



Magic Formula investing in the Benelux

Bachelor thesis BE

ABSTRACT

Joel Greenblatt's Magic Formula trading strategy was able to generate market beating returns without taking additional risk in the United States stock market during the period of 1988 until 2004, and therefore clearly violates the Efficient Market Hypothesis. This strategy is a simple stock selection method where Return on Invested Capital and Earnings Yield are the key metrics for determining the best common stock investments. This paper takes this specific Magic Formula trading strategy to the Benelux stock market and performs a backtest to see whether this strategy also shows market outperformance in the Benelux stock market. The answer to this question is clearly a yes. The Magic Formula trading strategy was able to realize an average 7,70% annual market premium in the Benelux stock market without taking additional risk during 1995 until 2014. This signalizes a market anomaly and also violates the Efficient Market Hypothesis.

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1: Introduction

Most investors are dreaming of a way to continuously beat the average returns of the stock market. The Efficient Market Hypothesis (EMH) however shattered these dream by stating that it is impossible to realize abnormal returns without taking additional risk because the stock market is very efficient and anomalies from which investors can take advantage are therefore eliminated. The only way investors could achieve above average returns is to take above average risks according to the EMH.

But what if there was a so called 'Magic Formula' which investors could use to achieve market beating returns in the stock market without taking additional risk? Well, there might be one. Joel Greenblatt, an American hedge fund manager and founder of Gotham Capital, wrote about a trading strategy based on a 'Magic Formula' in his New York Times bestseller '*The little book that beats the market*' (Greenblatt, 2006). In his book, Greenblatt states that beating the returns of a broad stock market like the S&P 500 can be very simple when you have a trading strategy based on his so called 'Magic Formula'. This formula consists of a combination of return on invested capital and earnings yield. Greenblatt described that by using this combination of factors, each investor is able to buy above average companies (measured by the return on invested capital ratio) for below average prices (measured by the earnings yield ratio).

Greenblatt backtested his 'Magic Formula' (MF) trading strategy over the period of 1988 until 2004 in the United States stock market and shows that this effective strategy indeed achieved market beating returns. Over this particular time period, the MF trading strategy realized an average annual return of 30,8%, while the S&P 500 index realized an average annual return of 12,4% during that same time period. That is a huge historical outperformance and Greenblatt even states that the MF trading strategy achieved those returns while taking on lower risk than the overall market (no matter how that risk was measured). So this strategy might signalize a market anomaly and therefore violates the EMH. In an efficient market, such abnormal returns could only be reached by taking huge amounts of risk. But there is some more research that supports the assumption that there are market anomalies in the stock markets. Research by Keim (1983) showed us that stock prices tend to have higher returns in January and that stock prices are affected by seasonal effects. Also value investing, which is put into practice by a lot of successful investors, is a famous anomaly in recent literature so it might be possible to continuously achieve returns above market averages.

Then let us have a quick look on how Greenblatt realized such high average annual returns with his so called MF trading strategy. He simply made two rankings of all the United States listed stocks with a market capitalization above \$50 million. One ranking is based on the companies' return on invested capital, and the other ranking is based on their earnings yield. He then combines these rankings into one compounded ranking so it becomes clear which companies have the best combination of return on invested capital and earning yield. This combination of rankings is important because in the end the MF trading strategy wants to select above average companies but only for below average prices and this shows us that this strategy has very close connection with value investing principles. According to Greenblatt, value investing is simply figuring out what something is worth and paying a lot less for it.

Once this compounded ranking is made, Greenblatt buys the top 30 stocks and holds them for a full year. Once the year has ended, he ranks all the stocks again and rebalances the portfolio to the top 30 stocks. So each year a new portfolio of 30 stocks will be formed and held for an entire year. With this simple MF trading strategy, your average return as an investor would be higher than the average return of the broad S&P 500 index. The magnitude of the transaction costs involved with this MF trading strategy is rather low according to Greenblatt as this strategy only trades about 30 stocks once a year. With a good priced broker, the negative effect of the transaction costs will be very small.

As it now is clear that the MF trading strategy is able to generate historical market beating returns in the United States stock market, it becomes interesting to research whether the MF trading strategy also works in other regions. That is why I am going to research if this particular trading strategy shows market outperformance in the Benelux (Belgium, Netherlands and Luxembourg) stock market. The main research question to which this paper delivers an answer is:

Does the 'Magic Formula' trading strategy of Joel Greenblatt show market outperformance in the Benelux stock market?

When the results of this research paper are showing us that that this simple but effective trading strategy historically outperformed the broad Benelux stock market, this might signalize a market anomaly outside the United States. Then investors can choose to put this strategy into practice and try to reach market beating returns in this particular market as well. We can also use the results to partly confirm or dismiss that the MF trading strategy works outside the United States.

2: Literature

The MF trading strategy looks like a market anomaly as it was historically consistently able to beat average market returns. In this literature section of the paper we take a look at other market beating stock strategies and their close connections with the old principles of value investing. There will be a deeper look into the mechanism of the MF trading strategy as well.

2.1 Market beating stock trading strategies

There are many different factor trading strategies which are pretty similar to the MF trading strategy. The MF trading strategy is using return on invested capital and earnings yield as his main factors, but there are many more possible combinations of factors. Even simple one-factor trading strategies tend to show historical market beating returns. Work of Basu (1977) and Reinganum (1981) reports that stock trading strategies based on price to earnings ratios or other earnings' yield related factors are giving excess returns on common stocks. Stocks with low price to earnings ratios are showing market beating returns and are outperforming stocks with high price to earnings ratio over almost every time scope. A simple quantitative factor trading strategy of only buying stocks with low price to earnings ratios can be easily formed by using this market anomaly. Litzenger and Ramaswamy (1982) confirmed that common stocks with certain factors are showing historical market outperformance. Their research is showing us that stocks of companies which are paying high amount of dividend tend to have higher returns than stocks of companies with low or none dividend payments. Earlier work of Charest (1978) already signaled this anomaly by showing us that a well formed trading strategy based on the change of dividend payments in the common stock market, could realize significant market outperformance.

Most of these kind of quantitative factor trading strategies are backtested within the United States stock market. James Patrick O'Shaughnessy, an American investor and founder of O'Shaughnessy Asset Management, wrote about the returns of quantitative factor trading strategies in his book '*What works on Wall Street*' (O'Shaughnessy, 2005). This book tries to be a guide to the best performing investment strategies of all time. Stock factors as price to earnings, price to book, price to cashflow, price to sales, dividend yield, earnings per share, return on equity and so on are individually back tested over the period from 1963 until 2003 to see whether a positive score on these factors achieved market beating returns. The book shows that most of these one-factor trading strategies actually did historically beat the broad United States stock market, but these strategies do have a relative high risk profile. So O'Shaughnessy

advises investors to use multi-factor models (like the MF trading strategy), as single-factor models show that certain market characteristics are giving investors market rewards but are carrying higher risk. Multi-factor trading strategies on the other hand, have a lower risk profile and are able to deliver even higher returns than single factor trading strategies. Investors should always make a stock pass several hurdles before deciding to invest in it.

Earlier work of Fama and French (1992) also showed that a multifactor model including a price to book ratio is able to achieve market beating returns. Their model considers the anomaly that stocks with a low price to book ratio tend to outperform the markets on a regular basis. Work by Lakonishok, Shleifer and Vishny (1994) confirmed the statement that low price to book ratio companies historically outperformed high price to book ratio companies. But they do not really focus on multi-factor strategies. Stanford University professor Joseph D. Piotroski extended this former research and also found that it is better to make a stock pass several hurdles before investing in it, and that using a multi-factor model is a better way to analyze stocks in an effective way. He therefore developed a so called Piotroski F-Score, which measures the financial strength of a company (Piotroski, 2000). The F-Score scans the historical financial statements of a company and ranks them from 0 (lowest F-Score) to 9 (highest F-Score). He did this because he also noticed that low price to book ratio companies historically outperformed high price to book ratio companies, but some of these relative 'cheap' companies tend to go bankrupt very quickly. That's where the F-Score comes in. First select low price to book ratio companies, and then only buy those with high Piotroski F-Scores. By using this multifactor trading strategy, Piotroski shows that winners can be separated from losers and a market premium of 7,5% can be realized annually.

