Magic Formula vs. Traditional Value Investment Strategies in the Finnish Stock Market

Denis Davydov, Jarno Tikkanen & Janne Äijö
December 2, 2016

Abstract

For the first time in a smaller market setting, we compare the performance of the magic formula proposed by Greenblatt (2006) against the most commonly used value investment strategies. We also test whether the cash flow-augmented magic formula is superior to other strategies. We find that while all tested value strategies consistently beat the market in the period 1991–2013, a strategy based on EBIT-to-enterprise-value ratio yields higher risk-adjusted returns on average. Furthermore, while the overall performance of the pure magic formula is not among the best, our findings show that the augmented magic formula yields the highest excess return during bull periods. The results also indicate that the reported abnormal returns are not compensation for higher level of risk.

Keywords:

value investing, investment strategy, portfolio management, magic formula

Denis Davydov is an Assistant Professor of Accounting and Finance at the University of Vaasa, Finland.
Jarno Tikkanen is a Portfolio Analyst at OP Wealth Management, Finland.
Janne Äijö is a Professor of Accounting and Finance at the University of Vaasa, Finland.

1. Introduction

Value investing is often considered one of the most popular investment strategies. Since it was originally proposed by Graham and Dodd (1934), value investing has evolved into many different forms and approaches. However, the basic principle underpinning the variants of value investing remain unchanged: stocks should be bought at a price lower than their intrinsic value. Graham and Dodd noticed that the market misjudges the fundamental value of some securities, making certain companies relatively undervalued. Numerous examples prove that these stocks tend to gain in value, thus creating fertile investment opportunities.

It is not surprising that the value investment strategies have attracted a great deal of attention from both academics and market professionals. Early literature on value strategies focuses mainly on the returns of US stocks with high Earnings to Price (E/P) or Book to Price (B/P) ratios. This literature suggests that the future returns of high E/P or B/P stocks are higher than the future returns of low E/P or B/P stocks (see e.g., Basu, 1977; Fama and French, 1992). Several other studies also use different traditional financial ratios such as the Cash Flow to Price (CF/P), Dividends to Price (D/P) and Earnings Before Income and Taxes to Enterprise Value (EBIT/EV) to confirm the existence of the value anomaly around the world (see e.g., Asness et al., 2013; Cakici and Tan, 2014; Chan and Lakonishok, 1991; 2004; Dimson et al., 2003; Elze, 2010; Fama and French, 1998; Kim, 2012; Lakonishok et al., 1994).[1] Using different methodological approaches, various authors have found value premiums on the portfolios to be in the range 2.6% to 17.1% p.a. Pätäri and Leivo (2015) provide an excellent survey of traditional value anomalies where they conclude that the best criteria for portfolio construction vary over time and across markets.

Although the value strategies have been extensively studied for several decades, academic literature still does not agree on the reasons for their ability to produce superior returns. Fama and French (1992), Kapadia (2011) and Vassalou and Xing (2004), for instance, argue that the value premiums emerge from the higher fundamental risk associated with the underlying companies. An alternative view, typified by the work of Campbell et al. (2008), Chan and Lakonishok (2004), La Porta (1996) and Lakonishok et al. (1994) argues that value premiums are not necessarily a result of higher risk, but are instead associated with the behaviour of investors, who tend to overvalue one company relative to another for a variety of reasons.[2] This strand of literature suggests that investors may extrapolate from the past performance of a company over too long an investment horizon, overreact to certain news announcements, or incorrectly assess a stock price trend, any of which can foster overoptimistic estimations of a firm's value. At the same time, stocks that do not attract the attention of the market participants may be undervalued. These under-priced stocks create the foundation for value investing strategies.

One of the most recent forms of the value investment strategy is that suggested by Greenblatt (2006, 2010), who selects stocks for a portfolio based on the enterprise value to earnings before interest and taxes (EV/EBIT) ratio and the return on invested capital (ROIC). Such a combination of stocks produced an annual return of 15.2% in the

1. In addition Leivo and Pätäri (2009, 2011), Pätäri et al. (2012), Pätäri and Leivo (2015) and Pätäri et al. (2016) confirm these findings by particularly examining the Finnish stock market.

2. Several other studies also show that when the riskiness of value and growth stocks are compared (betas and standard deviation), value stocks appear not to be any riskier than growth stocks or at least not as risky as suggested by the theory (Chan, et al., 1991; Kothari et al., 1995; Chan et al., 1995).

period 1988–2009, while the average return on the market index (S&P500) was 9.5% p.a. Greenblatt (2006, 2010) referred to this sorting technique as the "magic formula" because of its ability to consistently beat the market. Carlisle and Gray (2013) further examine the performance of this value strategy and document that an average value portfolio sorted in the same manner as in Greenblatt (2010) outperforms a growth portfolio by 7.96% p.a., while the difference between the average annual returns of value and market portfolios was about 3.27% in the period 1964–2011. These results are also robust for risk adjustment.

In this paper we test the recently suggested magic formula and compare its performance against the traditional value strategies in a different market setting. Although traditional value strategies have been tested all over the world, the magic value strategy has received surprisingly little attention outside of the US markets. Hence, in this paper, we examine the performance of the magic formula for the first time in a small financial market. Specifically, we test whether its claimed benefits apply to the Finnish stock market. The Finnish market serves as an interesting setting to examine the performance of the Greenblatt's value strategy for several reasons. First, the market is rather small in terms of number of listed firms, and consequently might exemplify the periphery syndrome.[3] Such characteristics also put significant limits on portfolio compositions, which make the investment strategy rather static in terms of stock combinations compared to markets with a greater number of listed firms. Second, the relatively high volatility and low liquidity of the Finnish stock market may affect the size of premiums as well as the risk-adjusted performance of the value strategies.

