2) used by Fama and French (2015), and are based on stock returns for all four countries. Although there are numerous sorting methods (e.g. 2 x 2 and 2 x 2 x 2 x 2), Fama and French conclude that the results of the five-factor model are independent of the sorting method.

A total of 18 portfolios are created each year on July 1 for the years 2001 - 2015. The companies are first sorted on size, with the median market capitalisation as breakpoint in the separation of small from big companies. Secondly, the companies are sorted on B/M, OP and INV respectively with the 30th and 70th percentile as breakpoints for this second assortment. The portfolios are labelled with two letters, the first defining size, small (S) or big (B). The second letter describes high (H), neutral (N) or low (L) in the B/M group; robust (R), neutral (N) or weak (W) in the profitability group; conservative (C), neutral (N) or aggressive (A) in the investment group.

Exhibit 2: Portfolio Sorting Method in FF5

	Median Market Cap.	
70th percentile (B/M)	SH	BH
	SN	BN
30th percentile (B/M)	SL	BL

	Median Market Cap.	
70th percentile (OP)	SR	BR
	SN	BN
30th percentile (OP)	SW	BW

	Median Market Cap.	
70th percentile (INV)	SC	BC
	SN	BN
30th percentile (INV)	SA	BA

Monthly value-weighted returns are calculated for each of the 18 portfolios. The portfolio returns are used to estimate the factor returns of SMB, HML, RMW and CMA according to the definitions stated in Exhibit 3 below. The monthly market risk premium (MRP) is calculated as the value-weighted return on the entire sample of stocks, less the monthly yield on the one-month Swedish treasury bill.

Exhibit 3: Definitions of Factors and Their Components

$$SMB_{B/M} = \tfrac{1}{3}(SH + SN + SL) - \tfrac{1}{3}(BH + BN + BL)$$

$$SMB_{OP} = \tfrac{1}{3}(SR + SN + SW) - \tfrac{1}{3}(BR + BN + BW)$$

$$SMB_{INV} = \tfrac{1}{3}(SC + SN + SA) - \tfrac{1}{3}(BC + BN + BA)$$

$$SMB = \tfrac{1}{3}(SMB_{B/M} + SMB_{OP} + SMB_{INV})$$

$$HML = \tfrac{1}{2}(SH + BH) - \tfrac{1}{2}(SL + BL)$$

$$RMW = \tfrac{1}{2}(SR + BR) - \tfrac{1}{2}(SW + BW)$$

$$CMA = \tfrac{1}{2}(SC + BC) - \tfrac{1}{2}(SA + BA)$$

4.6 Definition and Construction of Graham Portfolios

Exhibit 4: Definitions of Variables in the Construction of the Graham Portfolios

Criterion	Variable	Definition
(1)	Earnings-to-Price	Net earnings per share most recent fiscal year end / Average last twelve month price (adjusted)
(1), (3)	AAA Bond Yield	Yield on the 10-year Swedish government bond as of January the year prior to the investment
(2)	Price-to-Earnings	Current share price (adjusted) / Net earnings per share most recent fiscal year end
(3)	Dividend Yield	Total cash dividend per share last fiscal year / Current share price (adjusted)
(4)	Tangible Book Value Per Share	Year-end book value of a company less intangible assets / Number of shares outstanding
(5)	NCAV	Current assets - Total liabilities - Preferred equity
(6)	Total Debt	Long-term debt + Short-term debt
(6)	Book Value	Book value of shareholder's equity, plus balance-sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock
(7)	Current Ratio	Current assets / Current liabilities
(9), (10)	Earnings Growth	Companies with negative earnings for any of the 10 years preceding are scored zero. Compounded annual growth calculated as $\mathrm{CAGR}(t_0, t_n) = \left(\frac{V(t_n)}{V(t_0)}\right)^{\left(\frac{1}{t_n - t_0}\right)} - 1$

The definitions of the variables in each criterion are stated in Exhibit 4 above, based on our interpretation of James Rea's comments on the criteria (Blustein, 1977). Two types of "Graham Portfolios" are formed based on two different strategies. The first strategy is to form a portfolio of the 30 stocks that satisfy the highest number of criteria each year, denoted the *All Criteria Portfolio*. The second strategy is to form a portfolio of a maximum of 30 stocks that satisfy criterion (1) and (6) each year, denoted the *1 & 6 Portfolio*. The number of stocks in each portfolio is based on Graham's view that the defensive investor should hold a portfolio of a maximum of 30 stocks to have a sufficiently but not excessively diversified portfolio (Graham, 1973, p. 114). The Graham Portfolios are created for the years 2001 to 2015.

The portfolios are constructed on July 1 each year, with the criteria calculated on the financial statements for previous fiscal year, similar to the conservative procedure used by Fama and French (2015), in order to avoid hindsight bias. The yearly portfolio reconstruction coincides with Graham's opinion that the investor should evaluate his portfolio at least once a year (Graham, 1973, p. 117). Upon inception on July 1 each year, all stocks are equally weighted in the portfolio, without any rebalancing for the next twelve months. If a company is delisted for any reason over the next twelve months, no new company will replace it until July 1 when a new portfolio is formed. When the delisting was associated with any shareholder proceeds, e.g. in a takeover, the proceeds are assumed to be invested across the remaining portfolio companies the month after the delisting.

4.6.1 The All Criteria Portfolio

The All Criteria Portfolio is based the approach used by Singh and Kaur (2014), with some modifications. Companies in the portfolio must have a market capitalisation in excess of 1,000 MSEK as of July 1 each year when the portfolio is formed (Graham argued that the company should be large and well-established (Graham, 1973, p. 117)) and meet at least one of the reward criteria (1 - 5) and one of the risk criteria (6 - 10), following the procedure of Oppenheimer (1984). All stocks that pass this filter are ranked from highest to lowest on a score of maximum 10, based on the number of criteria the stock satisfies. It is common for Nordic companies to have more than one share class. If two or more share classes of the same company qualify, only one randomly selected is included in the portfolio. The 30 highest ranked stocks, after excluding any duplicates, are each year included in the portfolio.

4.6.2 The 1 & 6 Portfolio

The 1 & 6 Portfolio consists of the stocks that pass criterion (1) and (6) (earnings-to-price yield of at least twice the AAA bond yield, and total debt less than book value of equity). The earnings-to-price yield is equivalent to the inverse of the price-to-earnings ratio, e.g. a 5% earnings-to-price yield corresponds to a price-to-earnings ratio of 20. As in the All Criteria Portfolio, the company must have a market capitalisation in excess of 1,000 MSEK. However, unlike the preceding strategy, the number of companies in the 1 & 6 Portfolio varies from year to year, with a maximum of 30. For the years when fewer than 30 companies pass the two criteria,

all companies are included in the portfolio. When more than 30 stocks pass the two criteria, the stocks are ranked from highest to lowest on the earnings-to-price yield, and the 30 highest ranked are included in the portfolio for that year. When two or more stocks of the same company qualify for the portfolio, the stock with the highest earnings-to-price yield is selected.