So there are market anomalies out there in the stock markets. Many researchers claim to have found different kinds of market anomalies of which investors could take advantage by using a particular factor trading strategy. But apart from the price related factors I discussed before, there is evidence that other remarkable non-price related factors are showing excess returns in common stocks. The work of Ariel (1987) shows us that there is a 'monthly effect' in the stock market. Over a 19 year back tested period stocks seem to have higher returns during the first half of each month. So e.g. investors could choose to only buy stocks during these times of higher returns or form another trading strategy based on this particular market anomaly. Another remarkable market anomaly is found by Banz (1981) as he researched the relationship of total market value of the common stock of a company and its return. He found that on average, stocks of the small New York Stock Exchange (NYSE) firms have larger risk adjusted

returns than the stocks of large NYSE firms. A possible explanation of this effect can possibly be found in work of Klein and Bawa (1977). They came to the conclusion that investors are risk-averse when it comes to investing in stocks with limited information. Investors choose to invest more in stocks about which they have the most information, which are mostly the stocks of larger firms. Lack of information about small firms leads to limited diversification and therefore to higher returns of the less desirable stocks of the smaller firms. But still, good theoretical foundation for this 'size related effect' is hard to find. There might even be a market anomaly around the turn of the year. Roll (1983) shows us that there is a remarkable pattern in stock returns during the turn of the year. During this period, average returns of stocks are high in general. He also concluded that returns of stocks from smaller firms are higher during this period than stocks of larger firms, so there might be a relation with the earlier described 'size effect'.

There are many possible market anomalies which are found by researchers around the world which are implying that the financial markets are inefficient. Investors could choose to take advantage of these kinds of anomalies by creating a suitable trading strategy. Former literature found that anomalies arise in all kinds of areas. There are anomalies which are size related, price related, period related and so on. The MF trading strategy tries to combine a price related anomaly with the ability of a firm to create a return on its investments, but in general there are many more possible combinations of factors.

2.2 Efficient Market Hypothesis

But does it really make sense that there are trading strategies which are able to deliver market outperforming returns over a long period of time? According to the Efficient Market Hypothesis (EMH), it is impossible to continuously beat the market as equity prices reflect all available information in the market (Fama, 1970). And when new information arises, investors are quick to react and equity prices will follow just as fast.

In general, there are three levels of market efficiency. The *weak form* EMH implies that historical price information and trading volume information have no effect on future rates of returns. So investors cannot build market beating strategies based on this historical information. The *semi-strong form* EMH states that the market is reflecting all publicly available information as well. Investors are using the new available information immediately after it is released so investors cannot benefit by trading on new information. In the *strong form* EMH, hidden or insider information will also be reflected in equity prices. In such an investing world investors

cannot achieve risk-adjusted returns in excess of market averages. So when a market is that strongly efficient, it becomes impossible for investors to realize abnormal returns

This EMH has led to a lot of criticism. Many market participants and researchers claim that it is possible to reach market beating returns. But most of the time, the market is remarkably efficient in its utilization of information (Malkiel, 2003). There are times that investors will act less rationally what leads to pricing irregularities and in those cases there are patterns to be found in stock returns but those periods are often short of existence. These periods are more the exception than the rule. According to another work of Malkiel (2005) most of the time the EMH holds it ground, so switching from security to security realizes nothing but only increases transactions costs and harm the general performance of a portfolio. This is confirmed by Ellis (1975), who called this phenomenon of changing from security to security to try to outperform the average returns of the market the '*Loser's Game*'. Ellis stated that there are so many professionals in the investment management world that it is no longer feasible for any of them to profit from the errors of other investors. He stated that active management will not realize market outperforming returns, so it is better for these investors to admit to the EMH.

Many of the researchers who claim that the stock markets are efficient and therefore unable to beat without taking additional risk, were fully focused on the efficiency of the United States stock market. But there is also evidence that other stock markets are becoming more and more efficient. The European stock market is becoming more efficient according to Borges (2010). But also emerging markets like Latin America (Ojah & Karemera, 1999) have a form of efficiency and international investors cannot use historical price information to create a profitable trading strategy. The same counts for the African stock markets (Magnusson & Wydick, 2002) and the Middle East stock markets (Abraham, Seyyed, & Alsakran, 2002). These stock markets still have a *weak form* of efficiency and do not pass the high efficiency hurdles as the United Stock markets does, but even this *weak form* of efficiency should make it impossible to create a market outperforming trading strategy based on historical price changes without taking additional risk.

The EMH claims that from the moment that information is available in the market, equity prices will react immediately to that particular information. So when Joel Greenblatt informed the market about his MF trading strategy, the strategy should have immediately stopped working as all investors would jump on it and try to reach market outperformance with this trading strategy. Luckily for us, this MF trading strategy was found in 2006 and we are now living circa

9 years later. This criticism of EMH that market beating strategies will stop working once they are made publicly available to market participants and the main assumption that it is impossible to achieve risk adjusted returns above market averages inspired Joel Greenblatt to rewrite his book. Four years after he wrote his first book on his MF trading strategy, he wrote '*The little book that Still beats the market*' (Greenblatt, 2010). In this updated version of his previous book, Greenblatt shows that his MF trading strategy kept generating market beating returns after he published his first book in 2006. So there might be some continuous anomalies in the stock markets. Greenblatt explains this phenomenon by describing the psychological mind of an investor as psychological biases can affect market prices substantially.

The work of Fama (1998) confirmed that psychological biases affect prices because investors tend to overreact or underreact several times and that seems to produce many long-term return anomalies. But Fama also stated when these situations occur, they disappear very quickly. However, a study of Shiller (2003) concludes that the mere fact that anomalies sometimes disappear is not strong evidence that markets are fully rational. Shiller says that we have to distance ourselves from the presumption that financial markets are always efficient and that equity prices always reflect all the information. Some market reactions, like the stock market boom and crash after 2000, had its origins in human foibles and generated a real misallocation of resources. The work of Daniel, Hirshleifer and Hong Teoh (2002) also shows that psychological biases affect market prices substantially and that mispricing of stock prices can be a result of such an event.

Greenblatt agrees with this statement. He states that investors often choose to leave the MF strategy because in some of the years, the MF trading strategy actually underperformed the market. According to Greenblatt, many investors have a short term time horizon or do not have the discipline to keep loyal to the MF trading strategy in bad times and are therefore continuously psychologically overreacting or underreacting based on the positive or negative returns of the MF trading strategy. They want quick rewards and change from investing strategies multiple times during their investing careers. Those are some reasons why the MF trading strategy will keep working. It is very hard to stay with a strategy that underperforms the market multiple times a year.

2.3 Value Investing

What becomes obvious when looking at the particular outperforming factor trading strategies founded by many different researchers is that a lot of factor strategies have a tight connection with the value investing principles. E.g. stocks with low price to earnings ratios historically achieved higher returns than stocks with high price to earnings ratios. The same counts for the price to book, price to sales, price to cashflow and so on. These factors are specifically looked at by value investors who try to buy a dollar for fifty cents. Value investors claim that the market sometimes is very inefficient and that securities are often mispriced. Benjamin Graham, who is widely seen as the father of value investing, noticed this phenomenon a long time ago. In his book '*The Intelligent Investor*' which was first published in 1949, he stated that stock investors shouldn't buy stocks with high price related ratios (Graham & Zweig, 2006). Do not pay too much for your stocks is his advice. Many of the market outperforming factor strategies consist of such principles. Most of them try to signalize stocks of good companies which are relative cheap, and try to take advantage of the inefficiency and mispricing of securities.

