Comparison between the value investing strategy of Piotroski (2000) and the governance based investment strategy of Gompers, Ishii, Metrick (2003)

Master Thesis

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ABSTRACT

The main purpose of this Master Thesis is the comparison of the different investment strategies based on their annual risk-adjusted returns for the US companies during the study period 2002-2015. Specifically, we intend to determine which investment strategy beats the market, which is determined by the returns, including the dividends paid, of the SP500 index, and which investment strategy works the best by comparing the annual compounded returns and the risk-adjusted Sharpe ratio (Brealey, et al. (2014)). Consistent with Piotroski (2000), we find that the value investing strategy is the best investment strategy because it yields substantial excess returns above the risk-free rate with the moderate risk, and that the market is inefficient. The Composite Index strategy based on the aggregation of F-Score (Piotroski (2000)) and E-Score (Bebchuk et al. (2009)) is the second-best strategy with substantial compounded annual returns and a very good risk profile. This investment strategy aggregates two profitable strategies: value investing strategy (Piotroski (2000)) and E-Index strategy (Bebchuk et al. (2009)). The E-Index strategy (Bebchuk, et al. (2009)) has clearly lost the edge over the market after 2007. We find that the worst and the only loss-generating strategy is the G-Index strategy (Gompers et al. (2003)) with a very high risk. The results of the G-Index and E-Index strategies are consistent with the learning explanation (Gompers et al. (2003), Bebchuk et al. (2013). The Composite Index for the aggregation of F-Score (Piotroski (2000)) and G-Score (Gompers et al. (2003)) is a result of the merge between F-Score (Piotroski (2000)) that yielded substantial returns and G-Index (Gompers, Ishii, Metrick (2003)) that yielded substantial losses. If we look at only the raw performance, we can't recommend it as an investment strategy. However, this result confirms our hypothesis that Composite Index can act as a "fund-of-funds" of the investment strategies. All our results are robust for all firm sizes and industry classifications. However, our results suffer from certain limitations in our Master Thesis: a sample selection bias, limited data quality in the Datastream, no consideration of the following market mechanisms: actual trading, real-time stock spreads, transaction costs, income taxes, reference-day risk (Dimitrov et al. (2007)).

Keywords: capital markets, market efficiency, financial statement analysis, corporate governance

INTRODUCTION

PROJECT OVERVIEW

In this paper, we will evaluate and compare the following investment strategies:

- Value investing strategy based on the aggregate Financial Score, the aggregate F_Score (Piotroski (2000)).
- Governance based investment strategy based on the Governance Index, the G-Index (Gompers, Ishii, and Metrick (2003)).
- Governance based investment strategy based on the Entrenchment Index, the E-Index (Bebchuk, Cohen, Ferrell (2009)).
- Composite Score for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Score (Gompers, Ishii, and Metrick (2003)) using the framework of Saaty (2008).
- Composite Score for the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Score (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008).

Our prior literature review reveals that the accounting-based fundamental analysis investment strategy (Piotroski (2000)) and the governance based investment strategy (Gompers, Ishii, and Metrick (2003)) are prominent in the research of investment strategies. However, we have found that no literature is available for the aggregation of the results of these two investment strategies. Thus, we have decided to compute the innovative Composite Score using the framework of Saaty (2008) for the aggregation of the results of the Financial Score (Piotroski (2000)) and the Governace Index (Gompers, Ishii, and Metrick (2003)), as well as the Composite Score for the aggregation of the results of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)). We came up with the idea to calculate the Composite Score using the framework of Saaty (2008) based on our research of

the advantages of the Fund of Funds (http://www.investopedia.com/terms/f/fundsoffunds.asp). We assume that the aggregation of the financial data and the governance data will diversify risk and increase returns.

Our hypothesis is that the investment strategy based on the Composite Score using the framework of Saaty (2008) for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, and Metrick (2003)), or the investment strategy based on the Composite Score using the framework of Saaty (2008) for the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Score (Bebchuk, Cohen, Ferrell (2009)) would yield better and more robust results then using just one index separately.

The main purpose of this Master Thesis is the comparison of the different above-mentioned investment strategies based on their annual returns. Specifically, we intend to determine which investment strategy beats the market, which is determined by the returns, including the dividends paid, of the SP500 index and which investment strategy works the best by comparing the annual compounded returns and risk-adjusted Sharpe ratio.

If we are able to discriminate ex-ante between future winners and losers and earn excess returns, we will confront the efficient market hypothesis, i.e., the market does not efficiently incorporate past financial signals into current stock prices. The efficient market hypothesis, popularly called as random walk theory, states that the current stock price fully reflects available information about the value of the firm, and there is no way to earn returns superior to those yielded by the market index by using any publicly available or private information (Clarke et al. (2001)).

DELIMITATION

We will review literature for the following investment strategies: value investing strategy based on the aggregate Financial Score, the aggregate F-Score (Piotroski (2000)), governance based investment

strategy based on the Governance Index, the G-Index (Gompers, Ishii, and Metrick (2003)), governance based investment strategy based on the Entrenchment Index, the E-Index (Bebchuk, Cohen, Ferrell (2009)), the investment strategy based on the Composite Score for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Score (Gompers, Ishii, and Metrick (2003)) using the framework of Saaty (2008), the investment strategy based on the Composite Score for the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Score (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008).

We will acquire financial and governance data from the Datastream data provider for the computation of all the necessary Scores of Piotroski (2000), Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009), Saaty (2008). The companies selection includes 2920 companies listed on the US markets.

We will prune the data to remove the instances that contain too little information (missing data fields). We will process the data further to calculate and construct all the necessary Scores (Piotroski (2000), Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009), Saaty (2008)).

The Datastream does not provide information about one of the nine financial signals of the Financial Score (Piotroski (2000)): the issue of Seasoned Equity Offerings over the prior year. The issue of Seasoned Equity Offerings over the prior year signals the inability of a financially distressed firm to generate sufficient internal funds (Myers and Majluf (1984), Miller and Rock (1985)). Thus, the nonissue of Seasoned Equity Offerings is treated by Piotroski as a “good” signal for future firm performance and is assigned “1” for the calculation of the aggregate Financial Score, otherwise “0”.

Consequently, our calculated Financial Score (Piotroski (2000)) will be downward biased, i.e., our aggregate Financial Score of Piotroski (2000) would have been “9” instead of “8” if a company had only “good” signal realizations. Due to data unavailability for Seasoned Equity Offerings, we will assign firms with the F-Scores of 7 or 8 into “High F-Score Firms” and expect them to have the best subsequent

return performance. We will assign firms with the F-Score of 0 or 1 into “Low F-Score firms” and expect them to have the worst subsequent return performance.

Due to data unavailability in the Datastream data provider for the computation of the Governance Score (Gompers, Ishii, and Metrick (2003)), we will compute the Governance Score (Gompers, Ishii, and Metrick (2003)) based on 13 corporate governance provisions instead of the 24 governance provisions of Gompers, Ishii, and Metrick (2003).

We obtained data for 11 governance provisions. Additionally, we assume that if a company has a "supermajority voting requirement" provision, then it also has the following 2 provisions: limits to amend charters, and limits to amend bylaws. Limits to amend charters, and limits to amend bylaws usually take the form of the “Supermajority voting requirements” (Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009)). Thus, if a company has a "supermajority voting" provision it has a Governance score of “3” based on the assumption. We also make an additional assumption regarding one of the obtained governance provisions: “Equal voting rights”. Due to unavailability of “Unequal voting rights” in the Datastream data provider for the computation of the Governance Index (Gompers, Ishii, Metrick (2003)), we assume that if a company has an “Equal voting rights” provision, then it does not have an “Unequal voting rights” provision. Following the methodology of Gompers, Ishii, and Metrick (2003), such a company receives “0”, otherwise “1”.

The data unavailability for the remaining governance provisions of Gompers, Ishii, and Metrick (2003) in the Datastream data provider will lead to a downward biased Governance Score. If we had data available on additional 11 governance provisions for the calculation of the G-Score (Gompers, Ishii, and Metrick (2003)), we would have added one point for any additional governance provision that reduces shareholder rights (increases management power). Thus, we would have had much more companies with the higher G-Score, i.e., we would have assigned much more companies into “Dictatorship portfolio” with the weakest shareholder rights (G-Score >= 14) and short-sell them following the methodology of Gompers, Ishii, and Metrick (2003). Due to data unavailability on additional 11

governance provisions, we will place companies with the weakest shareholder rights (G-Score >= 8) in the “Dictatorship portfolio”, and we will sell these companies. We will place companies with the strongest shareholder rights (G-Score <= 3) in the “Democracy” portfolio, and we will buy these companies.

We obtained governance data for the six governance provisions of the E-Index of Bebchuk, Cohen, Ferrell (2009): staggered boards, poison pills, golden parachutes, supermajority voting requirements. Due to limited governance data availability in the Datastream, we assume that if a company has a "Supermajority voting requirement" provision, then it also has the following 2 provisions: limits to amend charters, and limits to amend bylaws.

We will apply the methodologies suggested by Piotroski (2000), Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009), Saaty (2008). Due to some data unavailability, we will apply the assumptions and adjust the suggested methodologies.

To calculate the Composite indexes based on Saaty (2008) we had to follow Saaty’s procedure of normalizing the data before the aggregation. For each index that is part of the aggregated score we calculated the normalized value as follows:

$$IndexNormalizedValue = \frac{IndexActualValue}{IndexMaximumValue}$$

We assumed that the index value can be equal 0.

We have made some adjustment to the F-Score normalized value. In the articles of Gompers et al. (2003) about the G-Index, and Bebchuk et al. (2009) about the E-Index, lower values of the indexes are used to filter the long positions and high values are used for short positions. In the article of Piotroski (2000), it’s exactly the opposite.

To reflect the components intent for long and short positions we have normalized the data for the F-Score as follows:

$$FScoreNormalizedValue = 1 - \frac{\text{FScoreActualValue}}{\text{FScoreMaximumValue}}$$

We will conduct robustness checks for all the necessary Scores (Piotroski (2000), Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009), Saaty (2008)) by size tercile cut-offs (small, medium, large) for each year to determine whether the identified return patterns hold across all size classifications, or they hold only for a certain size classification. We will also conduct robustness checks by industry to determine whether the identified return patterns hold across all industry types, or they hold only for a certain industry type. We obtained data for the following six industry types from the Datastream: Industrial, Utility, Transportation, Bank/Savings & Loan, Insurance, Other Financial. We will run regressions by indices. We will use the computer program for econometrics ´SPSS´ to conduct robustness checks.

We will analyse all the obtained results.

We will make the comparison between all the investment strategies based on their annual risk-adjusted returns.

According to the Chartered Financial Analyst book "Equity and Fixed Income" (2012), there are two main sources of equity securities´ total return: price change (or capital gain) and dividend income. The price change represents the difference between the purchase price (PN-1) and the sale price (PN) of a share at the end of time N-1 and N, respectively. Cash or stock dividends (DN) represent distributions that the company makes to its shareholders during period t. Therefore, we calculate an equity security´s total return to make the comparison between the investment strategies as follows:

$$LongReturn_N = \frac{StockPrice_N - StockPrice_{N-1} + DividendPerShare_N}{StockPrice_{N-1}}$$

$$ShortReturn_N = -LongReturn_N$$

Where N is a current year.

We have calculated separately short and long positions and we have constructed the equally weighted portfolio. Based on the above demonstrated returns calculations we have calculated the total portfolio returns for the index as follows:

$$Total\ Portfolio\ Return = \sum_{N}^{1} \frac{equityInIndexReturn}{N}$$

Due to financial and governance data scarcity in the Datastream data provider, we mixed the US based companies from all the different indexes and could not choose a single market index to adjust for risk the obtained annual returns for each index of Piotroski (2000), Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009), Saaty (2008). Thus, we used the Sharpe ratio for adjusting the total yearly indexes returns to emulate the market-adjusted returns of the indexes.

Following the purpose of our Master Thesis, we intend to determine which investment strategy beats the market, and which investment strategy works the best based on the annual risk-adjusted returns.

We will also describe limitations of our Master Thesis and provide suggestions for further research.

THEORY REVIEW

VALUE INVESTING STRATEGY BASED ON THE FINANCIAL SCORE OF PIOTROSKI (2000)

Many scholars have argued that value strategies outperform the market (Graham and Dodd (1934), De Bondt and Thaler (1985, 1987)). These value strategies involve buying stocks with high earnings to price

ratios (Fama and French (1992), Basu (1977), Jaffe, Keim, and Westerfield (1989)), high ratios of cash flow to price (Chan, Hamao, and Lakonishok (1991)). Piotroski (2000) shows that it is possible to earn substantial excess returns by discriminating, ex-ante, between future winners (High F-Score firms) and losers (Low F-Score firms). Woodley, Jones, Reburn (2011) confirm the findings of Piotroski (2000) that High F-Score firms generate higher returns than Low F-Score firms, and High F-Score firms generate higher returns than the entire portfolio of high BM firms during the Piotroski study period 1976-1996. However, Woodley, Jones, Reburn (2011) find that the trends of the superior return performance of High F-Score firms over Low F-Score firms, and the trends of the superior return performance of High F-Score firms over the complete portfolio of High BM firms have reversed during the Post-Piotroski study period 1997-2008. Specifically, Woodley, Jones, Reburn (2011) show that High F-Score firms generate lower returns than Low F-Score firms, and High F-Score firms generate lower returns than the whole portfolio of High BM firms during the Post-Piotroski study period 1997-2008.

All this evidence confronts the efficient market hypothesis, also called random walk theory. According to the efficient market hypothesis, the market is efficient, and incorporates fully and rapidly all the available public and private historical information into current stock prices. According to the efficient market hypothesis, investors are unable to earn excess returns above those yielded by market by using any publicly available or private information (Clarke et al. (2001)).

Despite the general agreement among scholars that value strategies outperform the market there is some disagreement regarding the reasons of the superior performance of value strategies.

Superior returns generated by value stocks can be attributed to the market efficiency. Value stocks are fundamentally riskier and earn higher returns as a fair compensation for higher risk (Fama and French (1992), Chan and Chen (1991)). According to Fama and French (1992)), and Chan and Chen (1991), BM captures financial distress. This evidence is supported by a strong association between BM and leverage (Fama and French (1992), Chen and Zhang (1998)), and by the consistently low return on equity associated with high BM firms (Fama and French (1995)). According to Fama and French (1995) and

Chen and Zhang (1998), the average high BM firm is financially distressed. This distress means declining and/or persistently low profits, cash flows, liquidity, and rising and/or high levels of financial leverage.

Value strategies generate higher returns because they are contrarian to "naïve" strategies followed by investors (Lakonishok, Shleifer, and Vishny (1994)). Contrary to Fama and French (1992), Lakonishok, Shleifer, and Vishny (1994) find that the market is inefficient, and the market does not understand that the growth rates of "value stocks" and "growth stocks" tend to converge in the future. Thus, the market makes biased forecasts of future earnings growth of "value stocks" and "glamour stocks". Specifically, the "naive" strategies mean that the market becomes "overoptimistic" about the future performance of low BM stocks ("glamour stocks", or "growth stocks") based on their superior past earnings growth, and the market becomes "overpessimistic" about the future performance of high BM stocks ("value" stocks) based on their poor earnings growth in the past. As a result, "growth stocks" increase in demand by investors, and become overpriced. In contrast, value stocks decrease in demand by investors, and become underpriced. "Value stocks" generate average high returns because their future actual earnings growth is higher than the market expected. Growth stocks generate average low returns because their future actual earnings performance is lower than the market expected (Lakonishok, Shleifer, and Vishny (1994)). La Porta et al. (1997) also finds that the market becomes "overpessimistic" about the future performance of value stocks based on their prior poor performance, and then the market becomes positively surprised by the future quarterly earnings announcements of value stocks.