Besides comparing the performance of the magic formula against traditional value strategies for the first time outside of the US markets, we add to the existing literature by augmenting Greenblatt's (2010) magic formula (MF) with the cash-flow-to-price (CF/P) ratio, which has proved to be one of the most important ratios in value strategies (see e.g. Lakonishok et al., 1994; Chan and Lakonishok, 2004; and Jokipii and Vähämaa, 2006). We furthermore augment traditional value strategies based on B/P, CF/P and E/P ratios in portfolio formation with one of the major components of the MF, the return on invested capital (ROIC) ratio, to test whether that combination yields better performance. In addition, as value premiums are potentially subject to improper risk adjustment especially in a smaller market, we use an extensive set of risk-adjusted performance measures. In addition to the traditionally-used Sharpe ratio, we apply the Sortino ratio, which considers only the downside risk. We also compare the portfolios' ability to yield abnormal returns using the Carhart (1997) model to account for the market, size, value and momentum factors.[4] Finally, value strategies may be especially vulnerable in the case of distress and adverse market conditions (see e.g., Cakici and Tan, 2014; Kapadia, 2011; Vassalou and Xing, 2004). Hence, we separately analyse the performance of the value strategies during stock market upturns and downturns.

The empirical findings reported in this study suggest that while all tested value strategies significantly outperformed the OMX CAP GI between 1991 and 2013, the recently re-

3. As discussed in Leivo and Pätäri (2011), periphery syndrome describes the process of asset sales in times of market stress by institutional investors that prefer to withdraw money from the furthest stock exchanges first rather than from domestic markets.

4. We also apply the traditional market-adjusted and Fama and French (1992) three-factor model to ensure robustness of our results. The results remain similar across models.

ported superiority of the pure magic formula (Greenblatt, 2006, 2010) is not supported in a small market environment, like the Finnish stock market. The results show that an EBIT/EV strategy on average yields the highest risk-adjusted returns over the full sample of the study, while the proposed cash flow-augmented magic formula (MF-CF) seems to outperform other value strategies, especially during bull market periods. The average annual return during the whole sample period is 20.6% and 20.2% for the EBIT/EV and MF-CF strategies respectively, while the average annual return of the OMXH CAP GI is 13.6%. The results show that high returns on these value strategies are not compensation for the higher level of risk when measured in terms of volatility or downside deviation. The abnormal returns are also positive and statistically significant when the Carhart four-factor model is used. Therefore, documented high returns cannot be explained by value, size, or momentum factors.

The remainder of this paper is organized as follows. Section 2 describes the data from the Finnish stock market and presents the methodology applied. The empirical findings are reported in Section 3, while Section 4 describes additional tests that are done in order to ensure the robustness of our results. Section 5 concludes the paper.

2. Data and Methodology

The sample consists of public companies listed in the Finnish Stock Exchange in the period 1991–2013. The stock prices and index values are obtained from the NASDAQ OMX, while the data for the financial variables are obtained from the Thomson Reuters Datastream database.[5] Following Fama and French (1992) and Asness et al. (2013), financial companies are excluded from the sample due to different interpretations of their financial statements. In total, the number of companies varies from 39 to 136 and the final sample includes 2 234 company-year observations. The data include firms that have gone bankrupt, so the results should be free of survivor bias. In cases where the values were reported in the Finnish Markka (FIM) currency that preceded Finland's adoption of the Euro, an exchange rate of 5.94573 was used to convert them into Euros. The OMXH CAP GI index is used as the market portfolio as it includes dividends. The index is also capped meaning that the maximum weight of a single stock is 10%, so eliminating the excess effect of very large individual companies on the performance of the index.[6] Finally, 12-month Helibor (1991–1998) and 12-month Euribor (1999–2012) are used as the risk-free rate.

2.1. Forming the magic and traditional value portfolios

This paper tests the magic formula (MF) and the cash-flow augmented magic formula (MF-CF) and compares their performance against the traditional value strategies. The MF strategy uses the EV/EBIT ratio and return on invested capital (ROIC). The second strategy was chosen because earlier studies suggest that stocks with a high CF/P ratio may produce higher returns (see e.g., Lakonishok et al., 1994). Accordingly, this strategy uses EV/EBIT, ROIC and CF/P ratios to form portfolios. Traditional value portfolios are based on the following ratios: B/P, E/P and CF/P. We also include EBIT/EV ratio as recent evidence shows

5. It is acknowledged that Datastream may have problems with small stock market data. Following Ince and Porter (2006), we manually screened our data sample to ensure that there were no unusually high monthly returns or dividend yields. Our sample does not contain any unusually high returns and contained only two observations with abnormally high dividends which we manually corrected using the companies' annual reports.

6. For example, Nokia Oyj accounted for over 70% of the proportion of the market capitalization of the value weighted OMX Helsinki (OMXH) index around the time of the technology bubble.

the superiority of the pure EBIT/EV ratio over the other value strategies in the Finnish stock market (Pätäri et al. 2016). Following Fama and French (1992) and Chan et al. (1991), the portfolios are formed every year on the last trading day of June. Therefore, the portfolio formation is based on the accounting variables as per the end of the previous year and stock prices at the end of June. This approach reduces the risk that the results are influenced by the look-ahead bias that can be a problem in studies of this kind.

The traditional value portfolios include the top 30% of equally weighted stocks sorted using the B/P, E/P, CF/P and EBIT/EV ratios. The portfolio based on the MF strategy includes the top 30% of stocks[7] with equal weights based on the following three-step procedure:

1. The companies are ranked based on their ROIC, so that the company with the highest ROIC was assigned first place.
2. The second step includes the companies ranked on their EV/EBIT ratio. The company with the lowest EV/EBIT ratio is ranked first and the company with the highest EV/EBIT ratio is ranked last. It should be noted that rankings are accounted for negative values of the coefficient. Specifically, companies with negative values are ranked after companies with positive values in order to avoid ranking companies with negative EV/EBIT ratios above those with positive EV/EBIT ratios.
3. In the last step, the rankings of companies are averaged. For example, if a company is ranked fifth based on the ROIC and sixth based on the EV/EBIT ratio, its average ranking is 5.5. Subsequently, the companies are sorted by those average rankings.

The procedure for the portfolio based on the MF-CF strategy is otherwise the same, but stocks are also ranked based on their CF/P ratio. We define the CF as in the study by Hou et al. (2011), that is, as the sum of net income and non-cash charges or credits that include depreciation and amortization items plus income statement deferred taxes.