A lot of successful value investors are stating that it is possible to outperform the average returns of the general stock markets and Joel Greenblatt is clearly one of them. The EMH would say that it is impossible that these value investors are generating abnormal market returns over a long period of time without taking a large amount of risk. Work of Bartov and Kim (2004) however shows us that value investors who like to use price related ratios like the price to book ratio, are not taking above average risk to generate these abnormal returns. They formulate value investing as buying stocks when their price is low relative to some fundamental benchmarks such as earning, cash from operations, dividends, or accounting book value. This should increase your returns and decrease your risk. A study of Chan and Lakonishok (2004) also confirmed that stock trading strategies based on value investing do not carry a high risk profile. The volatility of these value investing strategies is also relative low.

2.4 The Magic Formula

The MF trading strategy clearly has a lot of similarities with value investing as the strategy tries to buy above average companies for below average prices. The MF trading strategy uses the earnings yield (EY) and return on invested capital (ROIC) as their metrics to realize continuous market beating returns. The EY is a price related ratio and is best compared to the reversed price to earnings ratio. According to Greenblatt however, his EY ratio is an improved reversed price to earnings ratio as it is calculated in a slightly different way. The EY is calculated as follows:

$$\text{Earnings Yield}_t = \frac{\text{EBIT}_t}{\text{Enterprise value}_{t-1}} \quad (1)$$

$$\text{EBIT}_t = \text{Pretax Income}_t + \text{Interest Expense}_t \quad (2)$$

$$\begin{aligned} \text{Enterprise Value}_t = & \text{Market value of equity}_t \quad (3) \\ & + \text{Interest bearing debt}_t - \text{Excess cash}_t \end{aligned}$$

The most powerful part of this equation is the calculation of the Enterprise Value, while the reversed price to earnings ratio is using simple Market Capitalization as its denominator. Greenblatt states that “Enterprise value takes into account both the price paid for an equity stake in a business as well as the debt financing used by a company to help generate operating earnings”. By using this calculation of Enterprise Value, companies with a lot of debt are penalized, and companies with a lot of cash on hand are being rewarded. By using this EY ratio, the MF trading strategy measures how ‘cheap’ a companies’ stock is.

The second ratio, the ROIC, is calculated as follows:

$$\text{Return on Invested Capital}_t = \frac{\text{EBIT}_t}{\text{Net Tangible Assets}_{t-1}} \quad (4)$$

$$\begin{aligned} \text{Net Tangible Assets}_t = & \text{Accounts receivable}_t \quad (5) \\ & + \text{Inventory}_t + \text{Cash}_t - \text{Accounts payable}_t + \text{Net fixed assets}_t \end{aligned}$$

In general, the ROIC ratio has some similarities with the Return on Assets (ROA) and Return on Equity (ROE) ratios, but Greenblatt prefers the ROIC ratio instead of the ROA and ROE ratios. The main reason behind this is the fact that the ROIC ratio figures out how much capital the company actually needed to realize its profits. So the ROIC ratio measures how efficiently a company performs. A simple combination of the EY and ROIC can signalize companies which are cheap (those with high EY values) and which are good (those with high ROIC values), and that’s exactly what the MF trading strategy wants.

Step by step, the MF trading strategy as used by Greenblatt to realize market beating returns is as follows:

- Step 1: Screen common stocks based on their ROIC and rank them from high to low.
- Step 2: Screen common stocks based on their EY and rank them from high to low.
- Step 3: Combine these rankings into one compounded ranking.
- Step 4: Eliminate Utilities and Financial stocks, and also eliminate foreign companies which in the original MF trading strategy were American Depository Receipts (ADR's). Also eliminate companies with a market cap below \$50 million.
- Step 5: Buy the top 5-8 stocks out of the combined ranking each two to three months until you hold a portfolio of 30 stocks.
- Step 6: Sell each stock after holding it an entire year.
- Step 7: Continue to use this strategy for multiple years.

With this simple but effective trading strategy, your returns would be a lot higher than the average returns of the S&P 500 index. As mentioned before, according to the back test of Greenblatt this MF trading strategy would give you average annual returns of 30,8% over the period from 1988 until 2004. By using multiple factors (the ROIC and EY), the risk profile of the MF trading strategy should be lower than simply using a single factor trading strategy.

3: Data & Methodology

In this section, there is a description of the used dataset as well as the methodology by which the backtest of the MF trading strategy is constructed within the Benelux stock market.

3.1 Data

For backtesting the MF trading strategy in the Benelux stock market, specific historical financial information from 1994 until 2014 of stocks out of the Benelux-DataStream Market (Mnemonic TOTMKBX) is retrieved from the Thompson Reuters DataStream database. This Benelux-DataStream index covers the three selected regions (Belgium, Luxembourg and the Netherlands), and includes stocks of large cap-, middle cap- and small cap-companies. In total, this Benelux-DataStream Market index has 237 constituents. Based on the original strategy of Joel Greenblatt, stocks from Financials and Utilities are eliminated from the universe because they tend to have very high leverage and/or some form of state intervention which could make the calculations of their EY and ROIC very unreliable. This high leverage might signalize distress for a lot of industrial firms, but it has a different meaning for Financials and that makes it difficult to compare these kinds of sectors (Fama & French, 1992).

Because the selected Benelux region is clearly smaller than the United States region, I decided to lower the market capitalization threshold and only eliminate stocks with a market capitalization below €10 million from the universe instead of using the original \$50 million limit. This market capitalization limit is set to select stocks which are liquid enough for trading once a year. Companies with a market capitalization below the €10 million are excluded because their stocks might be illiquid and therefore untradeable in the MF trading strategy. The capitalization limit is lower than the original capitalization limit of Greenblatt because otherwise the Benelux backtest stock universe will become too small. Still, stocks of companies with a market capitalization above €10 million are liquid enough for small individual investors to use the MF trading strategy. Market capitalization is calculated as the Market Stock Price-Year End times the Common Shares Outstanding during that same year. Finally, stocks of which the DataStream database does not have any data available will also be eliminated.

Once these stocks are all eliminated from the backtest universe, a list of 136 stocks is left for backtesting the MF trading strategy. The Benelux-DataStream Market index will be used as a benchmark for the backtest. This is the most reliable benchmark as it covers all the stocks in the backtest universe.

The accounting variables which are needed to create the rankings based on ROIC and EY are also retrieved from the Thompson Reuters DataStream database. The DataStream database offers a predefined ROIC ratio for the backtest universe so I decided to use this ratio instead of using the original ROIC equation of Joel Greenblatt. The predefined ROIC has a lot of similarities with Joel Greenblatt's calculation of the ROIC, so this should not make a lot of difference in the results. The biggest difference between these two equations is the fact that the predefined ROIC ratio takes a tax rate into account. The pre-defined ROIC ratio in the DataStream database which is being used in this backtest is calculated as follows:

$$\text{Return on Invested Capital}_t = \frac{(\text{Net Income}_t + \text{Interest Expense}_t * (1 - \text{Tax Rate})_t)}{\text{Total Capital}_t + \text{Total Debt}_t} * 100 \quad (6)$$

As the DataStream database does not offer a predefined EY variable, the accounting variables of the EY formula will be calculated manually. Just like Joel Greenblatt's original EY formula, a company's EBIT is being divided by the Enterprise Value of the particular company to create an EY ratio. In this research, a slightly different calculation of the Enterprise Value is being used because the DataStream database does not offer accurate data about interest bearing debt. In the end, the EY calculation used in this research is close to identical to Joel Greenblatt's original approximation, so this should not lead to significant differences in the results. The EY variable is calculated as follows:

$$\text{Earnings Yield}_t = \frac{\text{EBIT}_t}{\text{Enterprise value}_{t-1}} \quad (7)$$

$$\text{EBIT}_t = \text{Pretax Income}_t + \text{Interest Expense}_t - \text{Interest Capitalized}_t \quad (8)$$

$$\text{Enterprise Value}_t = \text{Market value}_t + \text{Net debt}_t \quad (9)$$

In this particular calculation of the Enterprise Value, the Market Value is the share price multiplied by the number of ordinary shares outstanding. The amount outstanding is updated whenever new tranches of stock are issued or after a capital change. Net Debt represents the Total Debt minus Cash. Cash represents Cash & Short Term Investments. By using this calculation of EY, companies with low levels of cash and high levels of debt will be punished

with a lower EY ratio, and companies with high levels of cash and low levels of debt will be rewarded with a higher EY ratio.