Contrary to Lakonishok, Shleifer, Vishny (1994), Dechow and Sloan (1997) find no evidence that the market extrapolates superior past earnings growth of "glamour stocks", and poor past earnings growth of "value stocks" too far into the future. However, consistent with LaPorta (1995), Dechow and Sloan (1997) find evidence that stock prices naively reflect biased forecasts of future earnings growth. Specifically, Dechow and Sloan (1997) find that earnings tend to grow at less than half the growth rate

forecasted by market analysts, even though the stock prices fully reflect all the biased forecasted information about the earnings growth.

Piotroski (2000) argues that his results of superior returns of value stocks could be explained by the ”market mispricing” explanation of Lakonishok, Shleifer, Vishny (1994) instead of the risk explanation of Fama and French (1992), Chan and Chen (1991). Contrary to the risk explanation of Fama and French (1992), Chan and Chen (1991), Piotroski (2000) finds that the financially strongest firms with the lowest amounts of ex-ante financial risk earned the highest subsequent returns.

Piotroski (2000) aggregates the information about the financial condition of a firm based on a firm's overall aggregate financial signal, F-Score. Prior fundamental analysis research studies the relationship between a particular financial signal and returns. Examples of these particular financial signals include accruals (Sloan (1996)), seasoned equity offerings (Loughran and Ritter (1995)), share repurchases (Ikenberry, Lakonishok, and Vermaelen (1995)), and dividend omissions or decreases (Michaely, Thaler, and Womack (1995)). These studies intend to earn excess returns, and provide evidence that the market is inefficient.

Sloan (1996) finds that investors do not distinguish between the accrual and cash component of current earnings, i.e., earnings with a high level of accruals show lower persistence in the future. Thus, investors are inclined to overprice stocks with a high accrual component, and underprice stocks with a high cash component in earnings. The market corrects mispricing when the overpriced stocks with a high accrual component in earnings generate lower than expected earnings and negative abnormal returns, and when the underpriced stocks with a high cash component in earnings generate higher than expected earnings and positive abnormal returns. Thus, the findings of Sloan (1996), show that the market is inefficient, i.e., stock prices fail to differentiate between the different qualities of the accrual and cash component of current earnings.

Loughran and Ritter (1995) find that companies issuing seasoned equity offerings generate significantly lower returns than nonissuing firms for five years after the offering date. They also find that an investor

would have had to invest 44 percent more money in the issuers than in nonissuers of the same size to have the same wealth five years after the offering date. Loughran and Ritter (1995) provide the explanation for the underperformance of the issuing firms. When a firm issues seasoned equity offerings, its operating performance improves dramatically (Net Profit Margin, ROA), and the market capitalizes on the improved operating performance. However, this operating performance improvement turns out to be transitory, and the market undervalues the importance of it. Thus, the stock of the issuing firm underperforms when it becomes obvious that the improvement in the operating performance was transitory, and the operating performance deteriorates to the levels lower than before the issue of seasoned equity offerings. Thus, Loughran and Ritter (1995) find that the market is inefficient, i.e., the market overvalues the importance of the transitory improvement in the operating performance of issuing firms, and undervalues the importance of the rapid deterioration in the operating performance to levels lower than before the issue of seasoned equity offerings.

Michaely, Thaler, and Womack (1995) also show that the market is inefficient, i.e., there are predictable excess returns because of the annual drift of prices in the same direction after the company announcement of dividend initiation or omission, i.e., the stock price increases as a response to dividend initiations, and the stock price decreases as a response to dividend omissions. Additionally, the stock price decrease because of the dividend omissions is much stronger and more robust that stock price increase as a result of dividend initiations.

Ikenberry, Lakonishok, and Vermaelen (1995) also find evidence of the market inefficiency. They find that the market underreacts to open market share repurchases, i.e., the market treats the signals of the share repurchases with skepticism and incorporates the information into stock prices not fully and in a slow manner.

Prior fundamental analysis research also studies the relationship between several financial signals and earnings. Lev and Thiagarajan (1993) construct an aggregate score based on twelve financial signals to assess persistence, or "quality" of earnings. Several of the signals of Lev and Thiagarajan [1993] overlap

with the financial signals identified by Piotroski (2000). However, Piotroski (2000) considers some of the signals of Lev and Thiagarajan [1993], such as inventory choice, qualified audit opinions, capital expenditure decisions, effective tax rates, to be less important compared with the nine financial signals identified by Piotroski (2000) that capture the financial strength of companies.

Piotroski (2000) computes the nine financial signals based on historical financial statements, and states three main reasons why historical financial statements are the most reliable and accessible source of historical financial information for high BM firms.

Stock recommendations and analyst forecasts are unavailable for high BM firms because analysts are more willing to provide favourable stock recommendations for firms with superior past return performance, such as for low BM firms ("growth" companies) instead of high BM firms (Stickel (1998)). This is consistent with the view that analysts are reluctant to issue unfavourable investment information (McNichols and O'Brien (1997)), because they intend to earn high trading commissions for buy recommendations (Darlin (1983)), or analysts are afraid of spoiling the business relationship with the management as an information source (Dirks and Gross (1974)), or they do not want to endanger potential investment banking business (Darlin (1983)).

Voluntary disclosures issued by financially distressed firms are less credible than similar disclosures of financially healthy firms. According to Koch (2000), management earnings forecasts of distressed firms show greater upward bias, and are viewed as less credible than similar forecasts made by non-distressed firms.

High BM firms are "financially distressed" (Fama and French (1995), Chen and Zhang (1998)). These firms have low or declining profitability, low or declining liquidity, high or increasing financial leverage. Thus, the financial characteristics of these "financially distressed" firms can be assessed based on historical financial statements.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE GOVERNANCE INDEX OF GOMPERS, ISHII, METRICK (2003)

Gompers, Ishii, and Metrick (2003) construct the Governance Index, the G-Index, based on twenty-four external governance provisions. However, Cremers and Nair (2005) find that effective corporate governance should include both internal and external measures. Cremers and Nair (2005) use shareholder activism as a proxy for internal corporate governance.

Gompers, Ishii, and Metrick (2003) find the negative correlation between governance measured by the G-Index and returns, firm value, operating performance during the 1990s. Gompers, Ishii, and Metrick (2003) find that firms with stronger shareholder rights (Democracy portfolio) have higher firm value, higher returns, better operating performance (Sales Growth, ROE, Net Profit Margin) than firms with lower shareholder rights (Dictatorship portfolio) during the 1990s. Bebchuk, Cohen, Wang (2013) confirm the findings of Gompers, Ishii, and Metrick (2003) that stock returns, firm value and operating performance were negatively correlated with the G-Index of Gompers et al. (2003) during the 1990s.

Consistent with Gompers, Ishii, and Metrick (2003), and Bebchuk, Cohen, Wang (2013) prior studies have also found that better governance is associated with higher firm valuation as measured by Tobin's Q (Bebchuk and Cohen (2005); Bebchuk et al. (2005); Cremers and Nair (2005)). These authors and Gompers, Ishii, and Metrick (2003) use the definition of Tobin's Q as a proxy for firm value that was used by Kaplan and Zingales (1997). Kaplan and Zingales (1997) follow earlier work on the association between corporate arrangements and firm value (Demsetz and Lehn (1985), Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), Lang and Stulz (1994), Daines (2001), La Porta et al. (2002)). According to this definition, Tobin´s Q is equal to the market value of assets divided by the book value of assets, where the market value of assets is computed as the book value of assets plus the market value of common stock less the sum of book value of common stock and balance sheet deferred taxes.

Bhagat and Bolton (2008) also confirm the findings of Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, Wang (2013) that better governance as measured by the G-Index (Gompers, Ishii, and Metrick (2003)) is significantly positively correlated with better contemporaneous and subsequent operating performance.

Gompers, Ishii, and Metrick (2003) and subsequent work consider the following reasons for the negative correlation between the G-Index and returns during the 1990s:

- The "learning" explanation.

  Investors did not have enough experience to forecast the implications of the differences between well-governed and poorly governed firms for future firm performance during the 1990s because many anti-takeover governance provisions were adopted during the 1980s as a result of a rapid increase in hostile takeovers even for the largest public companies (Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Wang (2013)). However, the correlation between governance and returns disappeared during the subsequent period 2000-2008 (Bebchuk, Cohen, Wang (2013)). According to Bebchuk, Cohen, Wang (2013), the reason for the disappearance of the governance-return correlation was an increase in the attention to governance by a wide range of market participants, such as the media, institutional investors, and academic researchers, and that a sufficient number of market participants learned to understand the differences between firms scoring well and poorly on the governance indices in the beginning of the 2000s. The market became efficient in the beginning of the 2000s, i.e., market prices reflected fully the differences between well-governed and poorly governed firms. Thus, trading based on the G-index (Gompers, Ishii, and Metrick (2003)) could no longer generate abnormal profits in an efficient market (Bebchuk, Cohen, Wang (2013)).
  While the G-Index (Gompers, Ishii, and Metrick (2003)) could no longer yield abnormal returns in the 2000s, the negative correlation between the G-Index (Gompers, Ishii, and Metrick (2003))

with Tobin's Q and operating performance remained. Thus, the G-Index remains the valuable tool for investors, researchers etc. However, these findings do not resolve the causality questions concerning the extent to which governance provisions directly cause or merely signal the worse performance of the firms having them (Bebchuk, Cohen, Wang (2013)).

- Agency costs.

Gompers, Ishii, and Metrick (2003) find that governance provisions cause higher agency costs through the establishment of the positive correlation between governance and capital expenditures as well as the acquisition behaviour. Prior literature is consistent with the findings of Gompers, Ishii, and Metrick (2003) that governance provisions cause higher agency costs through inefficient investment, reduced operational efficiency, or self-dealing (Baum (1959), Williamson (1964), Clark (1986)). There is also evidence of long-run negative abnormal performance by acquirer firms (Loughran and Vijh (1997)).

Gompers, Ishii, and Metrick (2003) find that these higher costs were underestimated by investors in the 1990s. If the market underestimated these additional costs, then a firm's stock returns and operating performance would have been worse than expected, and the firm's value at the beginning of the period would have been too high.

- Model misspecification.

Under this explanation, governance is correlated with some common risk factor that is not captured by the standard four-factor model (Fama-French (1992), and Carhart (1997)) used by Gompers, Ishii, and Metrick (2003) to calculate abnormal returns (Core et al. (2006), Cremers et al. (2009)). Gompers, Ishii, and Metrick (2003) find that this type of omitted-variable bias is industry classification. The industry classification can explain between one-sixth and one-third

of the benchmark abnormal returns, but Gompers, Ishii, and Metrick (2003) do not find any other observable characteristic that explains the remaining abnormal return. Gompers, Ishii, and Metrick (2003) conclude that the remaining significant performance differences were either directly caused by governance provisions, or were related to unobservable or difficult-to-measure characteristics correlated with governance provisions. However, the findings of Bebchuk, Cohen, Wang (2013) are inconsistent with the findings of Gompers, Ishii, and Metrick (2003) regarding the model misspecification. Bebchuk, Cohen, Wang (2013) argue that both the existence and subsequent disappearance of the governance-return correlation cannot be fully explained by additional common risk factors suggested in the literature for expanding the standard four-factor model (Fama and French (1992) and Carhart (1997)). Bebchuk, Cohen, Wang (2013) include the following factors as an additional fifth risk factor to the four-factor model of Fama and French (1992) and Carhart (1997): the liquidity factor of Pastor and Stambaugh (2003), the downside risk factor of Ang et al. (2006), the takeover factor of Cremers et al. (2009). The liquidity factor of Pastor and Stambaugh (2003) reflects the level of market-wide liquidity in each month as the equally weighted average of the liquidity measures of individual stocks, using daily data within the month. The downside risk factor of Ang et al. (2006) reflects the downside movement of the market. The takeover factor of Cremers et al. (2009), reflects the spread between firms that are most likely to be exposed to takeovers and firms that are least likely to be exposed to takeovers.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE ENTRENCHMENT INDEX OF BEBCHUK, COHEN, FERRELL (2009)

Bebchuk, Cohen, Ferrell (2009) investigate the relative importance of the twenty-four external governance provisions included in the Governance index, the G-Index of Gompers, Ishii, and Metrick

(2003). Bebchuk, Cohen, Ferrell (2009) construct the Entrenchment index, the E-Index. Consistent with Gompers et al. (2003), Bebchuk et al. (2009) find that the entrenchment can lead to increased agency costs through increased shirking, empire-building, and extraction of private benefits by managers (Baum (1959), Williamson (1964), Clark (1986)). However, entrenchment can also have beneficial effects by enabling managers to extract higher acquisition premiums in negotiated transactions (Stulz (1988)). The Entrenchment index, the E-Index of Bebchuk, Cohen, Ferrell (2009) consists of only six external governance provisions that are based on the twenty-four external provisions of Gompers, Ishii, and Metrick (2003): staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, supermajority requirements for mergers, limits to charter amendments. Bebchuk, Cohen, Ferrell (2009) find that only these 6 above mentioned governance provisions of the 24 provisions of Gompers, Ishii, and Metrick (2003) are the most important for the construction of the Entrenchment index, the E-Index, because they are negatively correlated with firm value, and fully drive the negative correlation between all the twenty-four provisions of Gompers, Ishii, Metrick (2003) with firm value and returns during the 1990s. Bebchuk, Cohen, Wang (2013) confirm the findings of Bebchuk, Cohen, Ferrell (2009) that the E-Index is negatively correlated with firm value. Bebchuk, Cohen, Ferrell (2009) confirm the findings of Gompers, Ishii, and Metrick (2003) that entrenching provisions are negatively correlated with firm value as proxied by Tobin's Q. Bebchuk, Cohen, Ferrell (2009) follow Gompers, Ishii, and Metrick (2003) in using Tobin's Q as the measure of firm value. Gompers, Ishii, and Metrick (2003) use the definition of Tobin´s Q used by Kaplan and Zingales (1997). Consistent with Gompers et al. (2003), Bebchuk et al. (2009) find that the negative correlation between the entrenching provisions and firm valuation does not mean that the entrenching provisions, or that all the provisions in the aggregate, cause lower firm valuation. The reason for the established correlation could be that low-value firms adopt entrenching provisions to protect themselves from hostile takeovers (Bebchuk et al. (2009)).

According to Bebchuk, Cohen, Wang (2013), the E-Index of Bebchuk et al. (2009) is negatively correlated with the operating performance. Bhagat and Bolton (2008) confirm the findings of Bebchuk et al.

(2009), Gompers et al. (2003), Bebchuk, Cohen, Wang (2013) that better governance as measured by the E-Index (Bebchuk, et al. (2009)) and the G-Index (Gompers et al. (2003)) is correlated with better contemporaneous and subsequent operating performance.

Bebchuk, Cohen, Wang (2013) also confirm the findings of Gompers et al. (2003) and Bebchuk et al. (2009) that there was a negative correlation between governance and returns during the 1990s. Bebchuk, Cohen, Wang (2013) explain both the existence of the governance – return correlation during the 1990s and its subsequent disappearance in the 2000s by the learning hypothesis. However, the fact that negative correlation between the E-Index of Bebchuk et al. (2009) and the G-Index of Gompers et al. (2003) with Tobin's Q and operating performance remained in the 2000s, means that the E-Index (Bebchuk et al. (2009)) and G-Index (Gompers et al. (2003)) remain the valuable tools for researchers, and investors.