5. Results

5.1 The Fama-French Five-Factor Model

Exhibit 5: Statistics for Estimated Five-Factor Model

	MRP	SMB	HML	RMW	CMA
Panel A: Descriptive Statistics					
Mean	0.46%	-0.01%	0.65%	1.45%	0.71%
Std. Dev.	5.25%	3.41%	3.18%	5.29%	3.74%
Min	-16.00%	-13.52%	-9.58%	-33.98%	-15.51%
Max	13.67%	15.98%	13.77%	24.76%	13.49%
t Stat	1.186	-0.022	2.747	3.687	2.533
P-value	0.237	0.982	0.007	0.000	0.012
Panel B: Correlations					
MRP	1.00				
SMB	-0.39	1.00			
HML	-0.15	0.18	1.00		
RMW	-0.53	0.18	0.08	1.00	
CMA	-0.16	0.07	0.34	-0.02	1.00

SMB, HML, RMW and CMA are calculated as the difference between returns of the type of companies that are expected to outperform and underperform respectively, relative to CAPM, and it follows from CAPM that MRP should be positive. We would therefore expect to see positive values for all factors. The monthly mean factor returns for MRP, HML, RMW and CMA are positive, whereas SMB is slightly negative and not significant, implying there was no size premium on average for the studied sample. Thus, the average returns of large companies were similar to the returns of small companies. The monthly RMW and CMA factors are relatively high at 1.45% and 0.71% respectively. The high RMW factor indicates that profitable companies

generate considerably higher returns than less profitable companies, on average. Similarly, the CMA factor indicates that companies with low growth in assets on average have higher returns than companies with high growth in assets. Two-tailed t-tests show that HML and RMW are significant at the 1% confidence level and CMA at the 5% confidence level, while MRP and SMB are not significant.

A comparison of the estimated Nordic factors to the U.S. monthly factors shows that the monthly MRP is similar to the U.S. number of 0.53% for the same period. However, there are differences between the other factors for the two markets, which is to some extent expected. For the U.S., SMB is estimated to 0.29%, HML to 0.07%, RMW to 0.30% and CMA to 0.21% (French, 2017). The calculated Nordic SMB factor, close to zero and negative, deviates significantly from the U.S. factor. Moreover, there are relatively large differences between the Nordic RMW and CMA compared to the U.S., with both estimated Nordic factors substantially higher than the U.S. values. MRP is negatively correlated to all other four factors and there is also a negative correlation between RMW and CMA. Compared to the correlations of the factors presented by Fama and French (2015) for their 2 x 3 sorting, we note that the Nordic correlations are similar, with the exception of the estimated Nordic SMB factor, which has correlations of the opposite sign.

5.2 The All Criteria Portfolio

Exhibit 6: Portfolios Constructed on All Criteria

	Number of Stocks by Score											
Year	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Portfolio Size**	**Average Portfolio Score**	**Stocks in Total Sample**
2001	17	22	18	18	7	0	0	0	0	30	4.6	803
2002	35	49	25	17	11	2	0	0	0	30	5.1	760
2003	35	45	31	18	7	0	0	0	0	30	4.9	725
2004	43	53	22	24	9	0	0	0	0	30	5.1	716
2005	55	58	39	18	7	1	2	0	0	30	5.0	723
2006	52	70	47	20	8	2	0	0	0	30	5.1	764
2007	55	66	49	32	16	2	0	0	0	30	5.6	841
2008	31	50	53	32	24	2	0	0	0	30	5.8	871
2009	35	58	29	43	13	3	0	0	0	30	5.6	852
2010	35	68	53	34	12	1	0	0	0	30	5.4	840
2011	40	62	63	33	14	6	0	0	0	30	5.8	837
2012	30	63	58	39	14	4	0	0	0	30	5.6	803
2013	17	68	70	51	10	5	0	0	0	30	5.6	785
2014	33	72	69	32	21	4	2	0	0	30	5.9	793
2015	56	81	46	27	11	6	1	0	0	30	5.7	837

Exhibit 6 summarises the score on Graham's 10 for companies that are sufficiently large (a market capitalisation of at least 1,000 MSEK), and fulfil at least one reward and one risk criterion as of July 1 each year. The criteria are selective; the highest score any stock obtained is 8 for the entire period, and in 2005 and 2014, the two stocks that reached a score of 8 were different share classes of the same company. Average Portfolio Score shows the average score for the stocks included in the portfolio for each year. The average score increases over time, which is primarily the result of the increasing number of companies fulfilling criterion (1) and (3), which relate earnings yield and dividend yield to the AAA bond yield. This is driven by the fall in the yield on the Swedish 10-year government bond over the period. For the companies included in the All Criteria Portfolio each year, see appendix, Exhibit 11.

Exhibit 7: Regression of Monthly Returns of All Criteria Portfolio Against FF5

Regression Statistics			Coefficients	Standard Error	t Stat	P-value
Adjusted R^2	0.725	Intercept	0.0003	0.002	0.145	0.443 [a]
Standard Error	0.0275	MRP	1.013	0.050	20.214	0.000 [b]
Observations	180	SMB	0.555	0.066	8.386	0.000 [b]
P-value	0.000	HML	0.404	0.070	5.785	0.000 [b]
		RMW	0.237	0.046	5.140	0.000 [b]
		CMA	0.001	0.059	0.009	0.993 [b]

[a] One-tailed [b] Two-tailed

The monthly returns of the All Criteria Portfolio are regressed against the five-factor model. We find that the intercept (monthly abnormal return) of the portfolio of 0.03% is not significantly greater than zero. However, the coefficients for MRP, SMB, HML and RMW are significant at very high confidence levels, while the coefficient for CMA cannot be considered significant. An F-test shows that the overall regression is statistically significant and the adjusted coefficient of determination indicates that the estimated five-factor model explains c. 73% of the variation in returns of the portfolio. This is in the lower range of Fama and French's estimate of 71% - 94% for their sample (Fama and French, 2015).

An alternative regression excluding the CMA factor shows a miniscule improvement in the adjusted R^2 (from 0.725 to 0.727), and improvements in p-values of the intercept and the coefficients of similar magnitude. Thus, the alternative regression does not change any of our conclusions from the first regression.

5.3 The 1 & 6 Portfolio

Exhibit 8: Portfolios Constructed on Criterion 1 & 6

Year	Portfolio Size	Median Earnings Yield, Portfolio	Number Stocks That Satisfy Criterion 1 & 6	Stocks in Total Sample
2001	23	20.2%	33	803
2002	22	14.8%	27	760
2003	20	13.7%	23	725
2004	17	10.7%	23	716
2005	24	13.8%	30	723
2006	30	12.6%	50	764
2007	30	13.0%	64	841
2008	30	15.8%	99	871
2009	30	15.8%	74	852
2010	30	11.2%	101	840
2011	30	15.3%	100	837
2012	30	13.8%	105	803
2013	30	14.4%	155	785
2014	30	13.2%	155	793
2015	30	10.1%	77	837

Unlike the preceding portfolio, the size of the 1 & 6 Portfolio varies from year to year, with a minimum of 17 stocks and a maximum of 30. In 2001, 23 stocks qualified with comparably high interest rates. The column that states the number of stocks that satisfy criterion (1) and (6) includes all stocks, even multiple share classes of the same company. From 2006, as interest rates declined, more than 30 stocks qualified, and the 30 stocks included in the portfolio are the stocks with the highest earnings-to-price yield that also pass criterion (6). The median earnings yield of the stocks included in the portfolio shows the inverse relationship: as interest rates decline, the median earnings yield tends to decrease. For the companies included in the 1 & 6 Portfolio each year, see appendix, Exhibit 12.

Exhibit 9: Regression of Monthly Returns of 1 & 6 Portfolio Against FF5

Regression Statistics			Coefficients	Standard Error	t Stat	P-value
Adjusted R^2	0.739	Intercept	0.0023	0.002	0.969	0.167 [a]
Standard Error	0.028	MRP	1.057	0.052	20.428	0.000 [b]
Observations	180	SMB	0.488	0.068	7.146	0.000 [b]
P-value	0.000	HML	0.485	0.072	6.721	0.000 [b]
		RMW	0.204	0.048	4.277	0.000 [b]
		CMA	-0.056	0.061	-0.911	0.364 [b]

[a] One-tailed [b] Two-tailed

As in the regression for the All Criteria Portfolio, we find that the intercept (monthly abnormal return) of the 1 & 6 Portfolio of 0.2% is not significantly greater than zero. The factor coefficients are statistically significant at very high levels, with the exception of the CMA coefficient which cannot be considered significant. An F-test indicates that the overall regression is significant. The factor loadings are similar to that of the All Criteria Portfolio. The adjusted coefficient of determination of 74% is still in the lower range of Fama and French's estimate. A regression excluding CMA results in miniscule improvements in adjusted R^2 and p-values, similar to the alternative regression of the All Criteria Portfolio.