For calculating the annual returns of the MF trading strategy and the Benelux-DataStream index, the Total Return Index (RI) is used because this index includes dividend payments. The RI immediately reinvests company's dividend payments into the same stock. The RI is using an ex-dividend date method and is calculated as follows:

$$RI_t = RI_{t-1} * \frac{(P_t + D_t)}{P_{t-1}} \quad (10)$$

Where:

P_t = price on ex-date

P_{t-1} = price on previous day

D_t = dividend payment associated with ex-date t

3.2 Methodology

Joel Greenblatt took a very large stock universe of United States listed stocks. Out of this universe, he annually formed a portfolio of the top 30 stocks based on their ROIC and EY rankings and rebalanced this portfolio to the top 30 stocks annually. The Benelux universe is clearly a lot smaller than the universe of Joel Greenblatt, so instead of creating a portfolio of 30 stocks, a portfolio of only 10 stocks will be formed as the Magic Formula (MF) Portfolio. This MF Portfolio will be rebalanced annually just like the MF Portfolio in Joel Greenblatt's original MF trading strategy and the 10 constituents of the MF Portfolio will be selected based on the compounded ranking of ROIC and EY.

As described before, slightly different equations of ROIC and EY are used in comparison to the original equations used by Joel Greenblatt. These equations however are close to identical and therefore should not lead to significantly different results. For the annual formation of the MF Portfolio, the top 10 stocks of the compounded ranking of ROIC and EY are used. So first, the individual rankings based on ROIC and EY are made and the scores out of these rankings are the input for the compounded ranking. The ROIC and EY scores are calculated on data from the 31st of March of a particular year, to the 31st March of one year later. This is done because nearly all companies hand in their financial statements a few months after the turn of the year. These financial statements include the necessary inputs for the ROIC and EY calculations. So

the annual MF portfolio rebalance date is 31 March each year. This date is also chosen to make the MF trading strategy more useful for individual investors as they are only able to calculate the ROIC and EY scores after the listed companies handed in their financial statements. So for example, the compounded ROIC and EY ranking which is based on historical financial information of 1995 is linked to the MF Portfolio of 1996 which is held from 31 March 1996 until 31 March 1997.

Once the compounded ranking is made, an equal amount of money will be invested in each of the top 10 stocks. This is done due to simplicity of the backtest and is in line with the original approximation of Joel Greenblatt's MF trading strategy. There is no distinction between the amounts of money invested in the top 10 stocks. So the weight of each stock in the MF portfolio is exactly 10% after it is rebalanced. Then, after a full year, the RI of the 10 individual stocks in the MF portfolio are measured. The averages of those measured annual returns represent the annual returns of the MF portfolio.

The first MF portfolio is formed in 1995 and is annually rebalanced to the top 10 stocks until 2014. This is a 20 year period which should be long enough to signalize a possible market anomaly and to claim whether the MF trading strategy outperformed the Benelux-DataStream market. For this 20 year period, sufficient reliable data was available through the Thompson Reuters DataStream database. It would be a better choice to backtest the MF trading strategy over a longer period of time, but the available historical data in the Thompson Reuters database before 1995 is highly unreliable so I chose to use the reliable 20 year period. Further, this 20 year period contains two market crashes, the so called internet bubble during the beginning of the 21th century, and the United States credit crunch in 2008. It is interesting to see whether the MF trading strategy outperformed the markets during these stressful times.

In the end, this backtest methodology is using a slightly different approach from the original approach of Joel Greenblatt, but again, it is close to identical and should not lead to significant differences in the results. Step by step, the methodology used for the MF backtest in the Benelux stock market is:

- Step 1: Eliminate Utilities and Financial stocks. Also eliminate companies with a market cap below €10 million and companies of which no data is available.
- Step 2: Screen the stock universe based on the ROIC and rank stocks from high to low.
- Step 3: Screen the stock universe based on the EY and rank stocks from high to low.

- Step 4: Combine these rankings into one compounded ranking.
- Step 5: Buy the top 10 stocks out of the compounded ranking each year on 31th of March.
- Step 6: Sell each stock after holding it an entire year on the 31th of March. When a top 10 stock of the former year is again in the top 10 stocks of the following particular year, you simply keep the stock in portfolio without selling and rebuying it (to reduce transaction costs).
- Step 7: Continue to use this strategy from 1995 until 2014.

4: Results

Once the MF Portfolios are formed based on the description in the Data & Methodology section and held for an entire year, it becomes clear that the MF trading strategy beats the average annual returns of the Benelux market.

4.1 Magic Formula Trading Strategy

For the period of 1995 until 2014, each year a MF Portfolio consisting out of the top 10 ROIC and EY stocks are formed and their annual returns are calculated. Table 1 shows the annual returns of the MF trading strategy and the Benelux market from 1995 until 2014. Note that these returns are from 31th March 1995 until 31th March 2015 as described in the Data & Methodology section. So for example, the 1995 annual return is the annual return from 31 March 1995 until 31 March 1996 and so on. In Appendix A, the exact formations of the MF Portfolios for each year can be found.

Table 1:
Annual returns of the MF Portfolio and the Benelux market

	MF Portfolio (1)	Benelux market (2)	(1) – (2)
1995	31,72%	20,16%	11,56%
1996	40,10%	23,43%	16,67%
1997	45,43%	30,78%	14,65%
1998	-18,92%	4,90%	-23,82%
1999	10,93%	4,54%	6,39%
2000	3,11%	-18,30%	21,41%
2001	14,74%	-5,35%	20,10%
2002	-38,15%	-30,52%	-7,63%
2003	44,15%	48,71%	-4,56%
2004	31,29%	24,23%	7,06%
2005	44,94%	21,34%	23,60%
2006	39,07%	25,08%	13,99%
2007	-8,34%	1,78%	-10,13%
2008	-46,56%	-60,51%	13,95%
2009	59,94%	67,11%	-7,18%
2010	17,71%	8,57%	9,14%
2011	2,30%	-13,51%	15,81%
2012	6,52%	10,67%	-4,15%
2013	31,01%	21,42%	9,59%
2014	27,66%	0,07%	27,58%
Mean	16,93%	9,23%	7,70%

As Table 1 shows, the MF Portfolio containing the top 10 stocks with the best combination of ROIC and EY out of constituents of the Benelux market clearly outperforms the average annual returns of the complete Benelux market. Over the 20 year period from 1995 to 2014, the MF Portfolio annually outperformed the Benelux market by 7,70% on average. So it becomes clear that the MF trading strategy works in the Benelux region as well as in the United States region. The 16,93% average annual return of the MF Portfolio in the Benelux is not near the 30,8% average annual return of the MF Portfolio in the United States as shown by Joel Greenblatt, but it still is a remarkable outperformance.