However, Bebchuk, Cohen, Ferrell (2009) argue that the E-index provides a more accurate measure of corporate governance quality than the G-Index of Gompers, Ishii, Metrick (2003) because E-Index is not influenced by the "noise" created by the inclusion of the remaining irrelevant 18 provisions of Gompers, Ishii, and Metrick (2003). According to Bebchuk, Cohen, Ferrell (2009), the remaining 18 provisions of the Governance index of Gompers, Ishii, and Metrick (2003) that are not included in the E-Index are unimportant because they are uncorrelated with firm valuation and abnormal returns during the 1990s. Thus, these remaining 18 provisions of Gompers, Ishii, and Metrick (2003) provisions create "noise" because many irrelevant provisions are given equal weight, while the very important provisions are underweighted.

The findings of Brown and Caylor (2006) confirm the findings of Bebchuk, Cohen, Ferrell (2009) that only a small subset of provisions among a large set of governance provisions are important and correlated with firm value. Brown and Caylor (2006) construct the Governance Score based on 51 firm-specific internal and external governance provisions, and then show that only seven provisions of the Governance Score are important because they fully drive the correlation between the Governance

Score and firm value. These most important seven provisions of the Governance Score of Brown and Caylor (2006) include two external governance provisions that are also part of the Entrenchment index of Bebchuk, Cohen, Ferrell (2009): no staggered board and no poison pill. The fact that both Bebchuk, Cohen, Ferrell (2009), and Brown and Caylor (2006) identify these provisions using different data sets and methodologies provides a powerful evidence that these two external governance provisions are strongly correlated with firm value (Brown and Caylor (2006)). Bebchuk and Cohen (2005) confirm the findings of Brown and Caylor (2006) and Bebchuk et al. (2009) that staggered boards are negatively correlated with Tobin's Q.

We will discuss the E-Index provisions, interaction between them, and wealth effects. According to Bebchuk et al. (2009), the six provisions of E-Index are divided in two categories: constitutional limitations on shareholders' voting power, and takeover readiness provisions. The takeover readiness category consists of the following two provisions: poison pills, golden parachutes. The constitutional limitations on shareholders' voting power consist of the following provisions: staggered boards, supermajority voting requirements, limits to amend charters, limits to amend bylaws. Shareholders' most important source of power is their voting power (Clark 1986).

Poison pills (also called shareholder rights plans) allow the holder to buy at a steep discount an acquirer's stock (a so-called "flip over" provision), or buy the target's stock (a "flip in" provision). This way the holder will dilute the voting power of the acquirer, and make the target firm unattractive. These rights only become exercisable if a shareholder (the acquirer) buys more than a certain percentage of the target's stock (typically 10 or 15%) without the target board's approval (Gompers et al. (2003), Bebchuk, Coates, Subramanian (2002), Bebchuk et al. (2009)).

According to Comment and Schwert (1995), there are three possible wealth effects of poison pills: deterrence, bargaining power, and signaling. Comment and Schwert (1995) also provide evidence that poison pill rights issues increase the bargaining power of incumbent management versus bidders but they do not systematically deter takeovers. The wealth effect of a pill adoption is a combination of a

stock price decline from the expected present value of future takeover premiums forgone due to deterrence, offset by the expected present value of any increase in takeover premiums due to a gain in bargaining power of incumbent management versus bidders. In addition, prices can change due to a revelation of management's private information (Comment and Schwert (1995)).

Poison pills have price effects only if investors conclude that managers have private information that caused them to adopt the pill. The net price effect of poison pills will depend on the inference of investors about the nature and quality of the management private information based on different motivations. According to Comment and Schwert (1995), there are three motivations for adoption of a poison pill: a firm expects bid or the bid is pending; the firm management intends to send a resistance signal to hostile bidders; the firm management believes that stock prices could diverge from firm value in an inefficient market. The firm expectation of a following hostile bid would have a positive stock price effect. The stock price effect of the resistance signal would depend on which of the following two effects dominates: the management deters high-premium value-enhancing takeovers, or the management increases the acquisition takeover premiums for shareholders by blocking any hostile takeover offers that are above the market price but below the firm value. The stock price effect would be positive if there is a substantial increase in the firm value that is not followed by an increase in the stock price (Comment and Schwert (1995)).

Bebchuk, Coates, Subramanian (2002) find that the interaction between a poison pill and staggered board provides a powerful defence against a hostile bidder: the poison pill blocks any stock acquisition beyond the trigger level, and the staggered board forces any hostile bidder to wait at least one year to gain full control of the board, and requires such a bidder to win two elections far apart in time rather than a one-time referendum on its offer (Bebchuk, Coates, Subramanian (2002)). However, a poison pill provision and a staggered board provision are ineffective against a takeover bid without each other. On the one side, a poison pill provision without a staggered board provision is ineffective because the target's board can redeem the pill at any time, on a short notice, if the target is vulnerable to a rapid

proxy fight. On the other side, a staggered board provision is ineffective against a takeover bid without a poison pill, even though a staggered board provision nearly doubles the likelihood of remaining independent for an average target firm (Bebchuk, Coates, Subramanian (2002)). A staggered board alone does not prevent a bidder from acquiring a controlling block of stock, and creates a situation in which the bidder would ultimately gain control of the board. The combination of a poison pill and a staggered board has a "negative shareholder wealth effect" (Bebchuk, Coates, Subramanian (2002)). Staggered boards provision on its own reduces shareholders' wealth, i.e., the returns of shareholders of hostile bid targets decreased by 8-10% (Bebchuk, Coates, Subramanian (2002)). Consistent with Bebchuk, Coates, Subramanian (2002), there is evidence that firms' announcement of a classified board adoption causes negative abnormal stock returns (Faleye (2007)) and that firms' announcements that they are going to "destagger" causes positive abnormal stock returns (Guo, Kruse, and Nohel (2008)).

Regarding the supermajority voting provision of the E-Index (Bebchuk et al., 2009), the poison pill has made the supermajority voting provision of the E-index unimportant (Coates (2000)). If a bidder is unwilling or unable to win a proxy fight for the target, a poison pill will prevent the bidder from acquiring more than a certain threshold of a controlling block of stock (usually, 10-15%), although a supermajority of shareholders would like to accept the bidder´s offer. In the case of absence of a proxy fight, or in the case a bidder is willing and able to win a proxy fight for the target, the shadow pill would deter any bid a supermajority voting provision would deter (Coates (2000)).

We will also discuss another provision included in the E-Index of Bebchuk et al. (2009), i.e., golden parachutes. Golden parachutes are severance agreements that guarantee cash and non-cash compensation for senior executives in the event of termination, demotion, resignation following a change in control (e.g., an acquisition of the company by an unrelated party, or a change in the majority of the Board of Directors) (Gompers et al. (2003), Bebchuk et al. (2009), Lambert, Larcker (1985)). Golden parachutes are quite different from three other provisions that are included in the provisions of Gompers et al. (2003): severance agreements, compensation plans, and silver parachutes. In contrast

to golden parachutes, severance agreements are not conditional on a change in control. Unlike golden parachutes, silver parachutes provide benefits to a large number of the firm's employees and do not target the firm's top executives. Compensation plans are plans that accelerate benefits but do not by themselves provide additional benefits in the event of a change in control, in contrast to golden parachutes (Gompers et al. (2003), Bebchuk et al. (2009)).

According to Lambert, Larcker (1985), the adoption of golden parachutes reduces the conflict of interests between the target firm´s shareholders and the target firm´s management regarding takeovers.

The acquisition of a target firm has a favourable effect on shareholder wealth. According to Jensen and Ruback (1983), target shareholders earn abnormal returns of 30 percent for successful tender offers and 20 percent for successful mergers. As a result, the adoption of golden parachutes causes a positive security market reaction (Lambert, Larcker (1985)). However, in contrast to Lambert, Larker (1985) and Jensen, Ruback (1983), Bebchuk, Cohen and Wang (2014) find that golden parachutes, on average, have a negative effect on shareholder wealth. The reason for the negative effect on shareholder wealth could be that the adoption of golden parachutes might lead to an increase in managerial slack as a result as a result of a weakening of the discipline of the market for corporate control (Gompers et al. (2003), Bebchuk, Cohen and Wang (2014)). Golden parachutes weaken this market discipline by making managers less fearful of acquisitions (Bebchuk et al. (2009)).

In contrast to the favourable effect of takeovers on shareholder wealth (Lambert and Larker (1985), Jensen and Ruback (1983)), a takeover can have an unfavorable impact on the welfare of the target firm's management. The potential conflict of interest between shareholders and managers may cause the manager to fight against takeover bids to protect their own interests (Walkling and Long (1984)). According to Lambert, Larcker (1985), there are three categories of the loss that may be incurred by the target firm´s management if the target firm´s is taken over. First, the manager loses employment and wages until he finds a new job. Second, the manager faces the uncertainty of future wages, i.e.,

whether the manager will get the same high wages in his future employment as the manager received in the previous employment. Finally, the manager loses his power and prestige.

Thus, the adoption of golden parachutes reduces this conflict of interests between the target shareholders and the target´s firm management. The compensation provided by golden parachutes to executives in the event of their termination following a change in control reduces the manager's potential loss from the takeover (Lambert and Larker (1985)).

THE FRAMEWORK OF SAATY (2008) FOR THE COMPOSITE SCORE CONSTRUCTION TO AGGREGATE THE FINANCIAL SCORE (PIOTROSKI (2000)) AND THE GOVERNANCE SCORE (GOMPERS, ISHII, METRICK (2003)), AS WELL AS THE COMPOSITE SCORE TO AGGREGATE THE FINANCIAL SCORE (PIOTROSKI (2000)) AND THE ENTRENCHMENT SCORE (BEBCHUK, COHEN, FERRELL (2009))

According to Saaty (2008), the Analytic Hierarchy Process (AHP) determines the following four steps for an organized decision-making process:

1. Define the problem and determine the kind of knowledge sought.

2. Structure the decision hierarchy from the top level with the goal of the decision, and the objectives from a broad perspective, through the intermediate levels with criteria on which subsequent elements depend, to the lowest level with the identified alternatives.

3. Construct a set of pairwise comparison matrices. According to Saaty (2012), only homogeneous objects, i.e., similar objects, should be compared. Each element in an upper level is used to compare

the elements in the level below with respect to it. Reciprocal paired comparisons mean that one always enters the whole number in its appropriate position and automatically enters its reciprocal in the transpose position. Reciprocal paired comparisons are used to express judgments semantically automatically linking them to a numerical fundamental scale of absolute numbers. The comparisons are made using the fundamental scale of absolute numbers. The fundamental scale of absolute numbers ranges between 2 “Weak importance of one activity over another” and 9 “Extreme importance of one activity over another”. The fundamental scale of absolute numbers shows how much more one element dominates another one with respect to a given attribute.

4. Generate priorities to obtain the final global priorities of alternatives. According to Saaty (2012), ratio scales are used for the generation and synthesis of priorities in the AHP. A ratio scale is a set of numbers that is invariant under a similarity transformation (multiplication by a positive constant). A ratio is called commensurate if it is a rational number, otherwise it is incommensurate.

Then the principal eigenvector of priorities is derived. The principal eigenvector of priorities is obtained first for the criteria in terms of their importance to achieve the goal, then priorities are derived for the performance of the alternatives on each criterion. The principal eigenvector of priorities is derived based on the previous step in the decision-making, i.e., reciprocal paired comparisons using the fundamental scale of absolute numbers. The principal eigenvector of priorities shows the dominance of each element with respect to the other elements. The dominance is obtained in the exact form by raising the matrix to powers and normalizing the sum of the rows. We need to repeat this procedure until the obtained principal eigenvector does not change after raising the matrix to larger powers. Alternatively, the priorities can be obtained approximately by adding each row of the matrix and dividing by their total. This way we obtain normalized priorities. Priorities may also be expressed in the ideal form by dividing each priority by the largest one. The intention is to make this alternative the ideal one with the others getting their proportionate value (Saaty, 2008).

After obtaining normalized or ideal priorities for the criteria in terms of their importance to achieve the goal, and priorities for the performance of the alternatives on each criterion, we should synthesize these priorities. According to Saaty (2012), synthesis can be extended to dependence and feedback. The synthesis is applied to the derived ratio scales to create a unidimensional ratio scale for representing the overall outcome. Synthesis of the scales derived in the decision structure can only be made to yield correct outcomes on known scales by additive weighting. It should be carefully noted that additive weighting in a hierarchical structure leads to a multilinear form and is nonlinear. It is known that under very general conditions such multilinear forms are dense in general function spaces (discrete or continuous), and thus linear combinations of them can be used to approximate arbitrarily close to any nonlinear element in that space.

After the synthesis and the generation of the final global priorities of alternatives we should rank alternatives (determine the weights). According to Saaty (2008), the analytic hierarchy process has three modes for ranking alternatives: relative, absolute, benchmarking. The relative mode compares alternatives in pairs and is particularly useful in new decisions. The absolute mode rates an unlimited number of alternatives one at a time based on intensity scales that are constructed separately for each criterion. The benchmarking mode ranks and compares alternatives against a certain known alternative in the group.

SHARPE RATIO

We use the Sharpe ratios to measure the risk-adjusted performance of the investment strategies.

The Sharpe ratio is also called the reward-to-variability ratio. The Sharpe ratio is a ratio of portfolio´s risk premium to its risk (standard deviation) as follow

Sharpe ratio = Risk premium / Standard deviation = Rp– Rf / Standard deviation of a portfolio

The Sharpe ratio on itself is not informative (eg., 0.2 or 0.3). To rank portfolios, the Sharpe ratio of one portfolio must be compared with the Sharpe ratio of another portfolio. The portfolio with the highest Sharpe ratio has the best performance, and the one with the lowest Sharpe ratio has the worst performance, provided that the numerator is positive for all comparison portfolios (Brealey et al. (2014)).

DATA

For all the calculations, we decided to operate on the same set of data for all the analysis. This is to guarantee the fair comparison. We have downloaded the data for 2920 US based companies from Datastream data provider. The data spans between the year 2002 and the year 2016. The returns are calculated based on the years-end closing price data, therefore the result for year N gets the returns achieved in the year N+1. This is to make sure we have completeness of the data for the year N when we make an investment decision. We have analyzed the annual data for each company. We filtered out the data rows that did not have complete set of data fields for all the analysis types we have included in the project. That means, that for a hypothetical company Z we made sure that it had all the data fields necessary for analyzing value investing strategy based on the aggregate Financial Score, the aggregate F-Score (Piotroski (2000)), governance based investment strategy based on the Governance Index, the G-Index (Gompers, Ishii, and Metrick (2003)), governance based investment strategy based on the Entrenchment Index, the E-Index (Bebchuk, Cohen, Ferrell (2009)). The composite indexes operate on the normalized, aggregated values of the above methodologies.

VALUE INVESTING STRATEGY BASED ON THE FINANCIAL SCORE OF PIOTROSKI (2000)

Following Piotroski (2000) we calculate book-to-market ratio (BM) and total market value of equity (MVE) for each firm for each fiscal year t (i.e., financial report year) as of the fiscal year-end date for fiscal year t-1. Following Piotroski (2000) we calculate the market value of equity as the number of shares outstanding at fiscal year-end times closing share price. BM is calculated as book value of equity at the end of fiscal year t, scaled by market value of equity.

Contrary to Piotroski (2000), we use the data for each year from the year end for the computation of annual returns. That way we are certain we don't react to the data that might have not yet been published at the date of the analysis.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE GOVERNANCE INDEX OF GOMPERS, ISHII, METRICK (2003)

Gompers et al. (2003) construct the "Governance Index" based on the 24 governance provisions. The description of all the 24 governance provisions is given in Appendix 1. However, the Datastream provides data for 13 distinct corporate governance provisions. Basically, we obtained data for the following 11 governance provisions in the Datastream: poison pills, staggered boards, blank checks, supermajority voting requirements, elimination of cumulative voting rights, compensation plans, limitation of director liability, confidential voting policy, golden parachutes, limited shareholder rights to call meetings, unequal voting rights. We assume that if a company has a "supermajority voting requirement" provision, then it also has the following 2 provisions: limits to amend charters and limits to amend bylaws. Limits to amend charters and limits to amend bylaws usually take the form of

“Supermajority voting requirements” (Gompers et al. (2003), Bebchuk et al. (2009)). Thus, if a company has a "supermajority voting" it has a governance score of 3 based on the assumption.