If the stock is delisted during the holding period, it is assumed that the stock is sold on the last trading day, and the funds are invested at the risk-free rate until the end of the holding period. If a company is declared bankrupt during the holding period, the return of that stock is -100%. Following Rinne and Vähämaa (2011), cash dividends are reinvested in the same stock. Finally, the weight changes of the stocks stemming from the variability of constituent stock returns during the holding periods are taken into account in the calculation of time-series returns for portfolios.

2.2. Risk-adjusted performance measures

The risk-adjusted performance of the portfolios is measured using the Sharpe (1966) ratio that is commonly used in value anomaly literature. We apply the Ledoit–Wolf (2008) approach to test the statistical difference between the Sharpe ratios of the value strategies and the market. In order to avoid the problems stemming from negative excess returns used to calculate the Sharpe ratios, we use the following refinement for the denominator of the Sharpe ratio as suggested by Israelsen (2005):

7. Greenblatt (2006) used 20–30 US stocks to form magic portfolios. However, the small number of publicly traded companies in Finland, especially in the early part of the sample, restricts the number of stocks that can be included in the portfolios. Having a fixed number of stocks in a portfolio may potentially reduce the validity of a year-to-year comparison. Therefore, it is justified to let the number of stocks vary at each checkpoint of portfolio re-formation. We are grateful to an anonymous referee for pointing out this issue.

(1)
$$S_p = \frac{R_p - R_f}{\sigma_p^{(ER/|ER|)}}$$

where ER = Excess return that is equal
σ_p = Standard deviation of monthly excess returns of portfolio p

The Sharpe ratio has been criticized because it penalizes very high positive returns as they also increase the standard deviation (Goetzmann et al., 2007). Therefore, we also use the Sortino ratio which uses only negative returns to measure risk (Sortino & van der Meer 1991; Sortino & Price 1994). The Sortino ratio uses the root-mean-square deviation below the minimum acceptable return (i.e. downside deviation). The risk-free rate is used in this study as a minimum acceptable return. More formally, the Sortino ratio can be represented with the following equation:

(2)
$$SR_p = \frac{R_p - MAR}{\sqrt{\frac{1}{n}\sum_{R_p<MAR}(R_p - MAR)^2}}$$

where MAR = Minimum acceptable returnl
R_p =Return of portfolio p

In addition to these portfolio performance measures, we use the Carhart (1997) four-factor model to measure abnormal returns in order to determine whether the potential outperformance of the magic and traditional value strategies can be explained by the market, size, value or momentum factors.[8] Following Fama and French (1998), the equally weighted value portfolio includes the top 30% of stocks sorted using the B/P ratio. Conversely, the growth portfolio includes the bottom 30% of stocks with equal weights. The high minus low (HML) is the difference between equally weighted returns of stocks with a high B/P ratio and stocks with a low B/P ratio. The size factor (small minus big, SMB) is formed in a similar manner using market values of equity as the criterion.

The momentum portfolio is formed using the last 11-months returns with a 1-month lag. The winner portfolio consists of the top 30% of stocks with the highest returns over the past 11-month period with a 1-month lag. Conversely, the loser portfolio consists of stocks with the worst performance during the same period. Therefore, the momentum portfolio (winner minus losers, WML) is the difference between equally weighted returns of the winner and loser portfolios. In order to avoid autocorrelation and heteroscedasticity in the regressions, Newey and West (1987) robust standard errors are used. More formally, abnormal returns in the four-factor model are obtained from the following equation:

(3)
$$R_i - R_f = \alpha_i + b_i(R_m - R_f) + s_i SMB + h_i HML + w_i WML$$

We also report differences in abnormal returns (i.e. alphas) of value and growth portfolios for each strategy to give a better insight into the value investment strategy. The statistical significance of the difference in alphas between portfolios is tested through the following alpha spread test:

8. The abnormal returns were also obtained from the market-adjusted (Brown & Warner 1980) and the Fama-French (1992, 1993) three-factor model. For the sake of brevity, we report the results only from the Carhart four-factor model as it provides the highest adjusted R-squares in all model specifications.

(4) $$t = \frac{\alpha_i - \alpha_j}{\sqrt{SE^2_{\alpha i} + SE^2_{\alpha j}}}.$$

where α_i = alpha of a portfolio i
α_j = alpha of a portfolio j
SE^2_α = standard error of portfolio's alpha

3. Results

3.1. Performance of the magic and traditional value strategies

Columns 1 and 2 in Panel A of Table 1 show the annual returns for the MF and MF-CF strategies over the sample period 1991–2013. The MF (MF-CF) strategy produced an average annual return of 19.3% (20.2%), while the average annual return for the OMXH CAP GI was 13.6%. The results imply that both of the magic portfolios beat the market. While beating the market may be sufficient for some, others might question whether the magic formulas are useful to a value investor. Therefore, in Columns 3–6 we report the performance of the traditional value portfolios formed based on the B/P (Column 3), CF/P (Column 4), E/P (Column 5), and EBIT/EV (Column 6) ratios. The E/P and EBIT/EV strategies yield similar average returns. The mean annual return for the E/P strategy is 20.5%, while it is 20.6% for the EBIT/EV strategy. Overall, it seems that all tested value strategies beat the market in terms of annual returns, while the MF-CF is in top three best performing strategies.

Panel A also indicates that the level of risk varies across the portfolios examined. Hence, for an equity investor it may be more relevant to look at the risk-adjusted performance ratios that are reported in Panel B of Table 1. Columns 1-2 of Panel B show the Sharpe ratios for the magic portfolios. The mean Sharpe ratios for the magic portfolios are higher than those of the market. For example, the Sharpe ratio for the MF (MF-CF) is 0.641 (0.684), while it is 0.380 for the market. However, according to the Ledoit–Wolf (2008) test of significance, which is based on the circular block bootstrap method, only three out of six tested strategies perform statistically better than the market – MF-CF, E/P and EBIT/EV, suggesting that these strategies offer a higher excess return per single unit of total risk. When comparing the Sharpe ratios with the other value strategies, the results suggest that the EBIT/EV value strategy performs the best with a Sharpe ratio of 0.704 followed by the MF-CF (0.684) and E/P (0.683) strategies. Similar conclusions about the performance of the value strategies can be drawn based on the Sortino ratio. Overall, the results suggest that EBIT/EV, E/P and MF-CF are among the top three performers in investigated value strategies.