5.4 Returns of the Graham Portfolios Compared to Benchmark Indices

Exhibit 10: Graham Portfolios vs Market Index and OMXSR

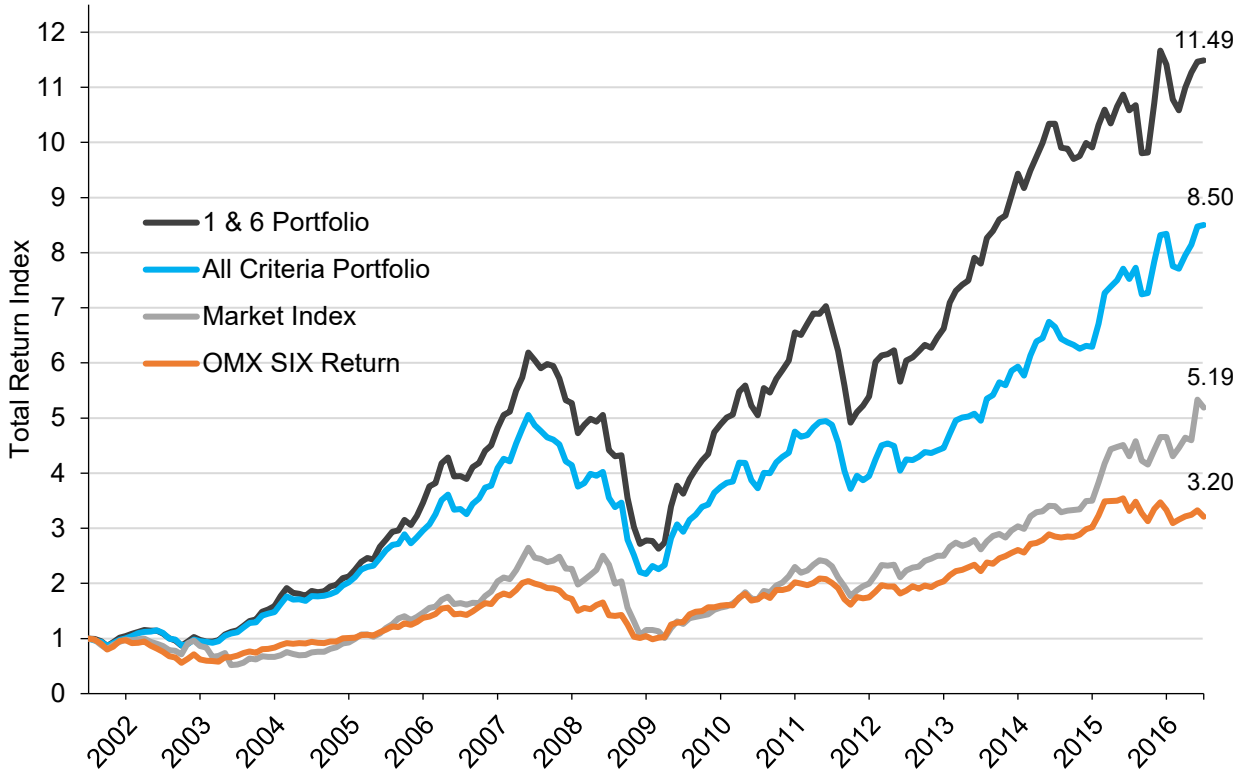

Exhibit 10 shows the value development of the two Graham Portfolios from July 2001 to July 2016. The 1 & 6 Portfolio resulted in an annually compounded rate of return of 17.7%, or 11.5 times the initial investment over a 15-year holding period. The annually compounded rate of return on the All Criteria Portfolio is 15.3%, or 8.5 times the initial investment over a 15-year holding period, which is slightly lower than the 1 & 6 Portfolio. However, both portfolios resulted in returns considerably above the OMX SIX Return Index (Stockholm Allshare index, including dividends) and the "Market Index" (value-weighted returns of all shares in the sample, including dividends) of 8.1% and 11.6% p.a., respectively. The higher return on the market index relative to OMXSR is explained by the higher return on the Copenhagen and Oslo exchanges compared to Stockholm for the period.

6. Analysis and Discussion

The first strategy, that of selecting the 30 stocks each year that fulfilled the highest number of criteria (All Criteria Portfolio), did not generate statistically significant positive abnormal returns, and the null hypothesis cannot be rejected. Relative to benchmark indices, the strategy outperformed both the overall sample (the market index) and the OMX Six Return Index by 3.7 and 7.2 percentage points p.a., respectively.

Similar to the first strategy, the second strategy, that of selecting a maximum of 30 stocks that fulfilled criterion (1) and (6) (1 & 6 Portfolio), did not generate statistically significant positive abnormal returns, and the null hypothesis cannot be rejected. The absolute magnitude of the returns is higher compared to the All Criteria Portfolio, with a return of 17.7% p.a., which is 6.1 and 9.6 percentage points p.a. higher than the market index and the OMX Six Return Index, respectively.

The findings raise three questions. Firstly, why did both strategies result in returns in excess of the market? Secondly, why did the 1 & 6 Portfolio generate higher returns than the All Criteria Portfolio? Thirdly, why did neither of the two strategies result in abnormal returns? The three questions are discussed in this order in the sections that follow.

6.1 The Graham Portfolios' Loadings on the FF5 Factors

The high returns of the two strategies relative to the market were expected, since the reward criteria (1 - 5) should capture the well-documented value effect. The regression analyses offer further insight into the reasons for the high returns of the two strategies. The All Criteria Portfolio and the 1 & 6 Portfolio both show similar loadings on the five factors. The coefficients of MRP are 1.0 and 1.1 for the two portfolios respectively, followed by SMB and HML loadings in the range of 0.4 to 0.5. This indicates that both strategies capture size and value premia, although the low average monthly SMB factor suggests that the size effect is limited, if it exists at all for the period. The coefficient of RMW is lower, at 0.24 and 0.20 for the All Criteria and the 1 & 6 Portfolio respectively. However, the average RMW factor return is high at 1.45% per month, and even with low RMW loadings, this suggests that some of Graham's criteria, or a combination, are successful in capturing the profitability premium in FF5. This was unexpected since no criterion explicitly relates to Fama-French's measure of operating profitability. In conclusion, the factor

loadings suggest that the value premium and profitability premium explain the high returns of both strategies compared to the market return.

The coefficient of CMA, which was projected to capture any return premium related to criterion (3) (a dividend yield of at least 2/3 of the AAA bond yield), is not significant in the regression for either of the two strategies. For the 1 & 6 Portfolio, this is reasonable, as the strategy does not consider criterion (3). For the All Criteria Portfolio, the low CMA coefficient could imply that the return premium associated with criterion (3) is captured by one or several of the other factors of FF5. Another possible explanation is that criterion (3) was not associated with any premium at all. There is reason to believe that this is indeed the case. The criterion was a largely ineffective filter to find companies with high dividend yields, as the yield on the Swedish 10-year government bond declined. This claim is elaborated in further detail in the section below.