We also make an assumption for another governance provision for the computation of the Governance Index of Gompers et al. (2003): "Equal Voting Rights". Due to unavailability of “Unequal voting rights” in the Datastream data provider for the computation of the Governance Index (Gompers, Ishii, Metrick (2003)), we assume that if a company has an “Equal voting rights” provision, then it does not have an “Unequal voting rights” provision. Following the methodology of Gompers, Ishii, and Metrick (2003), such a company receives “0”, otherwise “1”.

Due to unavailability of information in the Datastream data provider for governance provisions in the “State law” group, we divide our obtained data into four groups following the methodology of Gompers et al. (2003): tactics for delaying hostile bidders (Delay); voting rights (Voting); director/officer protection (Protection); other takeover defenses (Other). The “Delay” group includes the following obtained provisions: blank checks, staggered boards (also called classified boards), limited shareholder rights to call meetings. The “Voting rights” group includes the following provisions: supermajority voting requirements, supermajority voting requirements to limit charters, supermajority voting requirements to limit bylaws, cumulative voting rights, confidential voting rights (also called Secret Ballot), unequal voting rights. The “Protection” group protects officers and directors against job-related liability or compensates them following a termination includes the following provisions: compensation plans, golden parachutes, limitation of director liability. The “Other takeover defenses” group includes poison pills.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE ENTRENCHMENT INDEX OF BEBCHUK, COHEN, FERRELL (2009)

We have obtained data for the following six provisions for the construction of the E-Index (Bebchuk et al. (2009)) from the Datastream data provider: supermajority voting requirements, poison pills, golden parachutes, staggered boards, limits to amend charters, limits to amend bylaws. Due to data unavailability for the remaining two provisions (i.e., limits to amend charters, limits to amend bylaws) in the Datastream, we assume that if a company has a "supermajority voting requirement" provision, then it also has the following 2 provisions: limits to amend charters and limits to amend bylaws. Limits to amend charters and limits to amend bylaws usually take the form of the supermajority voting requirements (Gompers et al. (2003), Bebchuk et al. (2009)).

COMPOSITE SCORES USING THE FRAMEWORK OF SAATY (2008)

For the composite indexes, we aggregate the information for the Financial Score (Piotroski (2000)) with one of the governance scores: G-Score (Gompers et al. (2003)), or E-Score (Bebchuk et al. (2009)). Therefore, we require the data for the composite index to fulfil the requirements we listed above for the Financial Score and governance indexes.

METHODOLOGY

VALUE INVESTING STRATEGY BASED ON THE FINANCIAL SCORE OF PIOTROSKI (2000)

We follow the methodology of Piotroski (2000) and form portfolios based on the firm's aggregate Financial score (F-SCORE). Piotroski (2000) defines the aggregate Financial Score, F-SCORE. The aggregate Financial Score measures the firm's financial position, and is defined as the sum of the nine

financial binary signals, or F_SCORE = F_ROA + F_ ΔROA + F_CFO + F_ACCRUAL + F_ΔLEVERAGE + F_ΔLIQUIDITY + F_EQUITY OFFERINGS + F_ΔMARGIN + F_ΔTURNOVER. Following the approach of Piotroski (2000), we will assign a Score of either 1 (“good”) or 0 (“bad”) depending signal's implication for future profitability. Following Piotroski (2000), we assume that ex-ante implication of each signal for future firm performance is conditioned on the fact that an average high BM firm is financially distressed (Fama and French (1995), Chen and Zhang (1998)). For example, an increase in leverage can be either a positive (Harris and Raviv (1990)), or a negative (Myers and Majluf (1984), Miller and Rock (1985)) signal. According to Myers and Majluf (1984), and Miller and Rock (1985), an increase in leverage is a negative signal because it signals the inability of a financially distressed firm to generate sufficient internal funds.

The nine financial signals of Piotroski (2000) can be divided into indicators of the following three areas of the firm's financial condition: profitability; leverage, liquidity, and source of funds; and operating efficiency.

Following the methodology of Piotroski (2000) we have chosen the following four indicators in the area of profitability: ROA, ΔROA, CFO, ACCRUAL. We have assigned Scores of “1”, i.e., “good” signal realizations for future profitability, for each of the following outcomes: ROA (net income before extraordinary items over beginning-of-year total assets) is positive; CFO (cash flow from operations over beginning-of-year total assets) is positive; ΔROA (current year’s ROA minus prior year’s ROA) is positive; and ACCRUAL (ROA minus CFO) is negative. Otherwise, we have assigned Scores of “0” for the respective financial signals, i.e., “bad” signal realizations.

Due to data unavailability for one of the nine financial signals of Piotroski (2000), i.e., the issue of Seasoned Equity Offerings, we have chosen the following two specific indicators in the area of leverage and liquidity: ΔLIQUID and ΔLEVER. We have assigned Scores of “1”, i.e., “good” signal realizations, for each of the following outcomes: ΔLIQUID (the most recent year’s ratio of current assets to current liabilities, minus the corresponding ratio for the prior year) is positive; ΔLEVER (the most recent year’s

ratio of long-term debt to average total assets, minus the corresponding ratio for the prior year) is negative. Otherwise, we have assigned Scores of "0", i.e., "bad" signal realizations.

We have chosen the following two indicators in the area of operating efficiency: ΔMARGIN, ΔTURN. We have assigned Scores of "1", i.e., "good" signal realizations, for the following outcomes: ΔMARGIN (current year's ratio of gross margin to total sales, minus the corresponding number for the prior year) is positive; and ΔTURN (current year's ratio of total sales to beginning-of-year total assets, minus the corresponding number for the prior year) is positive. These ratios are important because they underlie a decomposition of return on assets.

An improvement in asset turnover can arise because of an increase in sales, or because of the more efficient use of assets generating the same sales.

Due to data unavailability for the issue of Seasoned Equity Offerings in the Datastream, we compute the aggregate F-Score for each firm for each year.

We classify firms with the lowest aggregate signals (F_SCORE equals 0 or 1) as "low F_SCORE firms" and expect these firms to have the worst subsequent return performance. We classify firms with the highest score (F_SCORE equals 7 or 8) as "high F_SCORE firms" and expect these firms to have the best subsequent return performance.

Following the investment strategy of Piotroski (2000) we buy stocks of "high F-SCORE firms" (F_SCORE equals 7 or 8) and short stocks of "low F_SCORE firms" (F_SCORE equals 0 or 1).

We intend to determine whether a simple accounting-based fundamental analysis strategy can separate future winners from losers, and earn excess returns. The attempt to discriminate ex-ante between future winners and losers, and make abnormal profits is an effort to find evidence that the stock market is inefficient, i.e., stock prices do not incorporate fully past historical information into prices in a timely manner.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE GOVERNANCE INDEX OF GOMPERS, ISHII, METRICK (2003)

Following the methodology of Gompers et al. (2003), we construct a "Governance Index", the G-Index, based on the 13 above mentioned governance provisions obtained from the Datastream data provider. The Governance Index is a proxy for the balance of power between shareholders and managers. We construct the G-Index in a straightforward manner: for every firm we add one point for every provision that restricts shareholder rights (increases managerial power). However, following the methodology of the G-Index construction (Gompers et al. (2003)), there are two exceptions in our G-Index construction: Secret Ballots and Cumulative Voting. A Secret Ballot, also called "confidential voting" by some firms, designates a third party to count proxy votes and prevents management from observing how specific shareholders vote. Cumulative Voting allows shareholders to concentrate their directors' votes so that a large minority holder can ensure board representation. Thus, we consider the presence of Secret Ballots and Cumulative Voting to be increases in shareholder rights. For each one we add one point to the Governance Index when firms do not have it. For all other provisions, we add one point when firms do have it.

We place firms in the highest decile of the Governance Index in the "Dictatorship Portfolio", i.e., firms with the "weakest shareholder rights" or with the "strongest management power" (G-Score >= 8). We place firms in the lowest decile of the index in the "Democracy Portfolio", i.e., firms with the "strongest shareholder rights" or with the "lowest management power" (G-Score <= 3).

Following the investment strategy of Gompers et al. (2003), we buy equities in the lowest decile of the index (Democracy portfolio, G-Score <= 3) and short sell equities in the highest decile of the index (Dictatorship portfolio, G-Score >= 8).

GOVERNANCE INVESTMENT STRATEGY BASED ON THE ENTRENCHMENT INDEX OF BEBCHUK, COHEN, FERRELL (2009)

We construct the Entrenchment index, the E-index, based on the six provisions of Bebchuk et al. (2009). Following the literature constructing governance indices based on a set of provisions (La Porta et al. (1998), Gompers, Ishii, and Metrick (2003)), we construct the E-index by giving an equal weight to each of the six provisions each firm has for each year. Thus, we calculate the E-Index by giving one point for each of the six provisions that the firm has.

Following Bebchuk et al. (2009), Gompers et al. (2003), Bebchuk, Cohen, Wang (2012) we construct two extreme portfolios based on the E-Index: Democracy portfolio and Dictatorship portfolio. We place firms with the strongest shareholder rights (E-Index is 0 or 1) in the Democracy portfolio. We place firms with the weakest shareholder rights (E-Index is 5 or 6) in the Dictatorship portfolio. We short sell firms with especially bad governance in the Dictatorship portfolio (E-Index is 5 or 6), and buy firms with especially good governance (E-Index is 0 or 1) in the Democracy portfolio.

COMPOSITE SCORE FOR THE AGGREGATION OF THE FINANCIAL SCORE (PIOTROSKI (2000)) WITH EITHER THE GOVERNANCE SCORE (GOMPERS, ISHII, METRICK (2003)) OR THE ENTRENCHMENT SCORE (BEBCHUK, COHEN, FERRELL (2009)) USING THE FRAMEWORK OF SAATY (2008)

The methodology for the Composite Score was developed by Saaty (2008). We assume that combining the indexes together would yield better and more robust results then when just using one index separately.

According to Saaty (2008), the Analytic Hierarchy Process allows us to formulate the Composite index with the following parameters: F-Score (Piotroski (2000)) and G-Index (Gompers, Ishii, Metrick (2003)) equally important; F-Score (Piotroski (2000)) and E-Index (Bebchuk, Cohen, Ferrell (2009)) equally important. Saaty's framework (2008) is very extensive and allows us to create the composite index in the way that the F-Score (Piotroski (2000)) is more important than the G-Index (Gompers, Ishii, Metrick (2003)), and vice versa; or the F-Score (Piotroski (2000)) is more important than the E-Index (Bebchuk, Cohen, Ferrell (2009)), and vice versa.

We will perform the following analysis for the construction of the Composite index to aggregate the F-Score (Piotroski (2000)) and the G-Index (Gompers, Ishii, Metrick (2003)) using the framework of Saaty (2008):

- F-Score (Piotroski (2000)) based on available financial data in the Datastream data provider
- G-Index (Gompers, Ishii, Metrick (2003)) based on available governance data in the Datastream data provider
- Composite Index, where G-Index (Gompers, Ishii, Metrick (2003)) and F-Score (Piotroski (2000)) information contributes equally to the result

We will perform the following analysis for the construction of the Composite index to aggregate the F-Score (Piotroski (2000)) and the E-Index (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008):

- F-Score (Piotroski (2000)) based on available financial data in the Datastream data provider
- E-Index (Bebchuk, Cohen, Ferrell (2009)) based on available governance data in the Datastream data provider
- Composite Index, where the E-Index (Bebchuk, Cohen, Ferrell (2009)) and the F-Score (Piotroski (2000)) information contributes equally to the result

To calculate the composite index, we must obtain the normalized values for the variables we intend to aggregate.

We can calculate it as follows

$$NormalizedValue = \frac{VariableActualValue}{VariableMaximumValue}$$

Where $NormalizedValue \in < 0 ; 1 >$

For G-Index the VariableMaximumValue is 13 and for the E-Index the VariableMaximumValue is 6. Both indexes can yield 0.

We have made some adjustment to the F-Score normalized value. In the articles of Gompers et al. (2003) about the G-Index, and Bebchuk et al. (2009) about the E-Index, lower values of the indexes are used to filter the long positions and high values are used for short positions. In the article of Piotroski (2000), it's exactly the opposite.

To reflect the components intent for long and short positions we have normalized the data for the F-Score as follows:

$$FScore\ NormalizedValue = 1 - \frac{FScoreActualValue}{FScoreMaximumValue}$$

As written above in our analysis we will only construct the composite indexes where each component is equally important.

The weights can be calculated as follow

$$w_i = \frac{1}{N}$$

Where w_i is weight of the i component in the composite index. Since N = 2 then all the weights will be equal 0.5.

Considering the above we can construct the composite indexes as follow

$$CompositeIndex_{EIndex\ and\ FScore} = \frac{1}{2} \times FScoreNormalizedValue + \frac{1}{2} \times EIndexNormalizedValue$$

$$CompositeIndex_{GIndex\ and\ FScore} = \frac{1}{2} \times FScoreNormalizedValue + \frac{1}{2} \times GIndexNormalizedValue$$

When we calculate the composite index, we have to construct the portfolio. We will apply the same rule as the authors of Financial Score, G-Index and E-Index – we will construct the long-short portfolio. Financial Score, G-Index and E-Index use certain levels to determine if we will use the equity in the portfolio for long position or short sale.

We have noticed that the levels are quite similar (Table 1).

	Number of possible values (including 0)	**Values for long position as percent of total number**	**Values for short position as percent of total number**
Financial Score	9	0.22	0.22
G-Index	14	0.33	0.33
E-Index	7	0.29	0.29
	Median	**0.28**	**0.28**

Table 1. Summary of the long-short boundary levels for the investment strategies

We will use the similar approach for the composite index. Based on the values in Table 1 we will filter the equities in the lower percentile (0.28) for long positions and short the equities in the higher percentile using the average values for the Financial Score, G-Index and E-Index. Since the composite index values are in the range between 0 and 1 we can determine the following

Long positions when composite index <= 0.28

Short positions when

composite index >= (1 – 0.28)

composite index >= 0.62

RESULTS AND ANALYSIS

For each of the presented investment strategies we will use the common investment strategy and portfolio construction. Each portfolio will be equally weighted, where the weight of each stock in the portfolio is

$$weight = \frac{1}{Total\ Number\ of\ the\ equities\ in\ the\ portfolio}$$

Therefore, the total returns of the portfolio will be equal

$$Total\ Portfolio\ Return = \sum_{N}^{1} \frac{equityInIndexReturn}{N}$$

Where N is the number of equities in the portfolio.

We will construct, for each year of the data, the long-short portfolio according to the specific methodology. We will adjust the returns by the Risk-Free Rate. As a base for the Risk-Free Rate we have

chosen 3 months US Treasury Bill for which we have obtained the historical rates from US Department of the Treasury.

After calculating all the returns, we will calculate the Sharpe ratio for the excess returns of the investment strategy. To present the total return of the strategy we have chosen the compounded excess returns over the time of the analysis (2002-2015). We will also calculate the Average Annual Growth Rate (AAGR). This approach will enable us to fairly compare the strategies.

VALUE INVESTING STRATEGY BASED ON THE FINANCIAL SCORE OF PIOTROSKI (2000)

We have presented the annual returns for the value investing strategy based on the Financial Score of Piotroski (2000) in the Table 2.