Next, we examine whether the documented abnormally high returns can be explained by a wider set of risk-adjustment methods. The purpose of this part of the analysis is to test whether these high returns can be explained by the market, size, value, or momentum factors. Panel C of Table 1 reports abnormal returns for each investigated value strategy. The reported alphas are obtained from the Carhart four-factor model, as it yields the highest R-square in the regressions. As can be seen from the table, abnormal annualized returns are the highest for the MF-CF (7.7%), followed by the EBIT/EV (7.6%), E/P (7.2%) and MF (6.7%) strategies. These results confirm our findings in panel A of Table 1 and indicate that the proposed cash-flow augmented MF yields one of the highest risk-adjusted returns on the Finnish stock market. Overall, with the exception of the B/P and CF/P strategies, all other value strategies yield statistically significant abnormal returns, implying that the Carhart four-factor risk-adjusted model is not able to explain documented high returns of value strategies. Panel C also reports the alpha spread of the long-short portfolios for each strategy. These results show that the spread between value and growth portfolios is pos-

Table 1. Summary statistics and performance of Magic strategies and traditional value strategies

The table shows yearly returns and performance ratios of traditional value strategies as well as MF strategies based on the top 30% of stocks in portfolios sorting. Panel A reports annual returns for the MF and MF-CF strategies (Columns 1-2), the four traditional strategies (Columns 3-6) and the market index (Column 7) over the sample period of 30.6.1991–30.6.2013. Reported skewness and kurtosis statistics are calculated on the basis of monthly return time-series. Panel B reports performance ratios for different strategies. The performance ratios have been calculated on the basis of monthly returns, but the reported figures are annualized. P-values (in brackets) are obtained from Ledoit–Wolf test for significance in difference in Sharpe ratios with the market. Panel C reports factor loadings for the Carhart four-factor model. *,** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

PANEL A: SUMMARY STATISTICS	(1) MF	(2) MF-CF	(3) B/P	(4) CF/P	(5) E/P	(6) EBIT/EV	(7) MARKET
Mean return	19.26%	20.17%	16.74%	19.04%	20.50%	20.57%	13.63%
Std. dev.	22.63%	22.49%	25.34%	23.81%	22.99%	22.42%	22.96%
Skewness	-0.070	0.030	0.579	0.171	0.240	0.083	0.267
Kurtosis	4.956	5.298	6.199	4.556	5.128	5.040	4.261

PANEL B: PERFORMANCE RATIOS	(1) MF	(2) MF-CF	(3) B/P	(4) CF/P	(5) E/P	(6) EBIT/EV	(7) MARKET
Sharpe ratio	0.641	0.684	0.478	0.601	0.683	0.704	0.380
Sharpe (Value - Market)	0.261	0.304*	0.098	0.221	0.303*	0.324*	
	(0.118)	(0.061)	(0.576)	(0.181)	(0.058)	(0.057)	
Sortino ratio	1.022	1.104	0.798	0.981	1.134	1.161	0.593

PANEL C: ABNORMAL RETURNS AND FACTOR LOADINGS	(1) MF	(2) MF-CF	(3) B/P	(4) CF/P	(5) E/P	(6) EBIT/EV
Alpha	6.71%**	7.66%**	1.01%	4.67%	7.22%**	7.58%**
	(0.033)	(0.017)	(0.745)	(0.154)	(0.013)	(0.020)
Market	0.741***	0.729***	0.808***	0.788***	0.751***	0.729***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HML	-0.040	-0.001	0.489***	0.200***	0.048	0.015
	(0.433)	(0.987)	(0.000)	(0.001)	(0.486)	(0.774)
SMB	0.080**	0.057	0.198***	0.145***	0.089*	0.097**
	(0.049)	(0.260)	(0.000)	(0.003)	(0.061)	(0.029)
WML	-0.056	-0.101	-0.110**	-0.090	-0.182***	-0.038
	(0.290)	(0.113)	(0.035)	(0.101)	(0.003)	(0.485)
Adj. R-sqr.	56.39%	57.30%	68.60%	60.79%	62.70%	54.40%
Alpha spread	8.46%*	11.85%**	0.78%	12.06%**	9.73%**	11.31%**
(value - growth)	(0.060)	(0.012)	(0.859)	(0.012)	(0.026)	(0.017)

itive and statistically significant for all value strategies except for the B/P strategy. The alpha spread is the largest for the CF/P (12.1%), MF-CF (11.9%) and EBIT/EV (11.3%) strategies, implying that these strategies may be particularly useful for forming long-short equity portfolios. Appendix 1 provides summary statistics for the growth portfolios, i.e. the short leg of the strategies.

Panel C of Table 1 also reports each strategy's factor loadings on the Carhart (1997) four-factor model. The estimated betas for the market factor indicate that all value strategies are associated with relatively low level of systematic risk, as their betas vary between 0.729 and 0.808, and they are subject to a lower level of systematic risk than growth strategies reported in the Appendix 1. Furthermore, most of the value strategies are positively associated with the size (SMB) factor implying that these portfolios consist of small stocks. Some strategies, like those that are based on B/P or CF/P ratios are also negatively associated with the momentum (WML) factor. Interestingly, the estimated betas show that the MF and MF-CF strategies have negative, albeit not statistically significant loading on the value factor suggesting that these strategies may be more tilted towards the quality side of a strategy rather than the value.

To give a better view on the performance of these strategies over time, the cumulative monthly returns of the magic (MF, MF-CF) and top performing traditional value strategies (E/P, EBIT/EV) and the OMXH CAP GI are presented in Figure 1. All strategies outperformed the market index during the sample period and the differences are economically significant. While the EBIT/EV strategy seems to consistently yield the highest returns, the E/P and the MF-CF strategies have similar end values. Figure 1 indicates that the pure magic formula, suggested by Greenblatt (2006), is not among the best value strategies in the Finnish stock market. However, the performance of the augmented magic formula (MF-CF) is among the best ones.