6.2 Comparison of the Returns of the All Criteria and the 1 & 6 Portfolio

The All Criteria Portfolio resulted in a return 2.3 percentage points p.a. below the 1 & 6 Portfolio, which with the compound effect results in a substantially larger ending value for the 1 & 6 Portfolio. This raises the question why the All Criteria Portfolio resulted in lower returns than the 1 & 6 Portfolio. Part of the answer could be that the strategy behind the All Criteria Portfolio applies all criteria at once, without any consideration for the relative importance of each criterion in finding stocks with high expected returns. Graham and Rea considered certain criteria to be more valuable than others, for example criterion (6), “the acid test of financial soundness” (Blustein, 1977). Similarly, several studies (Oppenheimer (1984), Klerck and Maritz (1997), Singh and Kaur (2014)) indicate that certain combinations of criteria, such as (1) and (6), and (1), (3) and (6), generate high and abnormal returns. Therefore, it is likely that the application of all criteria simultaneously reduces the magnitude of returns.

Furthermore, it appears that criterion (1) and (3) become more accommodative with lower interest rates. As the yield on the Swedish 10-year government bond declined over the period, an increasing number of companies pass the two criteria. In July 2001, c. 50% and 30% of the stocks in the All Criteria Portfolio fulfilled criterion (1) and (3), respectively. This figure increased to more than 90% for both criteria in July 2006, and stayed at that level throughout the remaining

years. Criterion (1) and (3) as originally formulated by Graham and Rea appear less effective as filters to find value stocks in a low-interest environment.

Unlike the All Criteria Portfolio, the 1 & 6 Portfolio uses a modified version of criterion (1). For the years when more than 30 stocks pass the two criteria, the stocks are ranked from highest to lowest on earnings-to-price yield, and only the 30 highest ranked stocks are included in the portfolio. Thus, this method implies selecting companies of high earnings yield, irrespective of interest rates. The procedure appears to reduce the problem related to low interest rates. Graham's study of returns indicated that criterion (1) together with (6) result in high returns, which was later confirmed by e.g. Oppenheimer (1984) and Klerck and Maritz (1997). This study adds to the evidence by showing that a slightly modified version of the strategy resulted in unadjusted returns significantly above comparable indices.

6.3 The Fama-French Five-Factor Model

Despite the high returns, the regressions against the five-factor model indicate that the returns of the two Graham Portfolios cannot be described as abnormal. The intercepts for the regressions are slightly positive, but close to zero and not statistically significant, while overall regressions are significant at very high confidence levels. Thus, the five-factor model explains the returns of the Graham Portfolios.

Criterion (1), (2), (4) and (5) seek to exploit the value effect, which is likely captured by HML. Criterion (6) relate to leverage, which Fama and French find is captured by the factors combined in FF3. Although Graham preferred low leverage, contrary to the view of Fama and French that leverage is positively correlated with expected returns, the leverage premium obtained with criterion (6), if any, is explained by FF5.

Criterion (9) (earnings growth), while not explicitly addressed by FF5, is likely correlated with sales growth, which Fama and French show is captured by the factors of FF3 combined (Fama and French, 1996). In a similar way, although the factors of FF5 do not have a direct relationship to some of Graham's criteria, e.g. criterion (7), (9) and (10), any return premium related to these criteria appears to be accounted for by the factors combined. In summary, the regression analyses show that any anomalies that arise with the application of Graham's 10 criteria in this study are explained by the five-factor model.

6.4 Discussion of Expected Return and Risk

Lakonishok, Shleifer and Vishny (1994) study value portfolios and find that they outperform the market over all the five-year horizons in the sample, and thereby argue that the value effect is the result of market inefficiency. A test similar to the one used by Lakonishok et al. reveals that the All Criteria Portfolio outperformed the market index over merely 4 out of the 11 five-year horizons (2001 to 2006, 2002 to 2007 etc.), although it outperformed the market in the first five years by a wide margin (235% compared to 64%). The 1 & 6 Portfolio performed better, and yielded returns above the market index over 8 out of the 11 five-year horizons. These findings indicate that while both portfolios outperform the market on average, they underperform in certain periods. Contrary to the findings of Lakonishok et al., this suggests that the two strategies involve a risk of inferior returns in certain states of the world. However, the scope of this study is too limited for any definite conclusions.

6.5 Critique of Data

The study uses historical constituents to minimise survivorship bias, and therefore includes a number of stocks that were delisted over the 15 years. The original data source does not offer any insight into the reason for delisting of a stock, and the number of delisted stocks is too large for any manual adjustments to be feasible for the entire sample. In the estimation of the factors of FF5, the return of the delisted stock is excluded from the period when it was delisted (the last twelve months as of July 1). This adjustment is not ideal, but it is our opinion that the quality of the data is improved by excluding the returns during the period when the stock is delisted.

The delisting of companies in the two Graham Portfolios could cause a more severe survivorship bias. In particular, companies included in the All Criteria and 1 & 6 Portfolios may be priced low multiples in light of financial distress, and are consequently delisted as the result of liquidation. Therefore, information on the delistings of companies included in the portfolios has been obtained from complementary data sources. Contrary to the initial projection, we find that all of the delisted portfolio companies, 20 in total, were either merged with another company or acquired. The shareholder proceeds are estimated by the last quoted price, since we were unable to find reliable data on the actual proceeds to the shareholders, in particular for the earlier years of the study.

The data for calculations of Graham's 10 criteria are available in Datastream, with the exception of preferred equity, used in the calculation of NCAV in criterion (5) and (8). Datastream states preferred equity as zero for the vast majority of companies in the sample, despite that some of the companies had preferred equity on their books. Consequently, NCAV is overestimated for companies with preferred equity, and criterion (5) and (8) are more easily satisfied. The issue is limited to the construction of the All Criteria Portfolio.

6.6 Critique of Method

The estimated five-factor model is aggregated for the four countries. However, as stated, previous research suggests that the factor returns vary to some extent between countries. As a result, the aggregated factors of this study may be less successful in explaining cross-sectional variation in returns compared to country-specific factors. Notwithstanding, we argue that the aggregation of the factors for the Nordic countries is preferred in order to have a larger sample and thereby construct more diversified Fama-French portfolios.

In spite of the aggregation of factor returns, we find that some portfolio returns are largely dependent on a handful of companies, in particular the constituent portfolios of RMW and CMA. An illustrative example is L M Ericsson AB. For extended periods, it is included in the Big-Weak portfolio, a constituent portfolio of the RMW factor. Measured by market capitalisation, Ericsson is very large relative to the other portfolio companies, and for some months represents as much as 60 - 70% of the total market value of the portfolio. Its size, in combination with volatile returns, increase the overall volatility in returns of the portfolio. Similar effects can be noted in e.g. the BR, BA and BC portfolios, where some large companies, e.g. Nokia Abp, have profound effects on the portfolio returns. It is possible that these concentrated portfolios distort the estimated factor returns for RMW and CMA, which would explain the unexpectedly high monthly average factor returns.

For the calculation of Graham's criteria, the yield on the Swedish 10-year government bond is used as a proxy for the yield on AAA bonds, and the monthly return on the one-month Swedish treasury bill is used as the risk-free rate when calculating excess returns. This neglects the differences in risk-free rates between the Nordic countries. Nevertheless, we argue that the Swedish rates are the most relevant estimates, since the Swedish exchanges combined (Nasdaq Stockholm and First North) are by far the largest in the sample as measured by market value.

Some of the assumptions in the study could be considered unrealistic and make the findings less relevant in practice. Transaction and search costs are not considered, nor is taxation. In addition, the return index used for calculating returns is in local currency. This implies that when a stock traded in a foreign currency is purchased, the theoretical investor locks the current exchange rate for the next twelve months, like a hedge. The benefit of this method is that we avoid exchange rate fluctuations, which could distort the return calculations. However, it is an unrealistic assumption that the investor can hedge without a cost.