Year	Long returns	Short returns	Total returns	Risk Free Rate	Excess returns	Compounded excess returns
2002	0.61017	-1.9107	0.59738	0.0122	**0.58518**	1.58518
2003	0.30374	-0.0647	0.26947	0.0094	**0.26007**	1.99743
2004	0.16507	0.15561	0.16427	0.0222	**0.14207**	2.28121
2005	0.1877	-0.1386	0.14759	0.0408	**0.10679**	2.52482
2006	0.13153	0.03531	0.12152	0.0502	**0.07132**	2.70489
2007	-0.367	0.52731	-0.2242	0.0337	**-0.2579**	2.0074
2008	0.59858	-2.1207	0.11871	0.0011	**0.11761**	2.24349
2009	0.3427	-0.101	0.27603	0.0006	**0.27543**	2.86141
2010	0.01559	0.00511	0.01457	0.0012	**0.01337**	2.89967
2011	0.18935	-0.1803	0.11722	0.0002	**0.11702**	3.239
2012	0.54927	-0.9269	0.26568	0.0005	**0.26518**	4.09791
2013	0.14111	-0.0751	0.10862	0.0007	**0.10792**	4.54015
2014	0.00297	0.19918	0.03821	0.0004	**0.03781**	4.71182
2015	0.11468	0.02133	0.09236	0.0016	**0.09076**	5.13948

Table 2. Returns for the Financial Score strategy (Piotroski (2000)) for the study period 2002-2015

We have adjusted for risk the annual returns of the value investing strategy based on the Financial Score of Piotroski (2000) demonstrated in the Table 2 using the Sharpe ratio (Table 3).

Average Excess returns	Standard Deviation of Excess returns	Sharpe ratio
0.13805	0.18431	**0.74898**

Table 3. Shape ratio for the value investing strategy based on the Financial Score of Piotroski (2000)

We have presented the compounded annual excess returns for Financial Score (Piotroski (2000)) for the study period 2002-2015 in the Chart 1.

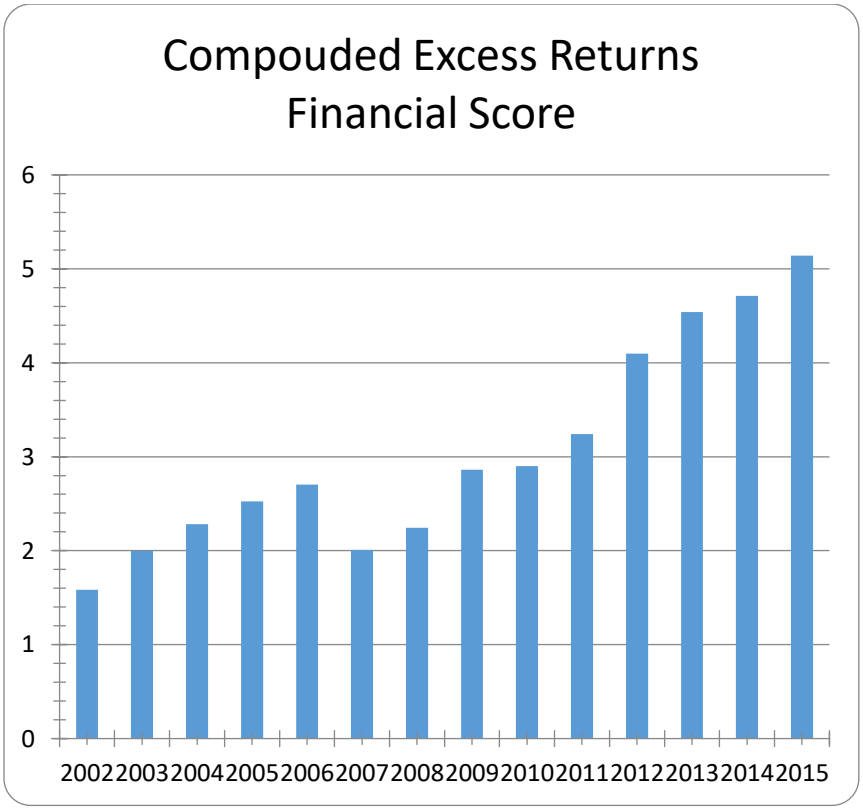

Chart 1. Compounded annual excess returns for the Financial Score strategy (Piotroski (2000)) for the study period 2002-2015

The Financial Score based investment strategy (Piotroski (2000)) has yielded an excellent return over the period 2002-2015 (Table 2). $1 invested in the portfolio based on the Piotroski (2000) investment hypothesis in 2002 would have been worth $5.13 in 2015 (Chart 1).

Sharpe ratios is also excellent at 0.75 (Table 3). The Financial Score based investment strategy (Piotroski (2000)) offers very good returns with the moderate risk.

The only negative period of this strategy (2007-2008) coincides with the global fiscal crisis. Yet, the strategy recovered and continued to bring sizable returns when the financial markets stabilized after 2010 (Table 2, Chart 1).

Our results confirm the findings of Piotroski (2000) and Woodley, Jones, Reburn (2011) that the market is inefficient, i.e., it is possible to discriminate ex-ante between future winners (High F-Score firms) and future losers (Low F-Score), and inverstors are able to earn substantial excess returns. However, our results contradict the findings of Woodley, Jones, Reburn (2011) that the Piotroski (2000) results have reversed in our Post-Piotroski study sample.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE GOVERNANCE INDEX OF GOMPERS, ISHII, METRICK (2003)

We have presented the annual returns for the governance investment strategy based on the Governance Index of Gompers, Ishii, Metrick (2003) in the Table 4.

Year	Long returns	Short returns	Total returns	Risk Free Rate	Excess returns	Compounded excess returns
2002	0.34407	-0.4067	0.07961	0.0122	**0.06741**	1.06741
2003	0.15941	-0.2242	0.01887	0.0094	**0.00947**	1.07752
2004	0.08818	-0.165	-0.0435	0.0222	**-0.0657**	1.00677
2005	0.18852	-0.1891	-0.0676	0.0408	**-0.1084**	0.89762
2006	0.09619	-0.083	-0.0291	0.0502	**-0.0793**	0.82643
2007	-0.3191	0.35339	0.28029	0.0337	**0.24659**	1.03023
2008	2.1412	-0.5102	-0.4901	0.0011	**-0.4912**	0.52414
2009	0	-0.1937	-0.1937	0.0006	**-0.1943**	0.42229
2010	0	-0.0347	-0.0347	0.0012	**-0.0359**	0.40713
2011	0	-0.2209	-0.2209	0.0002	**-0.2211**	0.31711
2012	0	-0.374	-0.374	0.0005	**-0.3745**	0.19837
2013	0	-0.1542	-0.1542	0.0007	**-0.1549**	0.16764
2014	0	0.02833	0.02833	0.0004	**0.02793**	0.17232
2015	0	-0.1814	-0.1814	0.0016	**-0.183**	0.14078

Table 4. Returns for Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015

We have adjusted for risk the annual returns of the governance investment strategy based on the Governance Index of Gompers, Ishii, Metrick (2003) demonstrated in the Table 4 using the Sharpe ratio (Table 5).

Average Excess returns	Standard Deviation of Excess returns	Sharpe ratio
-0.1112	0.18447	**-0.6029**

Table 5. Sharpe ratio for the governance investment strategy based on the Governance Index of Gompers, Ishii, Metrick (2003)

We have presented the compounded annual excess returns for the Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015 in the Chart 2.

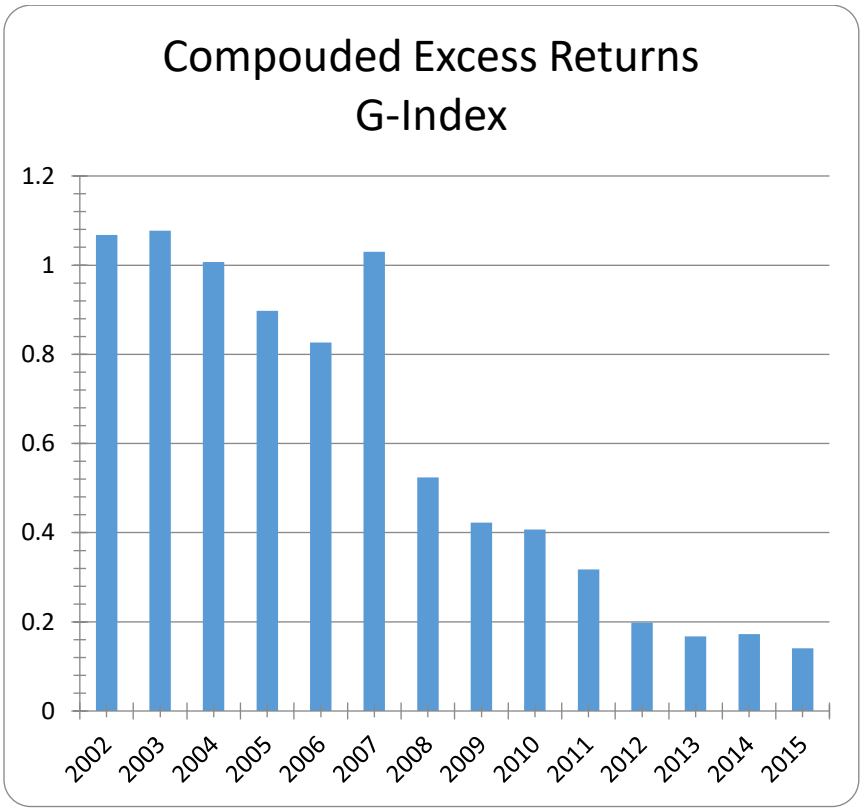

Chart 2. Compounded annual excess returns for Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015

Governance Index strategy (Gompers, Ishii, Metrick (2003)) has clearly lost an edge over the market during our study period (2002-2015) compared to the analysis of Gompers et al. (2003) during the 1990s (Table 4). The compounded returns indicate that $1 invested in the portfolio based on Gompers et al.

(2003) hypothesis in 2002 would have been worth only 14cc in 2015 (Chart 2). Sharpe ratio of -0.60 (Table 5) indicates extreme risk and makes the strategy unusable in the real-world applications.

However, our study sample is much smaller than the study sample of Gompers et al. (2003). Also, we could not obtain the full selection of the governance provisions (24) from the Datastream data provider. Since the returns show a clear downtrend we have tried to test the Gompers et al. (2003) hypothesis to reverse Governance Index companies selection.

We have constructed the investment portfolio with the selection of the companies where long positions are chosen for the companies with G-Index greater or equal 8 and short positions for companies with G-Index smaller or equal 3. We have presented the annual returns for the 'Inverted' Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015 in the Table 6.

Year	**Long returns**	**Short returns**	**Total returns**	**Risk Free Rate**	**Excess returns**	Compounded excess returns
2002	0.29986	-0.3988	-0.3917	0.0122	**-0.4039**	0.59607
2003	0	-0.2208	-0.2208	0.0094	**-0.2302**	0.45885
2004	0.28947	-0.1309	-0.1189	0.0222	**-0.1411**	0.39409
2005	0.32215	-0.1797	-0.1446	0.0408	**-0.1854**	0.32102
2006	0.08497	-0.0951	-0.0766	0.0502	**-0.1268**	0.2803
2007	-0.3104	0.35367	0.20841	0.0337	**0.17471**	0.32927
2008	0.55277	-0.5263	0.07992	0.0011	**0.07882**	0.35523
2009	0.19694	0	0.19694	0.0006	**0.19634**	0.42497
2010	0.03264	0	0.03264	0.0012	**0.03144**	0.43833
2011	0.22905	0	0.22905	0.0002	**0.22885**	0.53864
2012	0.34015	0	0.34015	0.0005	**0.33965**	0.72159
2013	0.12764	0	0.12764	0.0007	**0.12694**	0.81319
2014	-0.0344	0	-0.0344	0.0004	**-0.0348**	0.78488
2015	0.18324	0	0.18324	0.0016	**0.18164**	0.92744

Table 6. Returns for the 'Inverted' Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015

We have adjusted for risk the annual returns of the governance investment strategy based on the ´Inverted´ Governance Index of Gompers, Ishii, Metrick (2003) demonstrated in the Table 6 using the Sharpe ratio (Table 7).

Average Excess Returns	Standard Deviation of Excess returns	Sharpe ratio
0.01686	0.21066	**0.08003**

Table 7. Sharpe ratio for the ´Inverted´ Governance Index of Gompers, Ishii, Metrick (2003)

We have presented the compounded annual excess returns for the 'Inverted' Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015 in the Chart 3.

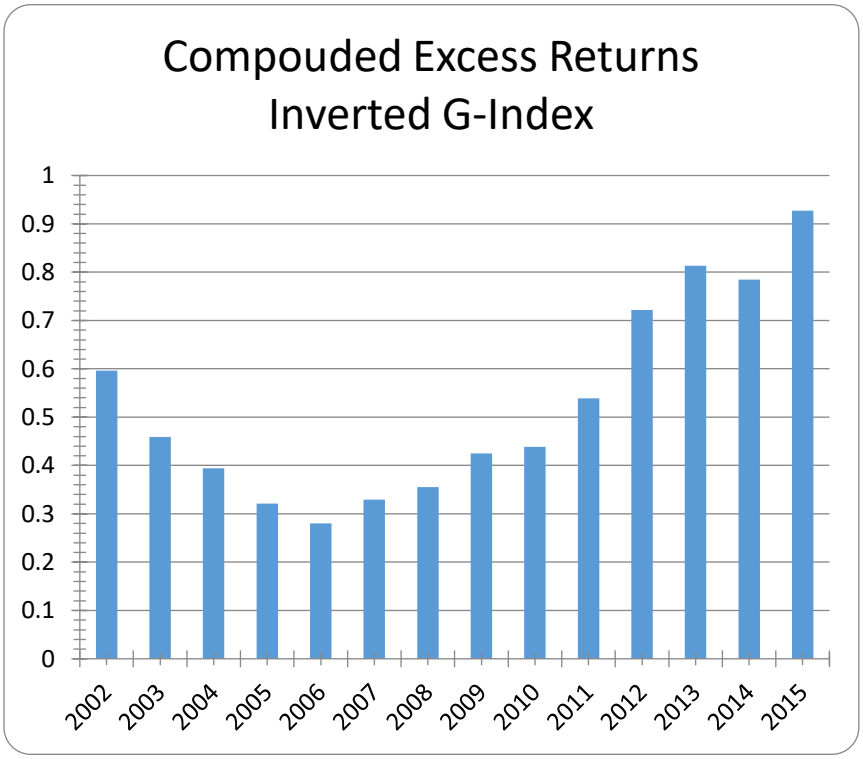

Chart 3. Compounded annual excess returns for 'Inverted' Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015

Unfortunately, 'inverting' the companies selection for Governance Index (Gompers, Ishii, Metrick (2003)) has not helped overall effectiveness of the strategy (Table 6, Chart 3). The Sharpe ratio is very low and equal 0.08 (Table 7). This means that the strategy yields subpar returns over the longer period. This is in line with learning explanation by Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, Wang (2013). Thus, the market became efficient, i.e., the current stock price incorporates all the available public information, and investors are unable to earn excess returns.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE ENTRENCHMENT INDEX OF BEBCHUK, COHEN, FERRELL (2009)

We have presented the annual returns for the governance investment strategy based on the Entrenchment index of Bebchuk, Cohen, Ferrell (2009) in the Table 8.