In 14 out of the 20 backtested years (70%) the MF trading strategy outperformed the Benelux market which is pretty similar to the average annual outperformance of the MF trading strategy in the United States measured by Joel Greenblatt where the MF trading strategy outperforms the S&P 500 in 19 out of 25 years (76%).

Now that it is clear that the MF trading strategy historically outperformed the Benelux market, it becomes interesting to see whether this outperformance comes with additional risk. Table 2 shows the descriptive statistics of the MF Portfolio and the Benelux market over the backtested period from 1995 until 2014.

Table 2:
Descriptive statistics of the MF Portfolio and the Benelux market

	MF Portfolio	BeNeLux market
Mean	0.1693	0.0923
Median	0.2268	0.0962
Standard deviation	0.2856	0.2770
Min	-0.4656	-0.6051
Max	0.5994	0.6711

The MF Portfolio has a higher standard deviation compared to the Benelux market. So the higher returns from the MF Portfolio come with some additional risk, which is in line with the Efficient Market Hypothesis where it is impossible to reach market outperformance by using historical information without taking additional to the market risk. Still the additional risk looks rather small as the standard deviation of the MF Portfolio is only a bit higher than the standard deviation of the Benelux market. A Sharpe (1994) ratio is therefore calculated to measure the risk-adjusted returns using the following equation:

$$\text{Sharpe Ratio} = \frac{E(R_p - R_f)}{\sigma_p} \quad (11)$$

Where:

$E(R_p)$ = Expected Return of the Portfolio

R_f = Risk Free Rate

σ_p = Portfolio standard deviation

With the use of this equation, a Sharpe ratio for the MF Portfolio and the Benelux market is calculated. For a risk free rate, the three month yield on a US Treasury bill is used for each particular date. The used risk free rates for each year can be found in Appendix B. The average of the portfolio returns minus the risk free rates represent the expected return of the portfolio in excess of the risk free rates. Table 3 shows the Sharpe ratios of both portfolios.

Table 3:
Sharpe Ratio of the MF Portfolio and the Benelux market

	MF Portfolio	Benelux market
Expected excess Return	0.1410	0.0640
Standard deviation	0.2856	0.2770
Sharpe Ratio	0.4936	0.2309

The MF trading strategy has a higher Sharpe ratio in comparison with the Benelux market, meaning that the MF Portfolio generates a more attractive risk-adjusted return than the Benelux market. This might signalize a market anomaly and violates the Efficient Market Hypothesis.

Another well-known risk measure is the market beta. A beta of 1 indicates that the MF Portfolio will move in line with the Benelux market. A beta of less than 1 indicates that the MF Portfolio is less volatile than the Benelux market, meaning that the MF Portfolio is less risky. A beta of greater than 1 indicates that the MF Portfolio is more volatile and therefore riskier than the Benelux market. The market beta is estimated using a simple linear regression model:

$$R_{MF_t} - R_{f_t} = \beta(R_{BNL_t} - R_{f_t}) + \varepsilon_t \quad (12)$$

Where:

R_{MF} = Return of MF Portfolio

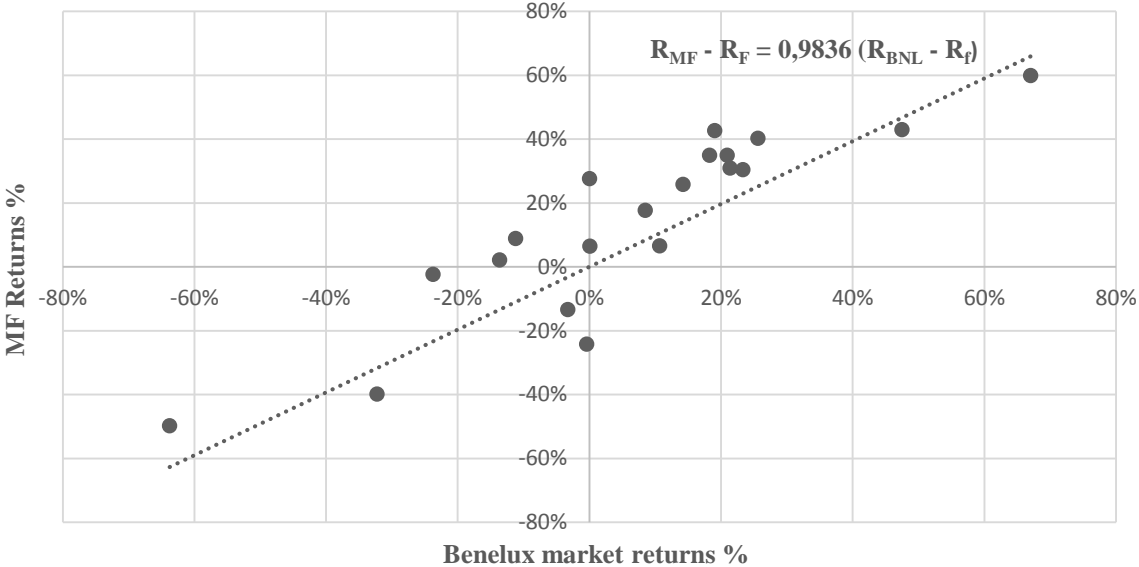
R_{BNL} = Return of Benelux market

R_f = Risk free rate

Graph 1 shows the annual returns of the MF Portfolio and the Benelux market, and inserts a regression line.

Graph 1:

Simple linear regression model. Regression of MF Portfolio returns on Benelux returns



As can be seen in Table 4, the MF Portfolio has a market beta of 0.9836 meaning that the MF Portfolio is less volatile and therefore less risky than the Benelux market. The p-value of the market beta is zero to four decimals, meaning that this market beta is high significant. The R^2 value of 0.7729 shows that this model explains 77.29% of the variation. So according to this risk measure statistic, the MF Portfolio is able to generate market beating returns without taking additional risk. Again, this clearly violates the Efficient Market Hypothesis and strengthens Greenblatt’s statement that the MF trading strategy is able to generate market beating returns, even with a lower risk profile.

Table 4:

Summary statistics of the linear regression model. Regression of MF Portfolio returns on Benelux returns

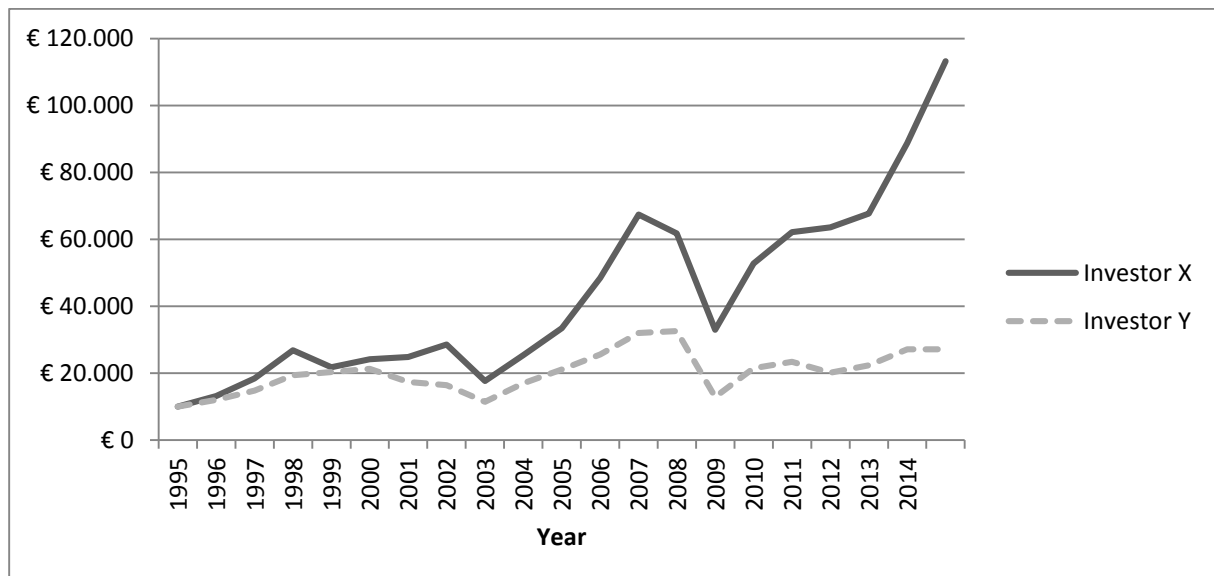
MF Portfolio	
Market $\hat{\beta}$	0.9836***
p-value β	0.0000
R^2	0.7729