6.7 Conclusions

This thesis tests Graham's 10 criteria for stock selection on the stock exchanges of Sweden, Finland, Denmark and Norway between July 1, 2001 and July 1, 2016. Two types of portfolios are constructed: firstly, the All Criteria Portfolio, which uses all ten of Graham's criteria to rank stocks from highest to lowest based on the number of criteria the stock satisfies, and includes the 30 highest ranked stocks; secondly, the 1 & 6 Portfolio, which implies buying stocks that fulfil two of the ten criteria in particular, namely high earnings yield and conservative leverage. Both strategies performed remarkably well, at least measured in the annually compounded rates of return of 15.3% and 17.7% for the All Criteria Portfolio and the 1 & 6 Portfolio, respectively. Thereby, both portfolios outpaced the general market. However, neither of the two portfolios resulted in positive abnormal returns of statistical significance. This shows that the five-factor model explains the variation in returns of the two portfolios, in contrast to some previous studies that find abnormal returns in the context of the Fama-French three-factor model.

The higher returns of the 1 & 6 Portfolio compared to the All Criteria Portfolio, before adjusting for expected return, is likely a result of that the stocks included in the All Criteria Portfolio are heavily tilted toward a handful of criteria that are less useful in finding value stocks. Thus, in line with some of the previous studies of Graham's 10 criteria, our results suggest that adding additional criteria does not necessarily increase returns. In addition, it appears that criterion (1) and (3) in their original form function less well in a low interest environment.

It should be noted that despite the lack of abnormal returns relative to the five-factor model, the findings of this study could carry real economic value to investors. Whether the five-factor model represents risk or simply explains returns is a debated issue. Some scholars argue that anomalies such as the value effect are signs of market inefficiency. If this is the case, Graham's

10 criteria for stock selection appear to be an effective strategy to exploit such anomalies. However, a test similar to the one by Lakonishok et al. reveals that both portfolios underperform in several of the five-year periods. This could be an indication that Fama and French are correct in arguing that the three and five-factor models do not merely explain the cross-sectional variation in returns, but that the expected return of the models indeed represents risk. From this perspective, the finding that neither of the two Graham Portfolios resulted in abnormal returns is consistent with the efficient market hypothesis. In conclusion, how one should interpret the findings of this study depends on whether the five-factor model represents risk. We show however, that two strategies based on Graham's 10 criteria did not result in abnormal returns given the expected return of the five-factor model.

6.8 Suggestions for Further Research

Both Graham Portfolios are evaluated on an annual basis, and stocks that no longer qualify are sold each year. James Rea, co-author of the criteria, pointed out that returns could possibly be higher if the holding period was extended to two years. To sell a stock once it has appreciated by 100% is another potentially more profitable method suggested by Rea.

In addition to the combination of criterion (1) and (6), previous research indicates that stock selection based on criterion (5) is profitable, and may even generate significant abnormal returns relative to the three-factor model. In our study, a too limited number of companies satisfy the criterion to construct a reasonably diversified portfolio (in the sample, the number of companies traded below two-thirds of NCAV rarely exceeded five). However, a less stringent rule, such as buying stocks valued at 100% of NCAV would offer more opportunities. Such a rule could be studied to determine to what extent it is applicable in the Nordic region, and if it generates abnormal returns.

The return of the All Criteria Portfolio is lower, but there are a few modifications that could possibly improve the returns, at least if the investor seeks to maximise the return, and not maximise abnormal return relative to FF5. For example, one could assign higher weights to criteria considered more important when calculating the score for a stock, e.g. criteria (1), (3) and (6). Another potential improvement is to apply the criteria sequentially, e.g. filter stocks that satisfy criterion (1) and (6) in the first step, and then reduce the number of stocks with additional criteria.

In order for future research to have greater practical relevance, the real-world costs and limitations investors face should be taken into account. Further studies could include returns after transaction and search costs and taxes, to reveal a more accurate picture of the returns that can be expected by the investor employing Graham's criteria in practice. Moreover, it would be preferable to have a liquidity requirement for the stocks included in the portfolio. This study does not consider the liquidity of the stock, and it is possible that certain stocks included in the portfolios were too illiquid for the investor to take any sizeable position.

The most important overarching question to be resolved in future research is whether the returns of value strategies such as Graham's 10 criteria are the result of higher risk, or if the returns are abnormal. The question is beyond the scope of this thesis, and the period considered is too short for any conclusions to this end. However, a study of the returns of Graham's 10 criteria over an extended period would allow for a more detailed analysis of whether or not the strategy underperforms in certain states of the world.

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8. Appendix

Equation 1: The Capital Asset Pricing Model

$$R_i - R_f = \beta_i(R_m - R_f) + \varepsilon_i$$

$R_i = Return\ on\ Asset\ i$
$R_f = Return\ on\ Risk\ Free\ Asset$
$\beta_i = Covariance\ of\ Asset\ i\ and\ the\ Market\ Divided\ by\ Variance\ of\ the\ Market$
$R_m = Return\ on\ the\ Market\ Portfolio$

Equation 2: The Fama-French Three-Factor Model

$$R_i - R_f = \alpha_i + b_i(R_m - R_f) + s_i SMB + h_i HML + \varepsilon_i$$

$R_i = Return\ on\ Asset\ i$
$R_f = Return\ on\ Risk\ Free\ Asset$
$b_i = Sensitivity\ of\ the\ Asset\ i\ to\ the\ Market\ Risk\ Premium$
$s_i = Sensitivity\ of\ the\ Asset\ i\ to\ the\ Size\ Premium$
$h_i = Sensitivity\ of\ the\ Asset\ i\ to\ the\ Value\ Premium$
$\varepsilon_i = Random\ error\ term$

Exhibit 11: All Criteria Portfolio Constituents by Year

Table below presents portfolio constituents of the All Criteria Portfolio as of July 1 each year.