Year	**Long returns**	**Short returns**	**Total returns**	**Risk Free Rate**	**Excess returns**	Compounded excess returns
2002	0.41856	-0.4191	0.35154	0.0122	**0.33934**	1.33934
2003	0.19976	-0.126	0.16697	0.0094	**0.15757**	1.55038
2004	0.1277	-0.2267	0.07906	0.0222	**0.05686**	1.63854
2005	0.18507	-0.2348	0.11293	0.0408	**0.07213**	1.75673
2006	0.16172	-0.104	0.10023	0.0502	**0.05003**	1.84461
2007	-0.3815	0.34443	-0.0455	0.0337	**-0.0792**	1.69848
2008	0.48087	-0.6398	-0.1774	0.0011	**-0.1785**	1.39534
2009	0.19778	-0.254	-0.1194	0.0006	**-0.12**	1.22787
2010	0.06077	0.03231	0.04088	0.0012	**0.03968**	1.2766
2011	0.17441	-0.242	-0.0845	0.0002	**-0.0847**	1.16848
2012	0.39813	-0.4621	-0.0726	0.0005	**-0.0731**	1.08312
2013	0.20315	-0.1178	0.03411	0.0007	**0.03341**	1.1193

2014	-0.0142	-0.0133	-0.0138	0.0004	**-0.0142**	1.10344
2015	0.16233	-0.1474	0.0304	0.0016	**0.0288**	1.13521

Table 8. Returns for Entrenchment Index 2002-2015

We have adjusted for risk the annual returns of the governance investment strategy based on the Entrenchment index of Bebchuk, Cohen, Ferrell (2009) demonstrated in the Table 8 using the Sharpe ratio (Table 9).

Average Excess returns	Standard Deviation of Excess returns	Sharpe ratio
0.0163	0.12889	**0.12645**

Table 9. Sharpe ratio for the governance investment strategy based on the Entrenchment index of Bebchuk, Cohen, Ferrell (2009)

We have presented the compounded annual excess returns for the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) for the study period 2002-2015 in the Chart 4.

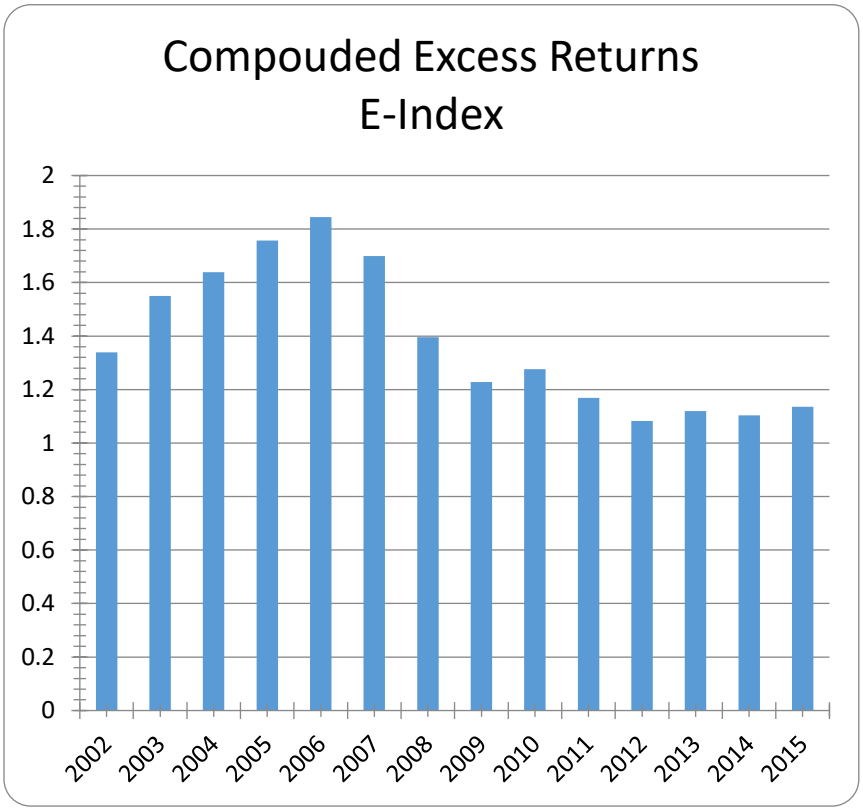

Chart 4. Compounded annual excess returns for the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) for the study period 2002-2015

Entrenchment Index strategy has yielded a very minor return over the period 2002-2015 (Table 8). $1 invested in the portfolio based on the Entrenchment Index hypothesis (Bebchuk, Cohen, Ferrell (2009)) in 2002 would have been worth only $1.13 in 2015 (Chart 4).

The Sharpe ratio is low at 0.12 (Table 9). From looking at the chart 4, it becomes apparent that strategy is losing the edge after 2007. Until 2007 we could have achieved very positive returns when investing according to the E-Index based investment strategy of Bebchuk, Cohen, Ferrell (2009) as demonstrated in the chart 4. Consistent with the Governance Index results (Table 4, Table 5, Chart 2; Table 6, Table 7, Chart 3), the failure of the E-Index based investment strategy (Bebchuk, Cohen, Ferrell (2009)) to generate superior returns after 2007 (Table 8, Table 9, Chart 4) can be associated with the learning

explanation by Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, Wang (2013). Thus, the market became efficient, i.e., the current stock price incorporates all the available public information, and investors are unable to earn substantial excess returns.

INVESTMENT STRATEGY BASED ON THE COMPOSITE SCORE FOR THE AGGREGATION OF THE FINANCIAL SCORE (PIOTROSKI (2000)) AND THE GOVERNANCE SCORE (GOMPERS, ISHII, METRICK (2003)) USING THE FRAMEWORK OF SAATY (2008)

We have presented the annual returns for the investment strategy based on the Composite Score for the aggregation of the Financial Score of (Piotroski (2000)) and the Governance Score (Gompers, Ishii, Metrick (2003)) using the framework of Saaty (2008) during the study period 2002-2015 in the Table 10.

Year	Long returns	Short returns	Total returns	Risk Free Rate	Excess returns	1
2002	0.36134	0	0.36134	0.0122	**0.34914**	1.34914
2003	0.23246	0	0.23246	0.0094	**0.22306**	1.65007
2004	0.14608	-0.4291	0.14276	0.0222	**0.12056**	1.849
2005	0.18051	0	0.18051	0.0408	**0.13971**	2.10733
2006	0.13454	-0.2566	0.12176	0.0502	**0.07156**	2.25813
2007	-0.3403	0.07756	-0.3253	0.0337	**-0.359**	1.44736
2008	0.43434	-0.7202	0.22442	0.0011	**0.22332**	1.77058
2009	-0.0828	-0.0118	-0.022	0.0006	**-0.0226**	1.73059
2010	-0.146	-0.1521	-0.1506	0.0012	**-0.1518**	1.46795
2011	0.3695	-0.0506	0.05444	0.0002	**0.05424**	1.54757
2012	0.24237	-0.3188	-0.2387	0.0005	**-0.2392**	1.17745
2013	0.67821	-0.2022	-0.0066	0.0007	**-0.0073**	1.1689
2014	-0.3342	0.06949	0.04258	0.0004	**0.04218**	1.2182
2015	0	-0.0833	-0.0833	0.0016	**-0.0849**	1.11482

Table 10. Returns for the investment strategy based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003)) using the framework of Saaty (2008) during the study period 2002-2015

We have adjusted for risk the annual returns of the investment strategy based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003)) using the Sharpe ratio (Table 11).

Average Excess returns	Standard Deviation of Excess returns	Sharpe ratio
0.02565	0.19077	**0.13445**

Table 11. Sharpe ratio for the investment strategy based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003))

We have presented the compounded annual excess returns for the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015 in the Chart 5.

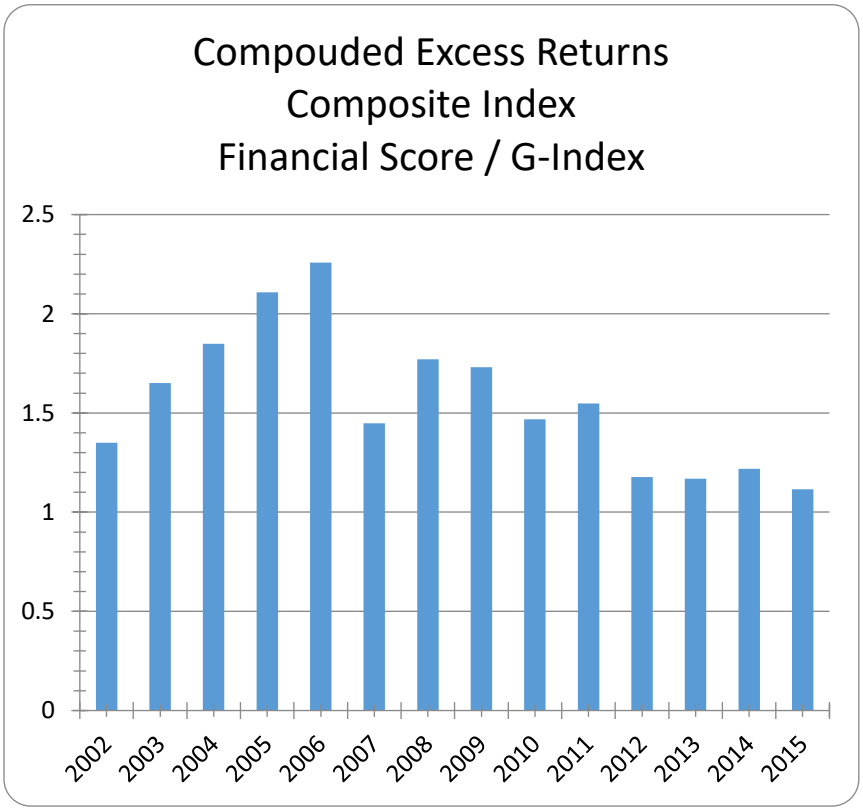

Chart 5. Compounded annual excess returns for the Composite Index to aggregate the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003)) for the study period 2002-2015

The investment strategy based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003)) using the framework of Saaty (2008) has yielded a modest return over the period 2002-2015 (Table 10). $1 invested in the portfolio based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers, Ishii, Metrick (2003)) in 2002 would have been worth $1.11 in 2015 (Chart 5). The Sharpe ratio is also low at 0.13 (Table 11).

If we look at only the raw performance of the composite index we can't recommend it as an investment strategy. The interesting part is that it is a result of the merge between Financial Score (Piotroski (2000)) that yielded substantial returns (Table 2, Table 3, Chart 1) and G-Index (Gompers, Ishii, Metrick (2003)) that has yielded substantial losses (Table 4, Table 5, Chart 2; Table 6, Table 7, Chart 3). If one investor would have invested in the only Financial Score based investment strategy (Piotroski (2000)), or in the only G-Index based governance strategy (Gompers, Ishii, Metrick (2003)),then the result for the above market returns would have a probability of the coin toss of 0.5. Based on this example, we can confirm our hypothesis that composite index can act as a "fund-of-funds" of the investment strategies.

(http://www.investopedia.com/terms/f/fundsoffunds.asp). On the one side, our hypothetical investor would not perhaps have earned a lot of money but on the other side, he would not have lost money as well.

INVESTMENT STRATEGY BASED ON THE COMPOSITE SCORE FOR THE AGGREGATION OF THE FINANCIAL SCORE (PIOTROSKI (2000)) AND THE ENTRENCHMENT SCORE (BEBCHUK, COHEN, FERRELL (2009)) USING THE FRAMEWORK OF SAATY (2008)

We have presented the annual returns for the investment strategy based on the Composite Score for the aggregation of the Financial Score of (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008) in the Table 12.

Year	Long returns	Short returns	Total returns	Risk Free Rate	Excess returns	1
2002	0.36443	0	0.36443	0.0122	**0.35223**	1.35223
2003	0.20672	-0.3297	0.18548	0.0094	**0.17608**	1.59032

2004	0.12158	-0.3355	0.09015	0.0222	**0.06795**	1.69839
2005	0.1682	-0.2812	0.13248	0.0408	**0.09168**	1.8541
2006	0.22858	-0.1638	0.16898	0.0502	**0.11878**	2.07433
2007	-0.3453	0.33568	-0.1227	0.0337	**-0.1564**	1.74999
2008	0.45417	-0.9255	-0.2296	0.0011	**-0.2307**	1.34635
2009	0.21834	-0.2542	-0.0442	0.0006	**-0.0448**	1.28603
2010	0.02199	0.05462	0.03673	0.0012	**0.03553**	1.33172
2011	0.16543	-0.2405	-0.0375	0.0002	**-0.0377**	1.28146
2012	0.38181	-0.5267	-0.0089	0.0005	**-0.0094**	1.26938
2013	0.19406	-0.114	0.06954	0.0007	**0.06884**	1.35675
2014	-0.0093	0.04553	0.01229	0.0004	**0.01189**	1.37288
2015	0.12617	-0.1504	0.03068	0.0016	**0.02908**	1.4128

Table 12. Returns for the investment strategy based on the Composite Score for the aggregation of the Financial Score of (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008) for the study period 2002-2015

We have adjusted for risk the annual returns of the investment strategy based on the Composite Index for the aggregation of the Financial Score of (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) (Table 12) using the Sharpe ratio (Table 13).

Average Excess returns	Standard Deviation of Excess returns	Sharpe ratio
0.03379	0.13988	**0.24156**

Table 13. Sharpe ratio for the investment strategy based on the Composite Index for the aggregation of the Financial Score of (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009))

We have presented the compounded annual excess returns for the Composite Index for the aggregation of the Financial Score of (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) for the study period 2002-2015 in the Chart 6.

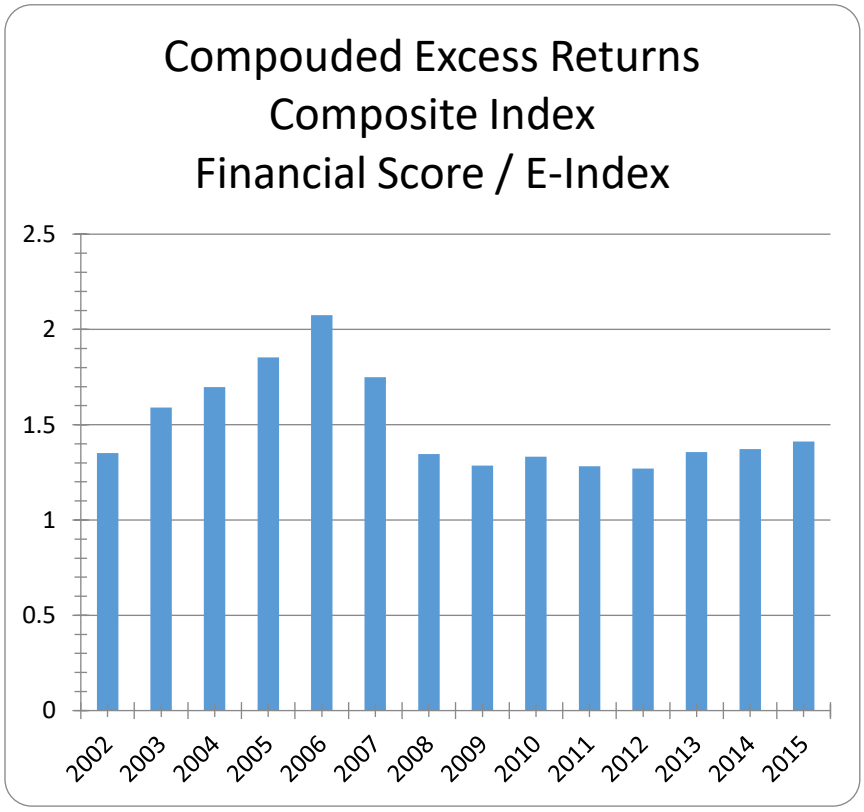

Chart 6. Compounded annual excess returns for the Composite Index to aggregate the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) for the study period 2002-2015

The investment strategy based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) using the framework

of Saaty (2008) has yielded average return over the period 2002-2015 (Table 12). $1 invested in the portfolio based on the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)) in 2002 would have been worth $1.41 in 2015 (Chart 6). The Sharpe ratio is modest at 0.24 (Table 13).