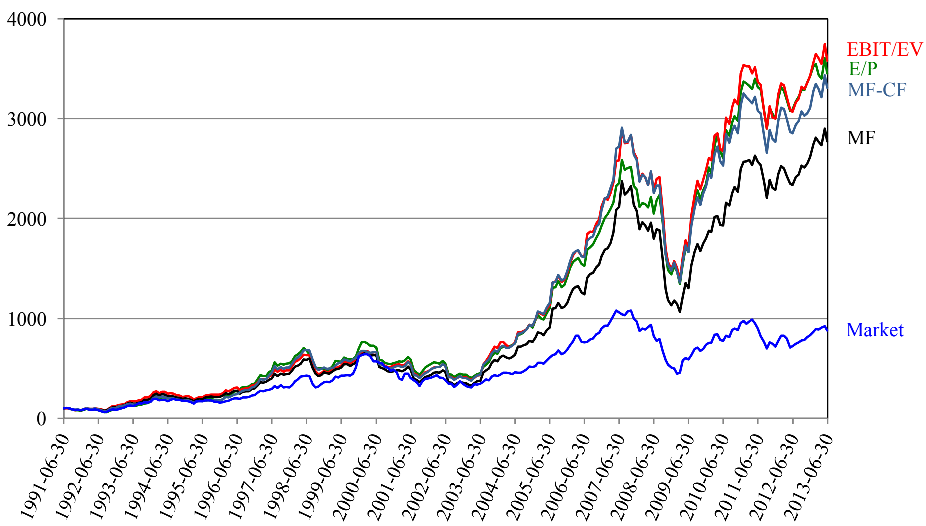

Figure 1. Cumulative monthly returns of MF, MF-CF, CF/P, EBIT/EV and the market index

3.2. The performance of the value strategies during bull and bear market periods

Similar to other studies on traditional value strategies (see e.g., Lakonishok et al., 1994) we are interested in the performance of the magic and other value strategies separately during bull and bear market periods. If these strategies involve taking additional risk which is not captured in the analysis above, one would expect to see relatively lower risk-adjusted returns especially during market downturns. The bull and bear market periods are defined using a simple filtering rule applied in previous studies (e.g., Lunde and Timmermann, 2004). We set □1 at 0.20 and □2 at 0.15. According to this rule, an increase of 20% over the last trough signals a bull market and a decrease of 15% over the last peak signals a bear market. We set □2 < □1 in order to take the upward drift in stock prices into consideration. Using this method, we get an aggregate bull (bear) market period consisting of 177 (87) monthly returns. That aggregate bull period includes seven separate periods. Correspondingly, our aggregate bear period includes seven separate periods.

The average returns and performance ratios are presented in Table 2 alongside the risk-adjusted returns. Panel A shows the performance of the value strategies during the bull periods. The average annualized return of the market (Column 7) is about 33.9%. The B/P strategy yields 37.9%, while the MF and EBIT/EV strategies yield relatively higher returns of 41.4% and 42.3%, respectively. The MF-CF and E/P strategies, in turn, yield the best average annualized rate of returns of 43.2% and 44.1%, respectively. Additionally, the MF-CF strategy seems to yield the highest risk-adjusted return, as measured by the Sharpe ratio (1.95). Abnormal returns, measured with the four-factor model (Carhart, 1997) also indicate that the MF-CF strategy provides the highest and a statistically significant abnormal return of 14.2%. However, one should interpret these abnormal returns as well as the results of the Ledoit-Wolf test with caution as this part of the analysis may potentially be a subject to validity issues stemming from the discontinuity characteristics of the return time-series during bull and bear periods.[9]

Panel B of Table 2 shows that value strategies seem to marginally outperform the market in terms of average returns and various performance measures also during bear periods. Nevertheless, abnormal returns in all examined strategies, except the B/P strategy, are not statistically different from zero at the conventional levels of significance implying that most of the value strategies are not particularly riskier in bad stock market environment. These results are broadly consistent with prior findings from the Finnish stock market (see e.g., Leivo, 2012; Leivo et al., 2009). Finally, the alpha spreads between value and growth portfolios are also not statistically distinguishable from zero, implying that long-short value strategies in general are not as profitable during bear periods as during bull periods.

[9]. We would like to thank the anonymous referee for pointing out this issue.

Table 2. Returns and performance of traditional and magic value strategies during the bull and bear markets

The table reports monthly returns and performance ratios of the MF strategies (Columns 1–2), the traditional value strategies (Columns 3–6) and the market index (Column 7). Panel A presents the results from bull market periods, while Panel B reports results from bear market periods. These periods are defined using a simple filtering rule applied in earlier studies (e.g. Lunde and Timmermann, 2004). Abnormal returns and corresponding p-values (in brackets) are obtained from the Carhart four-factor model as it yields the highest adjusted R-squares. *,** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

PANEL A: BULL PERIODS	(1) MF	(2) MF-CF	(3) B/P	(4) CF/P	(5) E/P	(6) EBIT/EV	(7) MARKET
Mean return	41.40%	43.20%	37.90%	42.20%	44.10%	42.30%	33.90%
Std. dev.	19.87%	19.62%	24.83%	22.05%	21.07%	19.85%	19.67%
Skewness	0.461	0.596	1.167	0.683	0.885	0.549	1.015
Kurtosis	5.088	5.943	6.513	4.571	5.733	4.825	5.550
Sharpe ratio	1.837	1.950	1.330	1.689	1.858	1.884	1.487
Sharpe (Value - Market)	0.350	0.463	-0.157	0.202	0.371	0.397	
	(0.227)	(0.105)	(0.391)	(0.464)	(0.152)	(0.156)	
Sortino ratio	4.171	4.641	3.155	4.016	4.743	4.512	3.513
Abnormal returns	11.59%***	14.23%***	7.94%**	11.30%***	13.70%***	12.54%***	
(4-factor model)	(0.001)	(0.000)	(0.039)	(0.002)	(0.000)	(0.001)	
Alpha spread	11.31%**	16.15%***	1.67%	13.83%**	13.46%**	15.57%***	
(value - growth)	(0.027)	(0.004)	(0.759)	(0.012)	(0.016)	(0.006)	
Adj. R-sqr.	50.58%	50.69%	71.47%	59.48%	58.13%	51.12%	
Bull periods:	10.1992–1.1995; 7.1995–7.1998; 3.1999–8.2000; 11.2001–6.2002; 8.2003–12.2007; 4.2009–6.2011; 1.2013–6.2013						