2001	2002	2003	2004	2005	2006	2007	2008
ASPOCOMP GROUP	ASTRAZENECA PLC	AMER SPORTS	ARENDALS F.	AB SKF	AB SKF	APETIT OYJ	ARENDALS F.
AURIGA INDUSTRIES	BERGESEN D.Y. ASA	BILLERUDKORSNAS AB	ASTRAZENECA PLC	ARENDALS F.	APETIT OYJ	ASTRAZENECA PLC	BEIJER ALMA AB
BILIA AB	BILIA AB	CARDO AB	BIOMAR A/S	ASPO OYJ	ASTRAZENECA PLC	BIOMAR A/S	BOLIDEN AB
BURE EQUITY AB	ELECTROLUX AB	DAMPSKIBS NORDEN	ELECTROLUX AB	BIOMAR A/S	BASWARE OYJ	BURE EQUITY AB	BURE EQUITY AB
CHIPS OYJ	FORTUM OYJ	DFDS A/S	FORTUM OYJ	CONCORDIA MAR.	BILIA AB	DAMPSKIBS NORDEN	CERMAQ ASA
DFDS A/S	HALDEX AB	ELECTROLUX AB	HEXAGON AB	DAMPSKIBS NORDEN	CONCORDIA MAR.	GETINGE AB	DAMPSKIBS NORDEN
ELECTROLUX AB	HOGANAS AB	ELKEM ASA	HKSCAN CORP	GETINGE AB	DAMPSKIBS NORDEN	HALDEX AB	GC RIEBER SHIPPING
FINNAIR OYJ	INSTRUMENTARIUM	FINNAIR OYJ	HOGANAS AB	H. LUNDBECK A/S	GETINGE AB	HUHTAMAKI OYJ	H. LUNDBECK A/S
GLASTON CORP.	INV. AB LATOUR	FISKARS OYJ	JM AB	HALDEX AB	HALDEX AB	JM AB	HIQ AB
GN STORE NORD A/S	JM AB	FORTUM OYJ	KARLSHAMNS AB	HOGANAS AB	HIQ AB	L E LUNDBERGF.	HL DISPLAY AB
HALDEX AB	KEMIRA OYJ	HALDEX AB	KEMIRA OYJ	INV. AB LATOUR	INDUSTRIVARDEN AB	MARIMEKKO OYJ	HOGANAS AB
HOLMEN AB	KESKO OYJ	HOGANAS AB	KESKO OYJ	JM AB	JM AB	MONBERG & THORSEN	JM AB
IND. AB KINNEVIK	L E LUNDBERGF.	HOLMEN AB	L E LUNDBERGF.	NOBEL BIOCARE HLDG	L E LUNDBERGF.	MUNTERS AB	KESKO OYJ
JM AB	LEMMINKAINEN OYJ	IND. AB KINNEVIK	MONBERG & THORSEN	NOKIAN TYRES PLC	MARIMEKKO OYJ	NOBEL BIOCARE HLDG	KINNEVIK
KEMIRA OYJ	NERA ASA	INDUSTRIVARDEN AB	NKT HOLDING A/S	NOVO NORDISK A/S	NKT HOLDING A/S	NOKIAN TYRES PLC	MEKONOMEN AB
KESKO OYJ	NESA A/S	INSTRUMENTARIUM	NOBEL BIOCARE HLDG	PKC GROUP OYJ	NOBEL BIOCARE HLDG	NORDIC ALUMINIUM	NOKIAN TYRES PLC
LEMMINKAINEN OYJ	NKT HOLDING A/S	JM AB	NOKIAN TYRES PLC	PROTECT DATA AB	NOKIAN TYRES PLC	NOVO NORDISK A/S	NOVO NORDISK A/S
MOELVEN INDUSTRIER	NOVO NORDISK A/S	KARLSHAMNS AB	NOVO NORDISK A/S	RATOS AB	NOVO NORDISK A/S	OEM-INTERN.	OUTOKUMPU OYJ
OUTOKUMPU OYJ	RATOS AB	KESKO OYJ	ORION OYJ	ROTTNEROS AB	PEAB AB	PEAB AB	PEAB AB
RATOS AB	RIEBER & SON ASA	LEMMINKAINEN OYJ	PKC GROUP OYJ	ROYAL UNIBREW A/S	PKC GROUP OYJ	PONSSE OYJ	PKC GROUP OYJ
ROTTNEROS AB	ROTTNEROS AB	NKT HOLDING A/S	PONSSE OYJ	SANISTAL A/S	RATOS AB	RAUTARUUKKI CORP	PONSSE OYJ
SANTA FE GROUP A/S	SKAKO A/S	NOVO NORDISK A/S	ROTTNEROS AB	SANTA FE GROUP A/S	SANISTAL A/S	SANISTAL A/S	Q-MED AB
SKAKO A/S	SMEDVIG ASA	PEAB AB	SANTA FE GROUP A/S	SIEVI CAPITAL OYJ	SANTA FE GROUP A/S	SIEVI CAPITAL OYJ	RAUTARUUKKI CORP
SSAB	STOCKMANN OYJ	ROTTNEROS AB	SCHOUW & CO A/S	SSAB	SIEVI CAPITAL OYJ	SJAELSO GRUPPEN	ROCKWOOL INT'L A/S
STOCKMANN OYJ	SWECO AB (PUBL)	SANTA FE GROUP A/S	SIEVI CAPITAL OYJ	TDC AS	SKANSKA AB	SSAB	SANTA FE GROUP A/S
SVENSKA CELLULOSA	TIETO OYJ	SCHOUW & CO A/S	SSAB	TELEFONAKTIEBOLAGE T	SSAB	SVENSKA CELLULOSA	SIEVI CAPITAL OYJ
VISMA ASA	TORM PLC	SIEVI CAPITAL OYJ	STOCKMANN OYJ	TIETO OYJ	TRELLEBORG AB	TAMFELT OYJ ABP	SJAELSO GRUPPEN
VOLVO AB	VESTAS WIND	STOCKMANN OYJ	TELESTE OYJ	UNITOR ASA	UPONOR OYJ	TRACTION AB	SVENSKA CELLULOSA
WM-DATA NOVO	WARTSILA OYJ	WARTSILA OYJ	TIETO OYJ	UPM-KYMMENE OYJ	VAISALA OYJ	VAISALA OYJ	VBG GROUP AB
YIT OYJ	YIT OYJ	YIT OYJ	UNITED INT.	UPONOR OYJ	YIT OYJ	YIT OYJ	YIT OYJ

2009	2010	2011	2012	2013	2014	2015
AURIGA INDUSTRIES	AB SKF	AB SKF	AB SKF	AB SKF	APETIT OYJ	AQ GROUP AB
BEIJER ALMA AB	AF GRUPPEN ASA	AF GRUPPEN ASA	AXFOOD AB	AF GRUPPEN ASA	AQ GROUP AB	ATLAS COPCO AB
BLACK EARTH	APETIT OYJ	AQ GROUP AB	BASWARE OYJ	ATLAS COPCO AB	ATLAS COPCO AB	AXIS AB
CARDO AB	ATLAS COPCO AB	BEIJER ALMA AB	BEIJER ALMA AB	AXIS AB	BEIJER ALMA AB	BEIJER ALMA AB
FAGERHULT AB	BEIJER ALMA AB	BURE EQUITY AB	BEIJER REF AB	BIOGAIA AB	BURE EQUITY AB	BULTEN AB
FORTUM OYJ	CARDO AB	CERMAQ ASA	DAMPSKIBS NORDEN	BLACK EARTH	CARLSBERG A/S	BURE EQUITY AB
GC RIEBER SHIPPING	DAMPSKIBS NORDEN	DAMPSKIBS NORDEN	DFDS A/S	CARGOTEC CORP.	CERMAQ ASA	CELLAVISION AB
H. LUNDBECK A/S	DOF ASA	FENIX OUTDOOR AB	FENIX OUTDOOR AB	DAMPSKIBS NORDEN	GC RIEBER SHIPPING	FISKARS OYJ
HEXAGON AB	FENIX OUTDOOR AB	HKSCAN CORP	FORTUM OYJ	FENIX OUTDOOR AB	HEXAGON AB	FORTUM OYJ
HIQ AB	GC RIEBER SHIPPING	HOGANAS AB	FRED. OLSEN ENERGY	HMS NETWORKS AB.	HIQ AB	HIQ AB
HOGANAS AB	GENMAB A/S	INDUSTRIVARDEN AB	H. LUNDBECK A/S	HOGANAS AB	INDUTRADE AB	HKSCAN CORP
INV. AB LATOUR	H. LUNDBECK A/S	KABE HUSVAGNAR AB	HALDEX AB	HOLMEN AB	JM AB	JM AB
JM AB	ICA GRUPPEN AB	KARJALAN KIRJAPAINO	HIQ AB	ITAB SHOP CONCEPT	KINNEVIK	KINNEVIK
KESKO OYJ	IND & FIN SYSTEMS	MEKONOMEN AB	HOGANAS AB	JM AB	L E LUNDBERGF.	L E LUNDBERGF.
KONECRANES ABP	KARJALAN KIRJAPAINO	NESTE OYJ	HOLMEN AB	L E LUNDBERGF.	MARINE HARVEST ASA	MALMBERGS ELEKTRISKA
MODERN TIMES GRP MTG	KINNEVIK	NEW WAVE GROUP AB	KESKO OYJ	NIBE INDUSTRIER AB	NIBE INDUSTRIER AB	NOKIAN TYRES PLC
NCC AB	KONE CORPORATION	NOKIAN TYRES PLC	KINNEVIK	NOKIAN TYRES PLC	NOKIAN TYRES PLC	NOLATO AB
NOVO NORDISK A/S	KONECRANES ABP	NORDIC ALUMINIUM	L E LUNDBERGF.	NOVO NORDISK A/S	NOVO NORDISK A/S	NOVO NORDISK A/S
POYRY OYJ	MONBERG & THORSEN	NORSK HYDRO ASA	NIBE INDUSTRIER AB	OEM-INTERN.	OEM-INTERN.	OEM-INTERN.
RATOS AB	NCC AB	NOVO NORDISK A/S	NOKIAN TYRES PLC	ORION OYJ	OLVI OYJ	OLVI OYJ
RAUTARUUKKI CORP	NIBE INDUSTRIER AB	OEM-INTERN.	NORDIC ALUMINIUM	PKC GROUP OYJ	ORION OYJ	ORION OYJ
ROCKWOOL INT'L A/S	NOVO NORDISK A/S	ORION OYJ	NOVOZYMES A/S	RAMIRENT OYJ	PROSAFE SE	OSSUR
SANTA FE GROUP A/S	ORC GROUP	PKC GROUP OYJ	OEM-INTERN.	ROCKWOOL INT'L A/S	SCHOUW & CO A/S	RATOS AB
SIEVI CAPITAL OYJ	ORION OYJ	PONSSE OYJ	ORION OYJ	SIMCORP AS	SIMCORP AS	SALMAR ASA
SKANDITEK INDUS AB	Q-FREE ASA	SANTA FE GROUP A/S	PROSAFE SE	SWEDISH MATCH AB	SRV GROUP PLC	SCANFIL PLC
SSAB	Q-MED AB	SCANIA AB	SCANIA AB	TGS-NOPEC GEOPHYSIC	TELEFONAKTIEBOLAGE T	SIMCORP AS
STATOIL ASA	SANTA FE GROUP A/S	SIEVI CAPITAL OYJ	SSAB	TRACTION AB	TGS-NOPEC GEOPHYSIC	TELESTE OYJ
TANDBERG ASA	SIEVI CAPITAL OYJ	TEKLA OYJ	TRACTION AB	VACON OYJ	TRACTION AB	TRACTION AB
TEKLA OYJ	TEKLA OYJ	TRACTION AB	VAISALA OYJ	VAISALA OYJ	UNITED INT.	VAISALA OYJ
VAISALA OYJ	TELEFONAKTIEBOLAGE T	VIKING SUPPLY	YARA INTERNATIO	VBG GROUP AB	VBG GROUP AB	VBG GROUP AB