As with the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) (Table 10, Table 11, Chart 5) we can see that the returns are a merge between the high-performance strategy based on the Financial Score of Piotroski (2000) (Table 2, Table 3, Chart 1) and the E-Index based investment strategy (Bebchuk, Cohen, Ferrell (2009)) that stagnated after 2007 (Table 8, Table 9, Chart 4). Until 2007 the Composite Index for the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Score (Bebchuk, Cohen, Ferrell (2009)) has been on par with Financial Score, delivering the returns that were less volatile then the Financial Score returns (Chart 6). Overall, the strategy earned the return of 41% above the risk-free rate returns.

ROBUSTNESS

We have used the White test in our robustness analysis of the above-mentioned investment strategies (White (1980)).

https://en.wikipedia.org/wiki/Homoscedasticity, https://en.wikipedia.org/wiki/White_test

In statistics, the White test is a statistical test that establishes whether the variance of the errors in a regression model is constant: that is for homoskedasticity.

This test, and an estimator for heteroskedasticity-consistent standard errors, were proposed by White in 1980.

To test for constant variance we will conduct regression analysis of the squared residuals from the regression model that will reflect our investment strategy onto a squared unstandardized predicted value. After that we will inspect the R^2.

The logic of the test is as follows. First, the squared residuals from the original model serve as a proxy for the variance of the error term at each observation. (The error term is assumed to have a mean of zero, and the variance of a zero-mean random variable is just the expectation of its square). The independent variables in the auxiliary regression account for the possibility that the error variance depends on the values of the original regressors in some way (linear or quadratic). If the error term in the original model is in fact homoskedastic (has a constant variance) then the coefficients in the auxiliary regression (besides the constant) should be statistically indistinguishable from zero, and the R^2 should be “small". Conversely, a “large" R^2 (scaled by the sample size so that it follows the chi-squared distribution) counts against the hypothesis of homoskedasticity.

The assumption of homoscedasticity simplifies mathematical and computational treatment. Serious violations in homoscedasticity (assuming a distribution of data is homoscedastic when in reality it is heteroscedastic) may result in overestimating the goodness of fit. Therefore, if the White test will result in insignificant R^2 then we can assume that our model is robust.

The independent value for the model will be annual returns for the stocks adjusted for the risk-free rate as follow

$$StockReturn_N = \frac{StockPrice_N - StockPrice_{N-1} + DividendPerShare_N}{StockPrice_{N-1}} - RiskFreeRate_N$$

where N is a current year.

For each model, we will assign the independent variables according to the model specification.

We will conduct robustness checks in the econometrics program ´´SPSS´.

VALUE INVESTING STRATEGY BASED ON THE FINANCIAL SCORE OF PIOTROSKI (2000)

For Financial Score (Piotroski (2000)), we have chosen the following parameters of the analysis as the independent variables: market capitalization of the stock, year, Financial Score value and the general industry classification where the stock is classified.

We have presented the output of the Financial Score (Piotroski (2000)) Model Regression in the econometrics program ´SPSS´ in the Tables 14, 15, 16, 17 and in the Chart 7.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.043[a]	.002	.002	2.4424602

a. Predictors: (Constant), General Industry Classification, MARKET CAPITALIZATION, Year, F-SCORE Calculated

b. Dependent Variable: Long excess return

Table 14. Financial Score (Piotroski (2000)) Model Regression output in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	230.234	4	57.559	9.648	.000[b]
	Residual	125355.403	21013	5.966		
	Total	125585.637	21017			

a. Dependent Variable: Long excess return

b. Predictors: (Constant), General Industry Classification, MARKET CAPITALIZATION, Year, F-SCORE Calculated

Table15. Piotroski (2000)) Model Regression output in the econometrics program ´SPSS´

'Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	49.398	8.552		5.776	.000
	Year	-.024	.004	-.040	-5.746	.000
	F-SCORE Calculated	-.007	.011	-.004	-.598	.550
	MARKET CAPITALIZATION	-1.151E-009	.000	-.013	-1.906	.057
	General Industry Classification	-.027	.035	-.005	-.773	.439

a. Dependent Variable: Long excess return

Table 16. Financial Score (Piotroski (2000)) Model Regression output in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.623877	.441931	.228614	.1046645	21018
Std. Predicted Value	-8.145	2.038	.000	1.000	21018
Standard Error of Predicted Value	.018	.386	.033	.018	21018
Adjusted Predicted Value	-.639070	.441579	.228602	.1047093	21018
Residual	-1.3779678	293.7626953	0E-7	2.4422278	21018
Std. Residual	-.564	120.273	.000	1.000	21018
Stud. Residual	-.564	120.279	.000	1.000	21018
Deleted Residual	-1.3783753	293.7900391	.0000121	2.4425013	21018
Stud. Deleted Residual	-.564	215.494	.005	1.593	21018
Mahal. Distance	.102	523.045	4.000	12.306	21018
Cook's Distance	.000	.269	.000	.002	21018
Centered Leverage Value	.000	.025	.000	.001	21018

a. Dependent Variable: Long excess return

Table 17. Financial Score (Piotroski (2000)) Model Regression output in the econometrics program ´SPSS´

We have presented unstandarized Residual / unstandarized Predicted Value for the Financial Score (Piotroski (2000)) in the Chart 7.

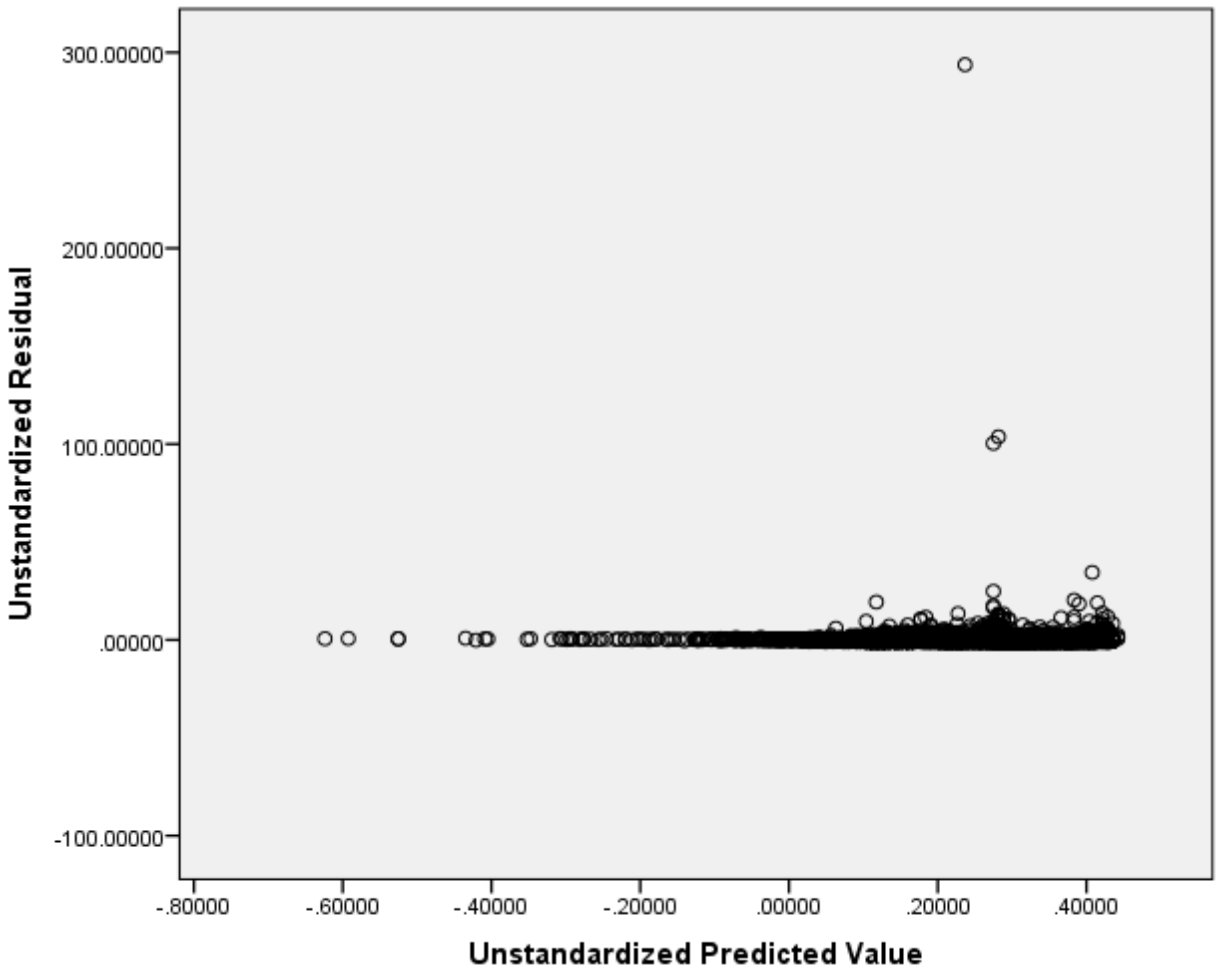

Chart 7. Unstandarized Residual / Unstandarized Predicted Value for the Financial Score (Piotroski (2000))

We have conducted the **White test regression** for the Financial Score (Piotroski (2000)) in the econometrics program ´SPSS´. We have presented the output of the White test regression for the Financial Score (Piotroski (2000)) in the econometrics program ´SPSS´ in the Tables 18, 19, 20.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.000[a]	.000	.000	603.99004

a. Predictors: (Constant), Unstandarized_Predicted_Value_Squared

Table 18. Output of the White test regression for the Financial Score (Piotroski (2000)) in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1271.477	1	1271.477	.003	.953[b]
	Residual	7666720277.453	21016	364803.972		
	Total	7666721548.930	21017			

a. Dependent Variable: Unstandarized_Residual_Squared

b. Predictors: (Constant), Unstandarized_Predicted_Value_Squared

Table19. Output of the White test regression for the Financial Score (Piotroski (2000)) in the econometrics program ´SPSS´

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.645	6.824		.827	.408
Unstandardized_Predicted_Value_Squared	5.047	85.485	.000	.059	.953

a. Dependent Variable: Unstandarized_Residual_Squared

Table 20. Output of the White test regression for the Financial Score (Piotroski (2000)) in the econometrics program ´SPSS´

We have found that the R Square in the White test is equal .000, therefore we assume our model for the Financial Score is robust.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE GOVERNANCE INDEX OF GOMPERS, ISHII, METRICK (2003)

For Governance Index, we have chosen the following parameters of the analysis as the independent variables: market capitalization of the stock, year, Governance Index value and the general industry classification where the stock is classified.

We have presented the output of the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´ in the Tables 21, 22, 23, 24 and in the Chart 8.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.135[a]	.018	.017	.4552559

a. Predictors: (Constant), General Industry Classification, MARKET CAPITALIZATION, Year, G-Index Calculated
b. Dependent Variable: Long excess return

Table 21. Output of the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.060	4	2.765	13.341	.000[b]
	Residual	593.379	2863	.207		
	Total	604.440	2867			

a. Dependent Variable: Long excess return
b. Predictors: (Constant), General Industry Classification, MARKET CAPITALIZATION, Year, G-Index Calculated

Table 22. Output of the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.144	6.625		3.493	.000
	Year	-.011	.003	-.090	-3.464	.001
	G-Index Calculated	.010	.004	.058	2.248	.025
	MARKET CAPITALIZATION	-1.080E-009	.000	-.106	-5.654	.000
	General Industry Classification	-.011	.006	-.036	-1.948	.052

a. Dependent Variable: Long excess return

Table 23. Output of the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.406952	.257763	.137571	.0621110	2868
Std. Predicted Value	-8.767	1.935	.000	1.000	2868
Standard Error of Predicted Value	.009	.090	.018	.007	2868
Adjusted Predicted Value	-.416732	.259552	.137514	.0622947	2868
Residual	-1.1655210	7.8204274	0E-7	.4549382	2868

Std. Residual	-2.560	17.178	.000	.999	2868
Stud. Residual	-2.561	17.208	.000	1.000	2868
Deleted Residual	-1.1661590	7.8479276	.0000572	.4556529	2868
Stud. Deleted Residual	-2.563	18.171	.001	1.014	2868
Mahal. Distance	.153	111.134	3.999	5.325	2868
Cook's Distance	.000	.208	.000	.004	2868
Centered Leverage Value	.000	.039	.001	.002	2868

a. Dependent Variable: Long excess return

Table 24. Output of the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

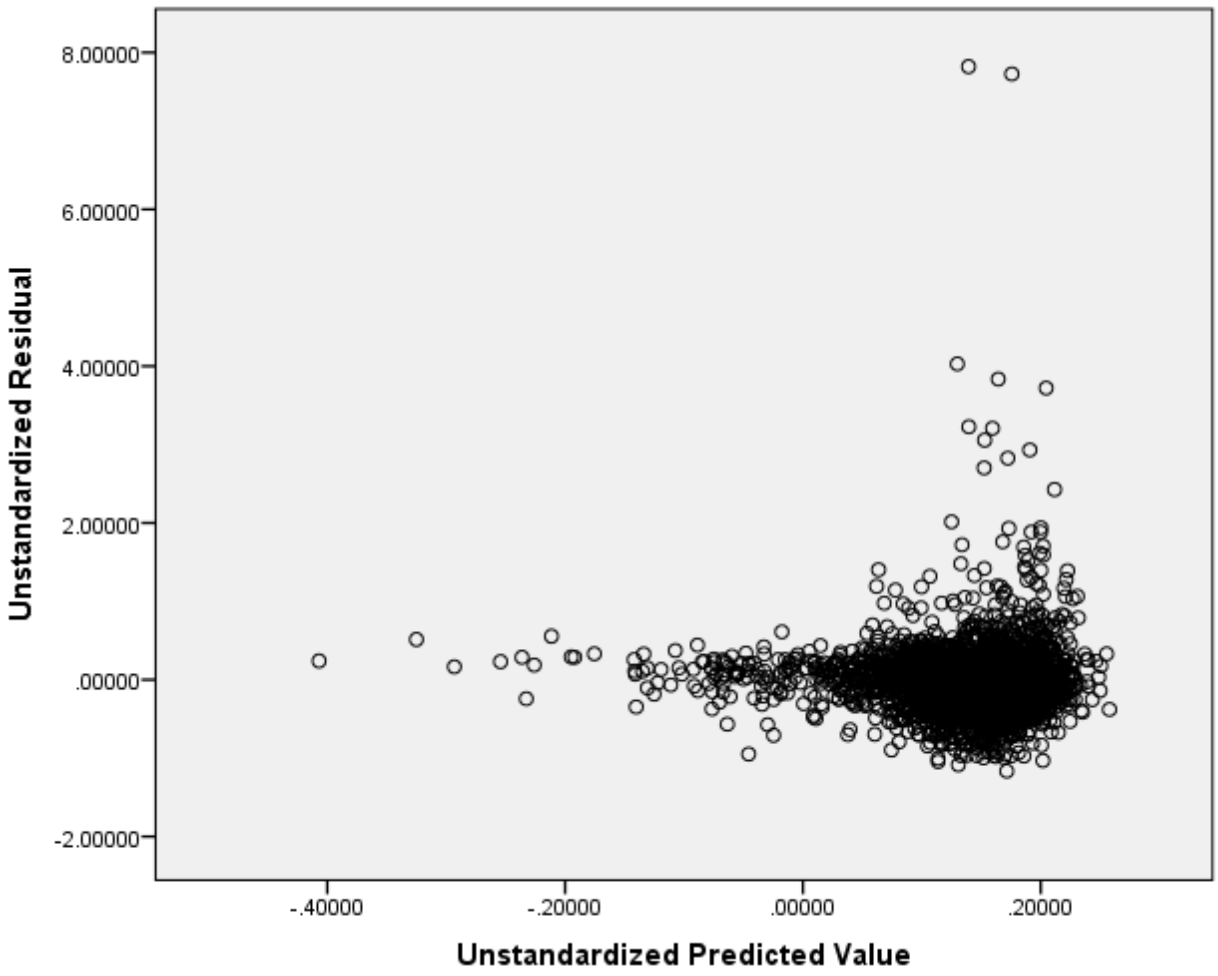

Chart 8. Unstandarized Residual / Unstandarized Predicted Value for the Governance Index (Gompers et al. (2003))