4.2 The individual investor

Let us put these results in the perspective of an individual investor. An individual investor X was confident in the way the Magic Formula trading strategy works and decided to invest €10.000 in this MF trading strategy in 1995. Another individual investor Y stated that it was impossible to reach market outperformance and was more confident in the Efficient Market Hypothesis. He decided to follow a strategy which completely matched the results of the Benelux market and also invested €10.000 in 1995. Graph 2 shows the virtual values of their portfolios from 1995 until 2014. Of course, transaction costs and other forms of brokerage costs are eliminated from this graph. Dividend payments however are immediately reinvested as this graph is using the Total Return Index (RI).

Graph 2:

Virtual values of an initial €10.000,- investment in the MF trading strategy and in the Benelux market



The terminal value of the portfolio of investor X on 31 March 2015 would be € 113.238 and the terminal value of the portfolio of investor Y would be € 27.182 on that same date. Graph 2 brings the results of Table 1 in a clear view. This graph however, shows the power of selecting a successful trading strategy and holding onto it for a long period of time. As described before, the holding on to a strategy part is one of the main difficulties according to Joel Greenblatt as the MF trading strategy often underperforms the market in one particular year. In the Benelux market backtest, this was the case in 30% of the time. Greenblatt states that it is very difficult to hold onto an underperforming strategy. Just like Ellis (1975) concluded that changing from security to security is playing the 'Losers game', changing from strategy to strategy could even be a bigger 'Losers game'.

5: Conclusion

Joel Greenblatt opened up a lot of investors eyes when he wrote *'The little book that beats the market'* by making former scientific work of many researchers easily readable for the general public. In a very simple way, he described that the United States stock market can be inefficient and that even small individual investors could take advantage of such an event by using his Magic Formula trading strategy. He showed that by buying a simple portfolio of 30 companies with a high Earnings Yield ratio and a high Return on Invested Capital ratio significantly outperformed the S&P 500 index. He therefore signalized a market anomaly which violates the Efficient Market Hypothesis.

This research takes this same Magic Formula trading strategy to the Benelux region by answering the following question:

Does the 'Magic Formula' trading strategy of Joel Greenblatt show market outperformance in the Benelux stock market?

The results show that the answer to this question is clearly a yes. This simple but effective Magic Formula trading strategy works outside the United States as well. The results of the 20 year-period backtest from 1995 until 2014 shows that the Magic Formula trading strategy on average realized an annual 7,70% market premium in the Benelux stock market without taking additional risk. So this might signalize a market anomaly outside the United States. This outperformance is not that big as the outperformance in the United States stock market, but the result still shows a relative high outperformance. Individual investors can choose to put this Magic Formula trading strategy into practice by simply buying a portfolio consisting of 10 stocks with the best combination of EY and ROIC.

This market outperformance of the Magic Formula is a remarkable event. Of course, historical returns do not guarantee the same returns for the future, but many researchers around the world showed that buying companies with particular accounting variables can be a very effective way of investing. The biggest question is why these kinds of strategies tend to keep on working over long periods of times. Many researchers believe the answer can be found in field of behavioral finance. The behavioral finance aspects of trading strategies like the Magic Formula trading strategy are interesting areas for further research.

Bibliography

- Abraham, A., Seyyed, F., & Alsakran, S. (2002). Testing the random behavior and efficiency of the Gulf stock markets. *The Financial Review*, 37(3), 469-480.
- Ariel, R. A. (1987). A Monthly Effect In Stock Returns. *Journal of Financial Economics*, 18, 161-174.
- Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*(9), 3-18.
- Bartov, E., & Kim, M. (2004). Risk, Mispricing, and Value Investing. *Review of Quantitative Finance and Accounting*(23), 353-376.
- Basu, S. (1977). Investment performance of common stocks in relation to their price earnings ratios: A test of the efficient market hypothesis. *Journal of Finance*, 32, 663-682.
- Borges, M. R. (2010). Efficient market hypothesis in European stock markets. *The European Journal of Finance*, 16(7), 711-726.
- Chan, L. K., & Lakonishok, J. (2004). Value and Growth Investing: Review and Update. *Financial Analysts Journal*, 60(1), 71-86.
- Charest, G. (1978). Dividend Information, Stock Returns and Market Efficiency. *Journal of Financial Economics*(6), 297-330.
- Daniel, K., Hirshleifer, D., & Hong Teoh, S. (2002). Investor psychology in capital markets: evidence and policy implications. *Journal of Monetary Economics*, 49, 139-209.
- Ellis, C. D. (1975). The Loser's Game. *The Financial Analysts Journal*, 31(4), 19-26.
- Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance*, 25(2), 383-417.
- Fama, E. F. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics*(49), 283-306.
- Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance*, 47(2), 427-465.
- Graham, B., & Zweig, J. (2006). *The Intelligent Investor*. New York: HarperCollins Publishers Inc.
- Greenblatt, J. (2006). *The little book that beats the market*. Hoboken, New Jersey: John Wiley and Sons Ltd.
- Greenblatt, J. (2010). *The little book that Still beats the market*. Hoboken, New Jersey: John Wiley and Sons Ltd.

- Keim, D. B. (1983). Size-Related Anomalies and Stock Return Seasonality. *Journal of Financial Economics*, 12, 13-32.
- Klein, R. W., & Bawa, V. S. (1977). The effect of limited information and estimation risk on optimal portfolio diversification. *Journal of Financial Economics*(5), 89-111.
- Lakoninshok, J., Shleifer, A., & Vishny, R. W. (1994). Contrarian Investment, Extrapolation, and Risk. *Journal of Finance*, 49(5), 1541-1578.
- Litzenberger, R. H., & Ramaswamy. (1982). The Effects of Dividends on Common Stock Prices Tax Effects or Information Effects. *Journal of Finance*, 37(2), 429-443.
- Magnusson, M. A., & Wydick, B. (2002). How efficient are Africa's Emerging Stock Markets? *Journal of Development Studies*, 4(38), 141-156.
- Malkiel, B. G. (2003). The Efficient Market Hypothesis and Its Critics. *Journal of Economic Perspectives*, 17(1), 59-82.
- Malkiel, B. G. (2005). Reflections on the Efficient Market Hypothesis: 30 Years Later. *The Financial Review*(40), 1-9.
- Ojah, K., & Karemera, D. (1999). Random Walks and Market Efficiency Tests of Latin American Emerging Equity Markets: A Revisit. *The Financial Review*(34), 57-72.
- O'Shaughnessy, J. P. (2005). *What works on Wall Street* (3rd ed.). New York: McGraw-Hill.
- Piotroski, J. D. (2000). Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research*, 38, 1-41.
- Reinganum, M. (1981). Misspecification of capital asset pricing: Empirical anomalies based on earnings' yields and market values. *Journal of Financial Economics*, 9, 19-46.
- Roll, R. (1983). Was ist das? The turn of the year effect and the return premium of small firms. *Journal of Portfolio Management*(9), 18-28.
- Sharpe, W. F. (1994). The Sharpe Ratio. *The Journal of Portfolio Management*, 21(1), 49-58.
- Shiller, R. J. (2003). From Efficient Markets Theory to Behavioral Finance. *Journal of Economic Perspectives*, 17(1), 83-104.