PANEL B: BEAR PERIODS	(1) MF	(2) MF-CF	(3) B/P	(4) CF/P	(5) E/P	(6) EBIT/EV	(7) MARKET
Mean return	-16.30%	-16.60%	-17.40%	-17.80%	-17.00%	-14.60%	-20.10%
Std. dev.	24.49%	24.32%	23.47%	23.79%	23.10%	24.10%	25.86%
Skewness	-0.193	-0.054	-0.702	-0.338	-0.344	0.026	0.190
Kurtosis	4.411	4.567	3.814	3.743	3.519	5.169	2.729
Sharpe ratio	-0.050	-0.051	-0.050	-0.052	-0.049	-0.045	-0.062
Sharpe (Value - Market)	0.012	0.012	0.012	0.010	0.013	0.017	
	(0.641)	(0.726)	(0.934)	(0.939)	(0.886)	(0.537)	
Sortino ratio	-0.950	-0.967	-0.980	-1.000	-0.992	-0.909	-1.050
Abnormal returns	-5.31%	-6.34%	-12.27%**	-9.73%	-7.70%	-4.32%	
(4-factor model)	(0.396)	(0.337)	(0.022)	(0.118)	(0.187)	(0.531)	
Alpha spread	7.30%	9.47%	2.73%	12.15%	4.76%	9.15%	
(value - growth)	(0.406)	(0.298)	(0.722)	(0.130)	(0.560)	(0.333)	
Adj. R-sqr.	53.89%	56.00%	57.33%	54.41%	60.79%	47.60%	
Bear periods:	7.1991–9.1992; 2.1995–6.1995; 8.1998–2.1999; 9.2000–10.2001; 7.2002–7.2003; 1.2008–3.2009; 7.2011–12.2012						

4. Additional tests

In order to ensure the robustness of our results, we perform several additional tests. First, we re-estimate our results after adjusting the returns for transaction costs. The prior literature suggests that one-way transaction costs vary between 0.23% and 0.5% (see e.g., Berkowitz et al., 1988, Jegadeesh and Titman, 1993). As a more conservative measure, we use 0.5% one-way transaction costs in our analysis. Given that the average turnover of the constructed portfolios varies between 49.6% and 57.6% and assuming that portfolio reformation includes both buy and sell orders, we estimate the transaction costs to vary between 0.50% and 0.58%, respectively.[10] The adjustment for transaction costs does not significantly affect our results.[11]

Second, given that the augmented magic formula (MF-CF) appears to be among the best performing in the Finnish stock market and for the sake of impartiality, we combine other traditional valuation ratios with an essential component of the magic formula, the ROIC. These augmented traditional value portfolios are formed in the same manner as the magic portfolios (see Section 2.1). Table 3 reports the results from this part of the analysis. We reproduce the results for MF and MF-CF strategies in Columns 1 and 2 for comparison reasons and report the statistics of augmented value strategies in Columns 3 to 5, and of the market in Column 6. The MF-CF, B/P & ROIC and CF/P & ROIC strategies yield marginally similar results and are among the best performing augmented strategies. Nevertheless, the MF-CF strategy yields the highest abnormal return and demonstrates the best performance according to Sharpe and Sortino ratios. In addition, the alpha spread between value and growth portfolios of MF-CF strategy is the highest among the other augmented strategies.

5. Conclusions

This study examines the recently suggested value investment strategy called the magic formula (MF) in the Finnish stock market and compares its performance against most commonly used value investment strategies. Originally proposed by Greenblatt (2006), the MF uses enterprise value to earnings before interest and taxes (EV/EBIT) ratio and return on invested capital (ROIC) to form portfolios. Besides examining the ability of the MF to generate excess stock returns for the first time outside the US stock markets, we propose an augmented magic formula, which also uses cash-flow-to-price (CF/P) as an additional criterion in the formation of a portfolio (MF-CF). Both of the investigated MFs are tested against traditional value strategies, which use B/P, CF/P, E/P and EBIT/EV ratios in the formation of a portfolio. This part of the analysis aims to investigate whether using MFs can benefit a value investor.

The results of this study show that both MF strategies outperform the OMXH CAP GI between 1991 and 2013, as the MF (MF-CF) portfolios produced an average annual return of 19.3% (20.2%), while the average annual return for the OMXH CAP GI was 13.6%. The results are robust after controlling for various risk-adjustment methods, such as the Carhart four-factor model. This study also provides further evidence to suggest that the recently reported superiority of the pure magic formula (Greenblatt, 2006, 2010) is not supported in the small market environment like the Finnish stock market, as the obtained results show that E/P and EBIT/EV strategies on average yield higher risk-adjusted returns over the full sample period. These findings are broadly consistent with previous evidence on performance of traditional value strategies on the Finnish stock market (see e.g. Pätäri and

10. Calculated as two-way transaction costs times average portfolio turnover ([0.005+0.005]*0.512).
11. We do not tabulate these results for the sake of brevity. However, they are available from the authors upon request.