Exhibit 12: 1 & 6 Portfolio Constituents by Year

Table below presents portfolio constituents of the 1 & 6 Portfolio as of July 1 each year.

2001	2002	2003	2004	2005	2006	2007	2008
ASPOCOMP GROUP	BERGESEN D.Y. ASA	AMER SPORTS	AP MOELLER MAERSK	AP MOELLER MAERSK	AHLSTROM OYJ	APETIT OYJ	ATRIA PLC
ELCOTEQ SE	BILLERUDKORSNAS AB	BILLERUDKORSNAS AB	BILLERUDKORSNAS AB	BILLERUDKORSNAS AB	AP MOELLER MAERSK	BEIJER ELECTRONICS	BJORN BORG AB
ELECTROLUX AB	ELECTROLUX AB	CARDO AB	ELECTROLUX AB	BOLIDEN AB	APETIT OYJ	BOLIDEN AB	BOLIDEN AB
ELTEK ASA	FORTUM OYJ	DAMPSKIBS NORDEN	HKSCAN CORP	CONCORDIA MAR.	CERMAQ ASA	BURE EQUITY AB	BURE EQUITY AB
FINNAIR OYJ	HOLMEN AB	ELECTROLUX AB	KEMIRA OYJ	DAMPSKIBS NORDEN	DAMPSKIBS NORDEN	BWG HOMES ASA	CERMAQ ASA
GLASTON CORP.	HYDRALIFT ASA	ELKEM ASA	KONE CORPORATION	ELECTROLUX AB	ENEA AB	BYGGMA ASA	DAMPSKIBS NORDEN
HALDEX AB	INV. AB LATOUR	FINNAIR OYJ	LUNDIN PETROLEUM	HALDEX AB	HALDEX AB	CERMAQ ASA	ELECTROLUX AB
HOLMEN AB	KEMIRA OYJ	FISKARS OYJ	MONBERG & THORSEN	INV. AB LATOUR	IBS AB	HALDEX AB	FINNAIR OYJ
KEMIRA OYJ	L E LUNDBERGF.	HALDEX AB	ORION OYJ	MONBERG & THORSEN	INDUSTRIVARDEN AB	IMAREX ASA	FISKARS OYJ
LEMMINKAINEN OYJ	LEMMINKAINEN OYJ	HKSCAN CORP	Q-MED AB	NCC AB	KEMIRA GROWHOW	IND & FIN SYSTEMS	H+H INTERNATIONAL
MONBERG & THORSEN	NESA A/S	HOLMEN AB	SANTA FE GROUP A/S	NESTE OYJ	KINNEVIK	INDUSTRIVARDEN AB	HALDEX AB
OUTOKUMPU OYJ	PEAB AB	INDUSTRIVARDEN AB	SCHOUW & CO A/S	OMX AB	L E LUNDBERGF.	KEMIRA OYJ	HIQ AB
RATOS AB	PERLOS OYJ	LEMMINKAINEN OYJ	SIEVI CAPITAL OYJ	PERLOS OYJ	NCC AB	KINNEVIK	JM AB
ROTTNEROS AB	RATOS AB	NOBIA AB	SKANSKA AB	RATOS AB	NESTE OYJ	L E LUNDBERGF.	KESKO OYJ
SANTA FE GROUP A/S	SANTA FE GROUP A/S	PEAB AB	SSAB	RAUTARUUKKI CORP	OMX AB	MARINE FARMS ASA	L E LUNDBERGF.
SKANSKA AB	SMEDVIG ASA	SANTA FE GROUP A/S	STX EUROPE ASA	SANISTAL A/S	PEAB AB	MIDWAY HOLDING AB	NCC AB
SSAB	SONERA OYJ	SIEVI CAPITAL OYJ	TORM PLC	SANTA FE GROUP A/S	Q-FREE ASA	MONBERG & THORSEN	NOBIA AB
SVENSKA CELLULOSA	SWECO AB (PUBL)	TDC AS		SIEVI CAPITAL OYJ	RATOS AB	NCC AB	NRC GROUP ASA
TDC AS	TORM PLC	WARTSILA OYJ		SSAB	RAUTARUUKKI CORP	NESTE OYJ	OUTOKUMPU OYJ
UPM-KYMMENE OYJ	VESTAS WIND	YIT OYJ		TDC AS	SANISTAL A/S	OMX AB	PKC GROUP OYJ
VISMA ASA	WARTSILA OYJ			TELEFONAKTIEBOLAGET	SIEVI CAPITAL OYJ	OUTOKUMPU OYJ	RAMIRENT OYJ
WARTSILA OYJ	YIT OYJ			TIETO OYJ	SKANDITEK INDUS AB	PARTNERTECH AB	ROCKWOOL INT'L A/S
YIT OYJ				TORM PLC	SSAB	PEAB AB	SALCOMP
				UPM-KYMMENE OYJ	STAPLES NORWAY AS	PKC GROUP OYJ	SCHOUW & CO A/S
					TDC AS	SCHOUW & CO A/S	SIEM SHIP
					TELE2 AB	SIEM SHIP	SIEVI CAPITAL OYJ
					TORM PLC	SIEVI CAPITAL OYJ	SKANDITEK INDUS AB
					TRELLEBORG AB	SKANDITEK INDUS AB	SOLAR A/S
					UNITED INT.	TORM PLC	UPONOR OYJ
					VOLVO AB	TRACTION AB	YIT OYJ