Appendix A: MF Portfolios from 1995 until 2014

1995 (rank 1994)	31-3-1995	31-3-1996	
REED ELSEVIER (AMS)	3073,31	4950,37	61,08%
NEDAP	3881,71	6839,82	76,21%
UNILEVER CERTS.	2098,26	2413,93	15,04%
WESSANEN	732,47	829,8	13,29%
BARCO NEW	266,03	474,17	78,24%
SLIGRO FOOD GROUP	225,89	395,74	75,19%
FUGRO	78,74	58,05	-26,28%
BEKAERT (D)	1756,35	2340,22	33,24%
RTL GROUP (LUX)	221,36	225,38	1,82%
STERN GROEP	263,09	235,07	-10,65%
Mean			31,72%

1996 (rank 1995)	31-3-1996	31-3-1997	
REED ELSEVIER (AMS)	4950,37	6105,74	23,34%
NEDAP	6839,82	12177,8	78,04%
HEIJMANS	314,17	590,53	87,97%
BARCO NEW	474,17	680,1	43,43%
UNILEVER CERTS.	2413,93	4038,33	67,29%
TESSENDERLO	1705,42	2361,32	38,46%
SLIGRO FOOD GROUP	395,74	550,13	39,01%
NEWAYS ELEC.INTL.	121,5	117,21	-3,53%
WESSANEN	829,8	957,99	15,45%
KPN KON	136,99	152,86	11,58%
Mean			40,10%

1997 (rank 1996)	31-3-1997	31-3-1998	
REED ELSEVIER (AMS)	6105,74	7193,43	17,81%
NEDAP	12177,8	17301,72	42,08%
ROYAL IMTECH	983,86	1305,89	32,73%
HEIJMANS	590,53	924,24	56,51%
UNILEVER CERTS.	4038,33	6317,11	56,43%
SLIGRO FOOD GROUP	550,13	799,96	45,41%
ARCADIS	129,55	170,87	31,90%
FUGRO	118,73	251,32	111,67%
WOLTERS KLUWER	9121,21	12161,59	33,33%
HUNTER DOUGLAS	575	726,88	26,41%
Mean			45,43%

1998 (rank 1997)	31-3-1998	31-3-1999	
CORBION	9022,73	9311,89	3,20%
BETER BED HOLDING	194,81	211,59	8,61%
FUGRO	251,32	148,79	-40,80%
ROYAL IMTECH	1305,89	751,76	-42,43%
NEDAP	17301,72	12403,04	-28,31%
HEIJMANS	924,24	598,15	-35,28%
PHILIPS ELTN.KONINKLIJKE	1318,99	1453,16	10,17%
ARCADIS	170,87	112,09	-34,40%
BALLAST NEDAM	158,6	98,03	-38,19%
SLIGRO FOOD GROUP	799,96	866,02	8,26%
Mean			-18,92%

1999 (rank 1998)	31-3-1999	31-3-2000	
REED ELSEVIER (AMS)	6444,64	5106,22	-20,77%
RANDSTAD HOLDING	1155,82	1094,38	-5,32%
CORBION	9311,89	7586,07	-18,53%
FUGRO	148,79	360,91	142,56%
HEIJMANS	598,15	564,33	-5,65%
ROYAL IMTECH	751,76	908,59	20,86%
NUTRECO	202,91	195,79	-3,51%
BAM GROEP KON.	2187,83	2453,03	12,12%
WESSANEN	800,3	671,59	-16,08%
BETER BED HOLDING	211,59	219,2	3,60%
Mean			10,93%

2000 (rank 1999)	31-3-2000	31-3-2001	
USG PEOPLE	3553,36	3633,63	2,26%
BETER BED HOLDING	219,2	87,19	-60,22%
ROYAL IMTECH	908,59	1093,78	20,38%
RANDSTAD HOLDING	1094,38	392,59	-64,13%
HEIJMANS	564,33	827,99	46,72%
BAM GROEP KON.	2453,03	3589,69	46,34%
POSTNL	105,48	108,02	2,41%
FUGRO	360,91	499,14	38,30%
NEDAP	15542,47	10460,3	-32,70%
NUTRECO	195,79	257,87	31,71%
Mean			3,11%

2001 (rank 2000)	31-3-2001	31-3-2002	
USG PEOPLE	3633,63	4107,58	13,04%
PHILIPS ELTN.KONINKLIJKE	2292,37	2577,62	12,44%
ASML HOLDING	1798,93	2063,05	14,68%
BETER BED HOLDING	87,19	101,85	16,81%
HEIJMANS	827,99	944,38	14,06%
HEINEKEN	3564,92	3536,32	-0,80%
ARCADIS	140,5	174,44	24,16%
RANDSTAD HOLDING	392,59	519,33	32,28%
CORBION	9774,05	10004,85	2,36%
HUNTER DOUGLAS	523,58	619,86	18,39%
Mean			14,74%

2002 (rank 2001)	31-3-2002	31-3-2003	
ORDINA	612,28	125,95	-79,43%
BETER BED HOLDING	101,85	32,78	-67,82%
STERN GROEP	807,84	784,06	-2,94%
DSM KONINKLIJKE	490,14	383,26	-21,81%
USG PEOPLE	4107,58	1800,43	-56,17%
HYDRATEC INDUSTRIES	43,56	33,38	-23,37%
MIKO	80,79	80,55	-0,30%
WESSANEN	767,19	425,78	-44,50%
AMSTERDAM COMMODITIES	34,14	32,82	-3,87%
CTAC NM	6,9	1,29	-81,30%
Mean			-38,15%

2003 (rank 2002)	31-3-2003	31-3-2004	
HEINEKEN	2596,13	2519,67	-2,95%
PICANOL	1151,85	1044,47	-9,32%
NEDAP	9506,1	20437,84	115,00%
MIKO	80,55	109,9	36,44%
MACINTOSH RETAIL	553,28	1132,99	104,78%
AMSTERDAM COMMODITIES	32,82	46,59	41,96%
ROYALREESINK	6084,44	7330,99	20,49%
SLIGRO FOOD GROUP	1115,84	1560,18	39,82%
HUNTER DOUGLAS	479,51	811,24	69,18%
POSTNL	65,71	82,84	26,07%
Mean			44,15%

2004 (rank 2003)	31-3-2004	31-3-2005	
MELEXIS	145,45	158,63	9,06%
UCB	11237,56	13631	21,30%
AGFA-GEVAERT	96,31	134,45	39,60%
AMSTERDAM COMMODITIES	46,59	65,59	40,78%
MIKO	109,9	140	27,39%
ARCADIS	184,99	296,83	60,46%
RANDSTAD HOLDING	663,32	1062,83	60,23%
NEDAP	20437,84	26423,3	29,29%
MOBISTAR	174,43	221,3	26,87%
HUNTER DOUGLAS	811,24	794,76	-2,03%
Mean			31,29%

2005 (rank 2004)	31-3-2005	31-3-2006	
MOBISTAR	221,3	200,08	-9,59%
CMB	51847,04	46672,28	-9,98%
BETER BED HOLDING	165,38	415,43	151,20%
MIKO	140	177,55	26,82%
POSTNL	109,21	146,05	33,73%
SIPEF	148,11	200,25	35,20%
MELEXIS	158,63	229,86	44,90%
AKZO NOBEL	1622,85	2091,4	28,87%
MACINTOSH RETAIL	2026,22	4799,79	136,88%
AMSTERDAM COMMODITIES	65,59	73,03	11,34%
Mean			44,94%