Table 3. Summary statistics and performance of magic formula strategies and augmented value strategies

The table shows yearly returns and performance ratios of the magic strategies as well as augmented value strategies. Panel A reports annual returns for MF and MF-CF strategies (Columns 1-2), three augmented value strategies (Columns 3-5), and the market index (Column 6) over the sample period of 30.6.1991–30.6.2013. Panel B reports performance ratios that are calculated as in Table 1. Panel C reports abnormal risk-adjusted monthly returns. Reported alphas and p-values (in brackets) are obtained from the Carhart four-factor model. *,** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

PANEL A: SUMMARY STATISTICS	(1) MF	(2) MF-CF	(3) B/P & ROIC	(4) CF/P & ROIC	(5) E/P & ROIC	(6) MARKET
Mean return	19.26%	20.17%	20.85%	20.14%	17.98%	13.63%
Std. dev.	22.63%	22.49%	24.44%	22.87%	22.51%	22.96%
Skewness	-0.070	0.030	0.424	-0.083	-0.200	0.267
Kurtosis	4.956	5.298	6.365	5.206	5.268	4.261

PANEL B: PERFORMANCE RATIOS	(1) MF	(2) MF-CF	(3) B/P & ROIC	(4) CF/P & ROIC	(5) E/P & ROIC	(6) MARKET
Sharpe ratio	0.641	0.684	0.656	0.671	0.589	0.380
Sharpe (Value - Market)	0.261	0.304*	0.276*	0.291*	0.209	
	(0.118)	(0.061)	(0.075)	(0.077)	(0.226)	
Sortino ratio	1.022	1.104	1.100	1.071	0.911	0.593

PANEL C: ABNORMAL RETURNS (4-FACTOR)	(1) MF	(2) MF-CF	(3) B/P & ROIC	(4) CF/P & ROIC	(5) E/P & ROIC
Alpha	6.71%**	7.66%**	5.67%*	7.41%**	6.65%**
	(0.033)	(0.017)	(0.071)	(0.022)	(0.044)
Market	0.741***	0.729***	0.794***	0.745***	0.708***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HML	-0.040	-0.001	0.138***	0.014	-0.040
	(0.433)	(0.987)	(0.003)	(0.777)	(0.491)
SMB	0.080**	0.057	0.207**	0.059	-0.002
	(0.049)	(0.260)	(0.018)	(0.214)	(0.965)
WML	-0.056	-0.101	-0.173***	-0.124**	-0.161***
	(0.290)	(0.113)	(0.009)	(0.024)	(0.005)
Adj. R-sqr.	56.39%	57.30%	62.87%	59.05%	58.05%
Alpha spread	8.46%*	11.85%**	6.28%	9.70%**	10.84%**
(value - growth)	(0.060)	(0.012)	(0.156)	(0.041)	(0.019)

Leivo, 2015). Nevertheless, the performance of proposed cash flow-augmented magic formula (MF-CF) is, in turn, among the best ones as it seems to outperform other value strategies, especially during bull market periods. Overall, the results show that high returns on these value strategies are not compensation for the higher level of risk when measured by volatility or downside deviation. The abnormal returns are also positive and statistically significant when the Carhart four-factor model is used. Therefore, the documented high returns cannot be explained by value, size, or momentum factors.

References

Asness, C., T. Moskowitz & L. Pedersen (2013). Value and Momentum Everywhere. *Journal of Finance* 68:3, 929–985.

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* 32:3, 663–682.

Berkowitz, S., D. Logue & E. Noser (1988). The Total Cost of Transactions on the NYSE. *Journal of Finance* 43:1, 97–112.

Brown, S. & J. Warner (1980). Measuring Security Price Performance. *Journal of Financial Economics* 8:3, 205–258.

Cakici, N. & S. Tan (2014). Size, Value, and Momentum in Developed Country Equity Returns: Macroeconomic and Liquidity Exposures. *Journal of International Money and Finance* 44, 179–209.

Campbell, J., J. Hilscher & J. Szilagyi (2008). In Search of Distress Risk. *Journal of Finance* 63:6, 2899–2939.

Carhart, M. (1997). On Persistence in Mutual Fund Performance. *Journal of Finance* 52:1, 57–82.

Carlisle, T. & W. Gray (2013). *Quantitative Value.* John Wiley & Sons, Inc.

Chan, L., Y. Hamao & J. Lakonishok (1991). Fundamentals and Stock Returns in Japan. *Journal of Finance* 46:5, 1739–1764.

Chan, L., N. Jegadeesh & J. Lakonishok (1995). Evaluating the Performance of Value versus Flamour Stocks: The Impact of Selection Bias. *Journal of Financial Economics* 38:3, 269–296.

Chan, L. & J. Lakonishok (2004). Value and Growth Investing: Review and Update. *Financial Analysts Journal* 60:1, 71–86.

Dimson, E., S. Nagel & G. Quigley (2003). Capturing the Value Premium in the United Kingdom. *Financial Analysts Journal* 59:6, 35–45.

Elze, G. (2010). Value investing anomalies in the European stock market: Multiple value, Consistent earner, and Recognized value. *Quarterly Review of Economics & Finance* 50:4, 527–537.

Fama, E. & K. French (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance* 47:2, 427–465.

Fama, E. & K. French (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics* 33:1, 3–56.

Fama, E. & K. French (1998). Value versus Growth: The International Evidence. *Journal of Finance* 53:6, 1975–1999.

Goetzmann, W., J. Ingersoll & M. Spiegel (2007). Portfolio Performance Manipulation and Manipulation-proof Performance Measures. *Review of Financial Studies* 20:5, 1503–1546.

Graham, B. & D. Dodd (1934). *Security Analysis.* McGraw-Hill Companies, Inc.

Greenblatt, J. (2006). *The Little Book That Beats the Market.* John Wiley & Sons, Inc.

Greenblatt, J. (2010). *The Little Book That Still Beats the Market.* John Wiley & Sons, Inc.

Hou, K., G. Karolyi, & B. Kho (2011). What factors drive global stock returns? *Review of Financial Studies* 24, 2527–2574.

Ince, O. & R. Porter (2006). Individual Equity Return Data from Thomson Datastream: Handle with Care! *Journal of Financial Research* 29:4, 463–479.

Israelsen, C.L. (2005). A Refinement to the Sharpe Ratio and Information Ratio. *Journal of Asset Management* 5, 423–427.

Jegadeesh, N. & S. Titman (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *Journal of Finance* 48:1, 65–91.

Jokipii, A. & S. Vähämaa (2006). The Free Cash Flow Anomaly Revisited: Finnish Evidence. *Journal of Business Finance & Accounting* 33:7–8, 961–978.