2009	2010	2011	2012	2013	2014	2015
AF GRUPPEN ASA	AF GRUPPEN ASA	AKASTOR ASA	AKER ASA	AKASTOR ASA	AKASTOR ASA	AKER SOLUTIONS ASA
AKASTOR ASA	BETSSON AB	AP MOELLER MAERSK	BILIA AB	AP MOELLER MAERSK	APETIT OYJ	AP MOELLER MAERSK
AP MOELLER MAERSK	BOLIDEN AB	BILIA AB	BOLIDEN AB	AWILCO LNG ASA	BITTIUM OYJ	AQ GROUP AB
BEIJER REF AB	CERMAQ ASA	BILLERUDKORSNAS AB	BWG HOMES ASA	BLACK EARTH	BUFAB AB (PUBL)	ATRIA PLC
CARGOTEC CORP.	DAMPSKIBS NORDEN	BOLIDEN AB	CARGOTEC CORP.	BOLIDEN AB	BURE EQUITY AB	AURORA LPG H
DAMPSKIBS NORDEN	DUNI AB	BURE EQUITY AB	CERMAQ ASA	ELTEK ASA	FRED. OLSEN ENERGY	BULTEN AB
FAGERHULT AB	FISKARS OYJ	CERMAQ ASA	COPEINCA ASA	ENIRO AB	GC RIEBER SHIPPING	BURE EQUITY AB
FLSMIDTH & CO A/S	H. LUNDBECK A/S	DAMPSKIBS NORDEN	DFDS A/S	FISKARS OYJ	GRIEG SEAFOOD ASA	ELANDERS AB
GC RIEBER SHIPPING	HALDEX AB	DFDS A/S	FISKARS OYJ	FORTUM OYJ	ICA GRUPPEN AB	FISKARS OYJ
HIQ AB	HIQ AB	ENERGYO SOLUTIONS	FORTUM OYJ	FRED. OLSEN ENERGY	INDUSTRIVARDEN AB	FORTUM OYJ
HOGANAS AB	HUHTAMAKI OYJ	FRED. OLSEN ENERGY	FRED. OLSEN ENERGY	GC RIEBER SHIPPING	KAROLINSKA	GUNNEBO AB
IMAREX ASA	LOOMIS AB	GC RIEBER SHIPPING	HOLMEN AB	HOLMEN AB	KINNEVIK	HKSCAN CORP
INV. AB LATOUR	MARINE HARVEST ASA	GN STORE NORD A/S	INV. AB LATOUR	INDUSTRIVARDEN AB	L E LUNDBERGF.	INDUSTRIVARDEN AB
JM AB	MEDA AB	GRIEG SEAFOOD ASA	KINNEVIK	METSA BOARD OYJ	MARINE HARVEST ASA	ITAB SHOP CONCEPT
KONECRANES ABP	MONBERG & THORSEN	HUHTAMAKI OYJ	L E LUNDBERGF.	METSO OYJ	METSO OYJ	JM AB
LINDAB INTER	NCC AB	INDUSTRIVARDEN AB	METSO OYJ	MISEN ENERGY AB	MISEN ENERGY AB	KINNEVIK
METSO OYJ	ORIOLA KD OYJ	KINNEVIK	NCC AB	NKT HOLDING A/S	NESTE OYJ	MEDIVIR AB
MODERN TIMES GRP MTG	PETROLEUM GEO-SVCS	MARINE HARVEST ASA	NEW WAVE GROUP AB	POLARIS MEDIA	PETROLEUM GEO-SVCS	MODERN TIMES GRP MTG
NCC AB	Q-MED AB	NCC AB	NORSK HYDRO ASA	PROSPECTOR OFFSH	POLARIS MEDIA	NOLATO AB
NOLATO AB	SANTA FE GROUP A/S	NOLATO AB	PANDORA	SAAB AB	REC SOLAR AS	PONSSE OYJ
RATOS AB	SIEM SHIP	ORIOLA KD OYJ	PRICER AB	SANTA FE GROUP A/S	SALMAR ASA	PROFFICE AB
RAUTARUUKKI CORP	SIEVI CAPITAL OYJ	REC SILICON ASA	SAAB AB	SCHOUW & CO A/S	SCHIBSTED ASA	REC SILICON ASA
SANTA FE GROUP A/S	SUBSEA 7 INC	SANOMA- OYJ	SANTA FE GROUP A/S	STATOIL ASA	SCHOUW & CO A/S	REC SOLAR AS
SIEM SHIP	TELE2 AB	SANTA FE GROUP A/S	SD STANDARD	TELEFONAKTIEBOLAGET	SEVAN MARINE	SALMAR ASA
SIEVI CAPITAL OYJ	TELEFONAKTIEBOLAGET	SCHIBSTED ASA	SKANSKA AB	TETHYS	TELE2 AB	SANTA FE GROUP A/S
SSAB	TELIA COMPANY AB	SIEVI CAPITAL OYJ	SSAB	TRACTION AB	TELEFONAKTIEBOLAGET	SCANFIL PLC
TELENOR GROUP	TGS-NOPEC GEOPHYSIC	TELE2 AB	STATOIL ASA	UNITED INT.	TETHYS	TELEFONAKTIEBOLAGET
TRICORONA	TRICORONA	TELEFONAKTIEBOLAGET	TELE2 AB	VITROLIFE AB	TGS-NOPEC GEOPHYSIC	TETHYS
UNITED INT.	UNITED INT.	TELIA COMPANY AB	TRELLEBORG AB	YARA INTERNATIO	TRACTION AB	TGS-NOPEC GEOPHYSIC
YARA INTERNATIO	VESTAS WIND	TRACTION AB	YARA INTERNATIO	YIT OYJ	UNITED INT.	TRACTION AB

Exhibit 13: Delisted Companies Included in the Graham Portfolios

The tables below state the companies that were delisted when included in either of the two Graham Portfolios, the year of delisting, and the reason for delisting.

Delistings – All Criteria Portfolio

Year	Company	Reason for Delisting
2001	Moelven Industrier	Acquired by Metsä Group
2004	Instrumentarium	Acquired by General Electric Finland Oy
2006	Unitor ASA	Acquired by Wilh. Wilhelmsen
2008	Nobel Biocare Holding	Acquired by Danaher Corporation
2008	Biomar Holding A/S	Acquired by Schouw & Co.
2010	Skanditek Industrier AB	Merged with Bure AB
2010	Tandberg ASA	Acquired by Cisco Systems, Inc
2011	Cardo AB	Acquired by ASSA ABLOY AB
2011	Q-Med AB	Acquired by Galderma Pharma S.A.
2012	Tekla Oyj	Acquired by Trimble Navigation Limited
2012	Nordic Aluminium Oyj	Acquired by Oy Lival Ab
2013	Höganäs AB	Acquired by H Intressenter
2014	Cermaq ASA	Acquired by Mitsubishi Corporation

Delistings – 1 & 6 Portfolio

Year	Company	Reason for Delisting
2003	Sonera OYJ	Merged with Telia AB
2003	Hydralift ASA	Acquired by National Oilwell-Hydralift AS
2006	ATG (Staples Norway AS)	Acquired by Buhrmann N.V
2008	OMX AB	Acquired by Nasdaq Stock Market Inc
2010	Tricorona	Acquired by TAV
2011	Subsea 7 Inc	Merged with Acergy S.A.
2011	Q-Med AB	Acquired by Galderma Pharma S.A.
2016	Proffice AB	Acquired by Randstad Nordic AB