2006 (rank 2005)	31-3-2006	31-3-2007	
CMB	46672,28	103435	121,62%
MELEXIS	229,86	251,66	9,48%
ARCELORMITTAL	117,76	150,67	27,95%
UCB	15071,93	16440,89	9,08%
LOTUS BAKERIES	546,51	852,61	56,01%
AKZO NOBEL	2091,4	2787,25	33,27%
POSTNL	146,05	179,62	22,99%
TKH GROUP	6859,47	9912,36	44,51%
ARCADIS	684,62	945,34	38,08%
BRILL (KON.)	185,69	237,15	27,71%
Mean			39,07%

2007 (rank 2006)	31-3-2007	31-3-2008	
MELEXIS	251,66	193,86	-22,97%
NEWAYS ELEC.INTL.	160,71	152,38	-5,18%
ROYAL IMTECH	3097,54	2957,25	-4,53%
JENSEN-GROUP	34,27	52,45	53,05%
BELGACOM	149,48	132,16	-11,59%
AKZO NOBEL	2787,25	2547,76	-8,59%
POSTNL	179,62	126,05	-29,82%
UNILEVER CERTS.	8326,39	8384,23	0,69%
MACINTOSH RETAIL	5836	3769,5	-35,41%
ARCADIS	945,34	764,94	-19,08%
Mean			-8,34%

2008 (rank 2007)	31-3-2008	31-3-2009	
REED ELSEVIER (AMS)	7148,87	4948,95	-30,77%
MOBISTAR	213,1	197,95	-7,11%
BETER BED HOLDING	346,08	196,99	-43,08%
UMICORE	406,83	174,07	-57,21%
CMB	92900,5	38969,02	-58,05%
RANDSTAD HOLDING	975,86	439,54	-54,96%
NEWAYS ELEC.INTL.	152,38	38,76	-74,56%
HAMON & CIE	57,82	38,85	-32,81%
SIPEF	500,62	286,43	-42,78%
MELEXIS	193,86	69,31	-64,25%
Mean			-46,56%

2009 (rank 2008)	31-3-2009	31-3-2010	
BETER BED HOLDING	196,99	564,22	186,42%
MOBISTAR	197,95	204,75	3,44%
ATENOR GROUP	2211,61	2517,27	13,82%
HAMON & CIE	38,85	60,91	56,78%
UNILEVER CERTS.	6072,99	9633,32	58,63%
CMB	38969,02	59357,83	52,32%
NEDAP	16275,76	19379,54	19,07%
FUGRO	839,52	1787,83	112,96%
AMSTERDAM COMMODITIES	91,95	159,73	73,71%
AHOLD KON.	1775,01	2169,43	22,22%
Mean			59,94%

2010 (rank 2009)	31-3-2010	31-3-2011	
REED ELSEVIER (AMS)	5794,46	6100,85	5,29%
MOBISTAR	204,75	237,8	16,14%
AMSTERDAM COMMODITIES	159,73	316,52	98,16%
BELGACOM	154,34	154,83	0,32%
LOTUS BAKERIES	1435,09	1564,33	9,01%
MIKO	170,99	175,27	2,50%
UNILEVER CERTS.	9633,32	9883,12	2,59%
AHOLD KON.	2169,43	2128,7	-1,88%
FUGRO	1787,83	2371,65	32,66%
ARCADIS	1010,37	1134,94	12,33%
Mean			17,71%

2011 (rank 2010)	31-3-2011	31-3-2012	
MELEXIS	253,53	278,13	9,70%
MOBISTAR	237,8	193,93	-18,45%
BELGACOM	154,83	145,47	-6,05%
KENDRION	255,39	288,39	12,92%
UNILEVER CERTS.	9883,12	11839,45	19,79%
BEKAERT (D)	13126,27	4040,08	-69,22%
LOTUS BAKERIES	1564,33	1995,07	27,54%
MIKO	175,27	169,5	-3,29%
BRILL (KON.)	167,13	228,78	36,89%
AHOLD KON.	2128,7	2408,31	13,14%
Mean			2,30%

2012 (rank 2011)	31-3-2012	31-3-2013	
MELEXIS	278,13	319,59	14,91%
MOBISTAR	193,93	100,61	-48,12%
UMICORE	557,73	505,23	-9,41%
LOTUS BAKERIES	1995,07	2731,75	36,93%
AHOLD KON.	2408,31	2883,37	19,73%
MACINTOSH RETAIL	2614,37	2300,01	-12,02%
UNILEVER CERTS.	11839,45	15353,37	29,68%
BELGACOM	145,47	127,16	-12,59%
TKH GROUP	14064,66	14564,56	3,55%
KINEPOLIS GROUP	198,54	283,09	42,59%
Mean			6,52%

2013 (rank 2012)	31-3-2013	31-3-2014	
MELEXIS	319,59	630,33	97,23%
BETER BED HOLDING	477,61	557,27	16,68%
ECONOCOM GROUP	1653,99	2214,88	33,91%
POSTNL	23,17	49,2	112,34%
JENSEN-GROUP	83,82	106,35	26,88%
MOBISTAR	100,61	84,75	-15,76%
UNILEVER CERTS.	15353,37	14868,22	-3,16%
INTERCULTURES	3728,77	3127,29	-16,13%
KENDRION	288,02	388,95	35,04%
LOTUS BAKERIES	2731,75	3361,85	23,07%
Mean			31,01%

2014 (rank 2013)	31-3-2014	31-3-2015	
UNILEVER CERTS.	14868,22	20092,74	35,14%
ECONOCOM GROUP	2214,88	1985,94	-10,34%
KINEPOLIS GROUP	417,32	533,6	27,86%
LOTUS BAKERIES	3361,85	5019,51	49,31%
ANHEUSER-BUSCH INBEV	437,07	668,47	52,94%
SIPEF	767,73	689,3	-10,22%
AMSTERDAM COMMODITIES	594,25	893,24	50,31%
ARCADIS	2017,51	2210,91	9,59%
BOSKALIS WESTMINSTER	1272,39	1504,47	18,24%
BELGACOM	162,59	249,93	53,72%
Mean			27,66%

Appendix B: Risk Free Rates and Excess Returns

	Risk Free Rates (1)	MF Returns (2)	Benelux Returns (3)	(2) - (1)	(3) - (1)
1995	5,95%	31,72%	20,16%	25,77%	14,21%
1996	5,20%	40,10%	23,43%	34,90%	18,23%
1997	5,19%	45,43%	30,78%	40,24%	25,59%
1998	5,32%	-18,92%	4,90%	-24,24%	-0,42%
1999	4,49%	10,93%	4,54%	6,44%	0,05%
2000	5,48%	3,11%	-18,30%	-2,37%	-23,78%
2001	5,87%	14,74%	-5,35%	8,87%	-11,22%
2002	1,74%	-38,15%	-30,52%	-39,89%	-32,26%
2003	1,22%	44,15%	48,71%	42,93%	47,49%
2004	0,93%	31,29%	24,23%	30,36%	23,30%
2005	2,32%	44,94%	21,34%	42,62%	19,02%
2006	4,16%	39,07%	25,08%	34,91%	20,92%
2007	5,07%	-8,34%	1,78%	-13,41%	-3,29%
2008	3,26%	-46,56%	-60,51%	-49,82%	-63,77%
2009	0,08%	59,94%	67,11%	59,86%	67,03%
2010	0,08%	17,71%	8,57%	17,63%	8,49%
2011	0,15%	2,30%	-13,51%	2,15%	-13,66%
2012	0,02%	6,52%	10,67%	6,50%	10,65%
2013	0,08%	31,01%	21,42%	30,93%	21,34%
2014	0,07%	27,66%	0,07%	27,59%	0,00%
Mean	2,83%	16,93%	9,23%	14,10%	6,40%