Kapadia, N. (2011). Tracking Down Distress Risk. *Journal of Financial Economics* 102:1, 167–182.

Kim, D. (2012). Value Premium across Countries. *Journal of Portfolio Management* 38:4, 75–86.

Kothari, S., J. Shanken & R. Sloan (1995). Another Look at the Cross-section of Expected Stock Returns. *Journal of Finance* 50:1, 185–224.

La Porta, R. (1996). Expectations and the Cross-section of Stock Returns. *Journal of Finance* 51:5, 1715–1742.

Lakonishok, J., A. Shleifer & R. Vishny (1994). Contrarian Investment, Extrapolation, and Risk. *Journal of Finance* 49:5, 1541–1578.

Ledoit, O & M. Wolf (2008). Robust Performance Hypothesis Testing with the Sharpe Ratio. *Journal of Empirical Finance* 15:5, 850–859.

Leivo, T. (2012). Combining value and momentum indicators in varying stock market conditions: The Finnish evidence. *Review of Accounting and Finance* 11:4, 400–447

Leivo, T. & E. Pätäri (2009). Performance of the Value Strategies in the Finnish Stock Markets. *Journal of Money, Investment and Banking* 8, 5–24.

Leivo, T. & E. Pätäri (2011). Enhancement of Value Portfolio Performance using Momentum and the Long-Short Strategy: the Finnish Evidence. *Journal of Asset Management* 11:6, 401–416.

Leivo, T., E. Pätäri & I. Kilpiä (2009). Value Enhancement Using Composite Measures: The Finnish Evidence. *International Research Journal of Finance and Economics* 33:4, 7–30.

Lunde, A. & A. Timmermann (2004). Duration Dependence in Stock Prices. *Journal of Business & Economic Statistics* 22:3, 253–273.

Newey, W. & K. West (1987). A Simple Semidefinite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica* 55:3, 703–708.

Pätäri, E., T. Leivo & S. Honkapuro (2012). Enhancement of equity portfolio performance using data envelopment analysis. *European Journal of Operational Research* 220:3, 786–797.

Pätäri, E. & T. Leivo (2015). A Closer Look at Value Premium: Literature Review and Synthesis. *Journal of Economic Surveys*.

Pätäri, E. V. Karell & P. Luukka (2016). Can Size-, Industry-, and Leverage-adjustment of Valuation Ratios Benefit the Value Investor? *International Journal of Business Innovation and Research* 11:1, 76–109.

Rinne, E. & S. Vähämaa (2011). The 'Dogs of the Dow' Strategy Revisited: Finnish Evidence. *European Journal of Finance* 17:5, 451–469.

Sharpe, W. (1966). Mutual Fund Performance. *Journal of Business* 39:1, 119–138.

Sortino, F. & R. van der Meer (1991). Downside Risk. *Journal of Portfolio Management* 17:4, 27–31.

Sortino, F. & L. Price (1994). Performance Measurement in a Downside Risk Framework. *Journal of Investing* 3:3, 59–64.

Vassalou, M. & Y. Xing (2004). Default Risk in Equity Returns. *Journal of Finance* 59, 831–868.

Appendix 1.
Summary statistics and performance of the growth portfolios

The table shows yearly returns and performance ratios of the short leg of investment strategies, i.e. growth portfolios. Panel A reports annual returns, standard deviation, skewness and kurtosis statistics calculated based on the monthly return time-series over the sample period of 30.6.1991–30.6.2013. Panel B reports performance ratios for different strategies. The performance ratios have been calculated on the basis of monthly returns, but the reported figures are annualized. P-values (in brackets) are obtained from Ledoit–Wolf test for significance in difference in Sharpe ratios with the market. Panel C reports factor loadings for the Carhart four-factor model. *,** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

PANEL A: SUMMARY STATISTICS	(1) MF	(2) MF-CF	(3) B/P	(4) CF/P	(5) E/P	(6) EBIT/EV	(7) MARKET
Mean return	14.27%	11.74%	13.17%	8.03%	14.92%	12.60%	13.63%
Std. dev.	22.63%	28.29%	25.17%	27.80%	29.34%	28.72%	22.96%
Skewness	0.460	0.602	-0.034	0.255	0.605	0.454	0.267
Kurtosis	4.838	5.200	4.676	4.504	5.544	4.670	4.261
PANEL B: PERFORMANCE RATIOS	**(1) MF**	**(2) MF-CF**	**(3) B/P**	**(4) CF/P**	**(5) E/P**	**(6) EBIT/EV**	**(7) MARKET**
Sharpe ratio	0.344	0.357	0.344	0.134	0.353	0.282	0.380
Sharpe (Growth - Market)	-0.036	-0.023	-0.036	-0.246	-0.027	-0.098	
	(0.869)	(0.421)	(0.818)	(0.113)	(0.845)	(0.542)	
Sortino ratio	0.594	0.423	0.521	0.201	0.582	0.459	0.593
PANEL C: ABNORMAL RETURNS AND FACTOR LOADINGS	**(1) MF**	**(2) MF-CF**	**(3) B/P**	**(4) CF/P**	**(5) E/P**	**(6) EBIT/EV**	
Alpha	-1.75%	-4.19%	0.23%	-7.40%**	-2.50%	-3.72%	
	(0.586)	(0.227)	(0.937)	(0.013)	(0.445)	(0.283)	
Market	0.861***	0.919***	0.834***	0.948***	0.970***	0.952***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
HML	0.047	-0.033	-0.437***	-0.258***	-0.122	-0.103	
	(0.534)	(0.716)	(0.000)	(0.000)	(0.306)	(0.252)	
SMB	0.350**	0.345	0.244***	0.380***	0.447*	0.370**	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
WML	-0.220	-0.225	-0.111**	-0.145	-0.194***	-0.231	
	(0.003)	(0.000)	(0.035)	(0.013)	(0.020)	(0.002)	
	0.861***	0.919***	0.834***	0.948***	0.970***	0.952***	
Adj. R-sqr.	62.72%	64.20%	68.31%	67.74%	66.09%	66.83%	