We have conducted the **White test regression** for the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´. We have presented the output of the White test regression for the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´ in the Tables 25, 26, 27, 28.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.027[a]	.001	.000	1.74024

a.Predictors:(Constant),

Unstandarized_Predicted_Value_Squared

b. Dependent Variable: Unstandarized_Residual_Squared

Table 25. Output of the White test regression for the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.480	1	6.480	2.140	.144[b]
	Residual	8679.474	2866	3.028		
	Total	8685.955	2867			

a. Dependent Variable: Unstandarized_Residual_Squared

b. Predictors: (Constant), Unstandarized_Predicted_Value_Squared

Table 26. Output of the White test regression for the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.122	.067		1.830	.067
	Unstandarized_Predicted_Value_Squared	3.732	2.551	.027	1.463	.144

a. Dependent Variable: Unstandarized_Residual_Squared

Table 27. Output of the White test regression for the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.1219	.7399	.2069	.04754	2868
Std. Predicted Value	-1.788	11.211	.000	1.000	2868
Standard Error of Predicted Value	.032	.366	.044	.014	2868
Adjusted Predicted Value	.1219	.7715	.2069	.04770	2868
Residual	-.68219	60.96483	.00000	1.73993	2868
Std. Residual	-.392	35.032	.000	1.000	2868
Stud. Residual	-.401	35.039	.000	1.000	2868

Deleted Residual	-.71373	60.98760	-.00003	1.74073	2868
Stud. Deleted Residual	-.401	46.336	.008	1.266	2868
Mahal. Distance	.000	125.693	1.000	2.761	2868
Cook's Distance	.000	.286	.000	.007	2868
Centered Leverage Value	.000	.044	.000	.001	2868

a. Dependent Variable: Unstandarized_Residual_Squared

Table 28. Output of the White test regression for the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

The R Square in the White test is equal .001 therefore we assume our model for the Governance Index is robust.

GOVERNANCE INVESTMENT STRATEGY BASED ON THE ENTRENCHMENT INDEX OF BEBCHUK, COHEN, FERRELL (2009)

For the Entrenchment Index (Bebchuk et al. (2009)), we have chosen the following parameters of the analysis as the independent variables: market capitalization of the stock, year, Entrenchment Index value and the general industry classification where the stock is classified.

We have presented the output of the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´ in the Tables 29, 30, 31, 32 and in the Chart 9.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.111[a]	.012	.011	.5084557

a. Predictors: (Constant), General Industry Classification, MARKET CAPITALIZATION, Year, E-Index Calculated
b. Dependent Variable: Long excess return

Table 29. Output of the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.740	4	3.435	13.286	.000[b]
	Residual	1092.019	4224	.259		
	Total	1105.759	4228			

a. Dependent Variable: Long excess return
b. Predictors: (Constant), General Industry Classification, MARKET CAPITALIZATION, Year, E-Index Calculated

Table 30. Output of the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.286	4.311		1.690	.091
	Year	-.004	.002	-.027	-1.642	.101
	E-Index Calculated	.002	.005	.006	.349	.727
	MARKET CAPITALIZATION	-1.330E-009	.000	-.104	-6.643	.000
	General Industry Classification	-.012	.005	-.036	-2.319	.020

a. Dependent Variable: Long excess return

Table 31. Output of the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.477986	.215901	.152046	.0570058	4229
Residual	-1.1870104	17.5449390	0E-7	.5082152	4229
Std. Predicted Value	-11.052	1.120	.000	1.000	4229
Std. Residual	-2.335	34.506	.000	1.000	4229

a. Dependent Variable: Long excess return

Table 32. Output of the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

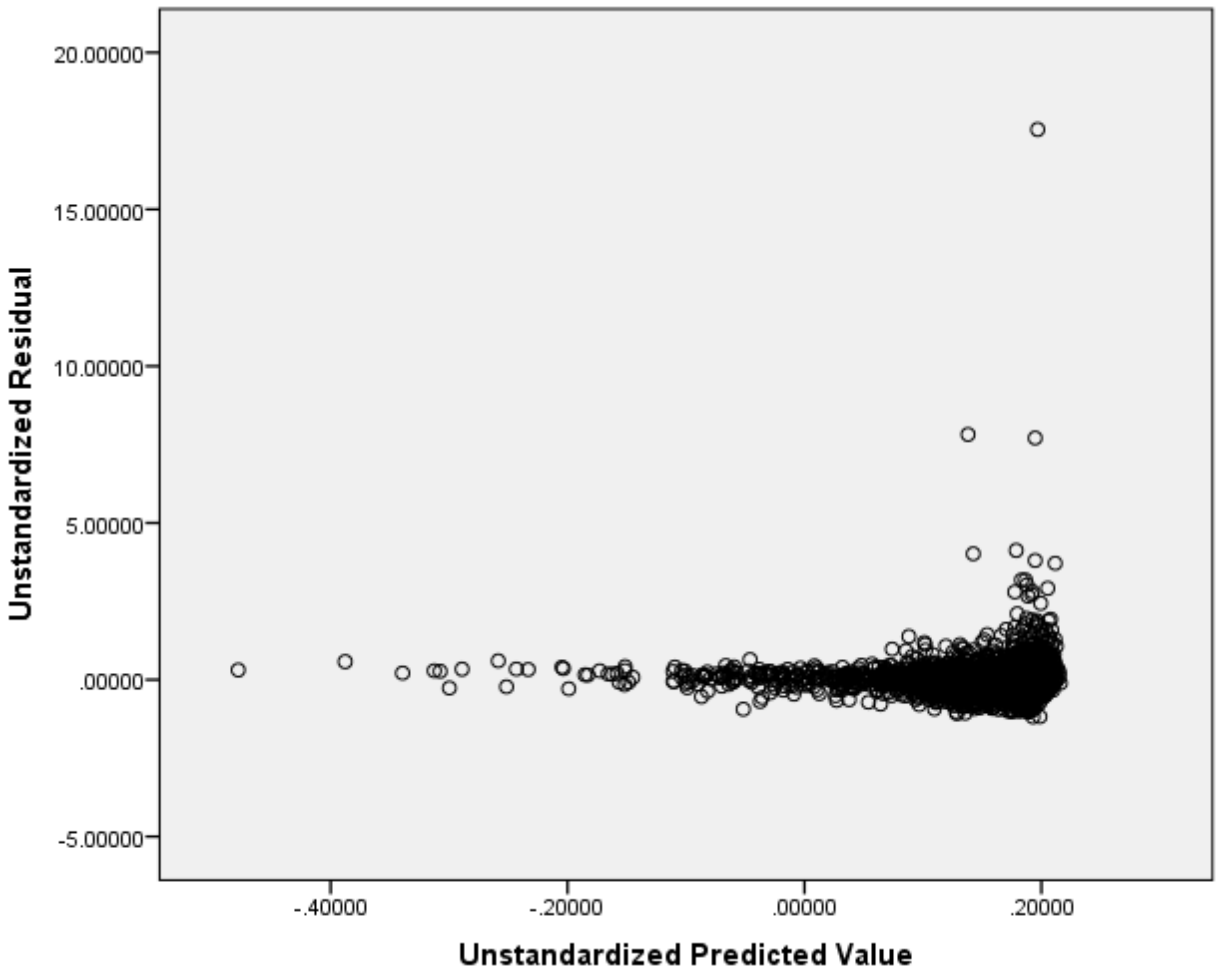

Chart 9. Unstandarized Residual / Unstandarized Predicted Value for the Entrenchment Index (Bebchuk et al. (2009))

We have conducted the **White test regression** for the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´. We have presented the output of the White test regression for the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´ in the Tables 33, 34, 35.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.029[a]	.001	.001	4.95186

a. Predictors: (Constant), Unstandarized_Predicted_Square

Table 33. Output of the White test regression for the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86.944	1	86.944	3.546	.060[b]
	Residual	103649.864	4227	24.521		
	Total	103736.808	4228			

a. Dependent Variable: Unstandarized_Residual_Square

b. Predictors: (Constant), Unstandarized_Predicted_Square

Table 34. Output of the White test regression for the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.073	.192		-.382	.703
	Unstandarized_Predicted_Square	12.570	6.676	.029	1.883	.060

a. Dependent Variable: Unstandarized_Residual_Square

Table 35. Output of the White test regression for the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

The R Square in the White test is equal .001 therefore we assume our model for the Entrenchment Index is robust.

COMPOSITE SCORE FOR THE AGGREGATION OF THE FINANCIAL SCORE (PIOTROSKI (2000)) AND GOVERNANCE SCORE (GOMPERS, ISHII, METRICK (2003)) USING THE FRAMEWORK OF SAATY (2008)

Composite Index for Financial Score and Governance Index is more complex than the previous models. We have chosen the following parameters of the analysis as the independent variables:

market capitalization of the stock, year, and the general industry classification where the stock is classified. Additionally, we will add the values for the Financial Score and Governance Index. The aggregated nature of the composite index will be reflected by the product of Financial Score (Piotroski (2000)) and Governance Index (Gompers et al. (2003)) (F-Score x G-Index).

We have presented the output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´ in the Tables 36, 37, 38, 39 and in the Chart 10.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.139[a]	.019	.017	.4398873

a. Predictors: (Constant), FScoreGIndex, General Industry Classification, MARKET CAPITALIZATION, F-SCORE Calculated, Year, G-Index Calculated

b. Dependent Variable: Long excess return

Table 36. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.920	6	1.487	7.683	.000[b]
	Residual	453.179	2342	.194		
	Total	462.099	2348			

a. Dependent Variable: Long excess return

b. Predictors: (Constant), FScoreGIndex, General Industry Classification, MARKET CAPITALIZATION, F-SCORE Calculated, Year, G-Index Calculated

Table 37. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.079	7.096		3.816	.000
	Year	-.013	.004	-.110	-3.795	.000
	G-Index Calculated	.025	.016	.155	1.504	.133
	F-SCORE Calculated	.003	.016	.009	.216	.829

MARKET CAPITALIZATION	-9.690E-010	.000	-.101	-4.813	.000
General Industry Classification	-.014	.020	-.014	-.673	.501
FScoreGIndex	-.002	.003	-.087	-.841	.401

a. Dependent Variable: Long excess return

Table 38. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.359808	.281284	.145750	.0616364	2349
Residual	-1.1778497	7.7240987	0E-7	.4393249	2349
Std. Predicted Value	-8.202	2.199	.000	1.000	2349
Std. Residual	-2.678	17.559	.000	.999	2349

a. Dependent Variable: Long excess return

Table 39. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) Model Regression in the econometrics program ´SPSS´

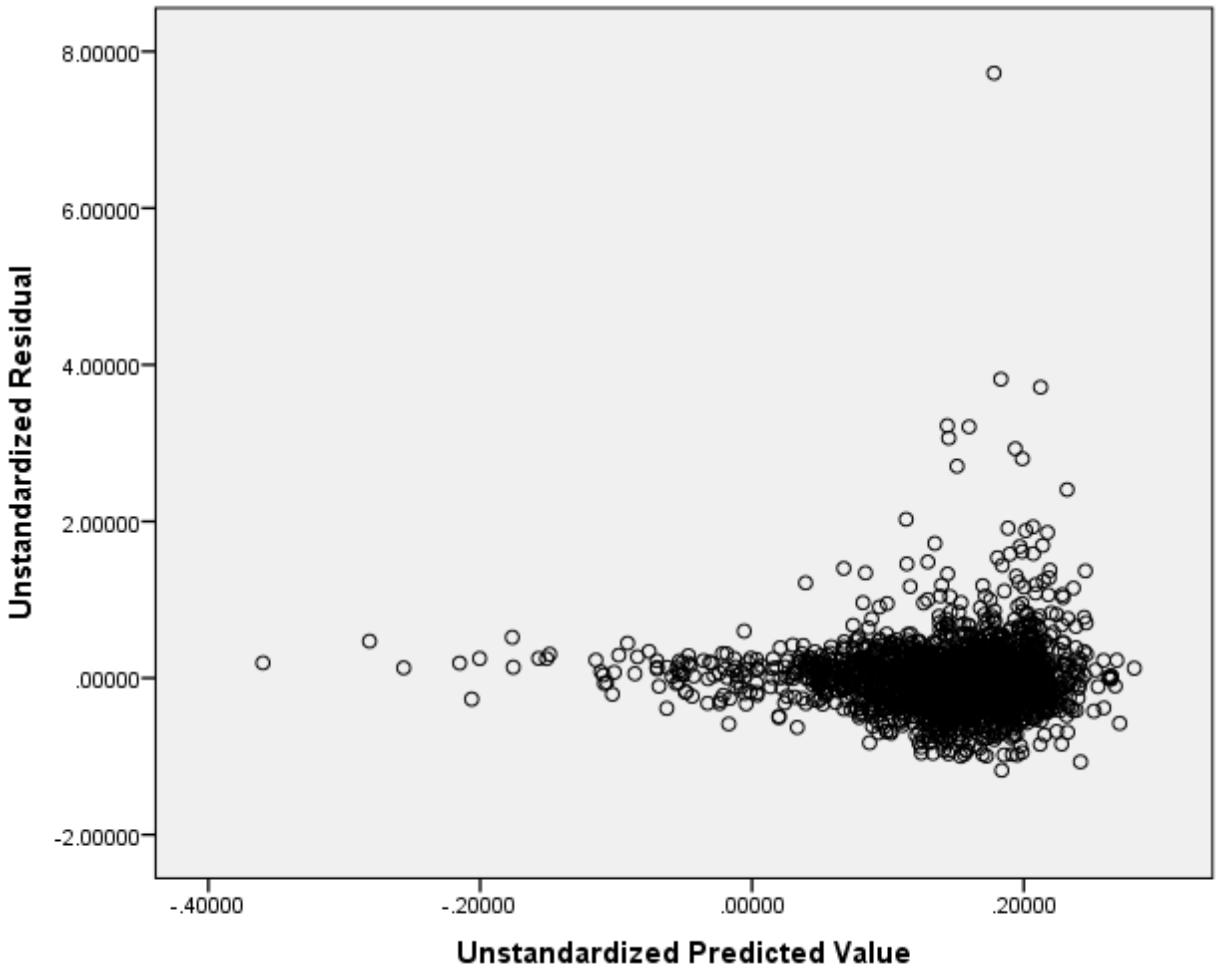

Chart 10. Unstandarized Residual / Unstandarized Predicted Value for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003))

We have conducted the **White test regression** for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) in the econometrics

program ´SPSS´. We have presented the output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´ in the Tables 40, 41, 42, 43.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.045[a]	.002	.002	1.40823

a. Predictors: (Constant), Unstandardized_Predicted_Value_Square

b. Dependent Variable: Unstandardized_Residual_Square

Table 40. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.552	1	9.552	4.817	.028[b]
	Residual	4654.362	2347	1.983		
	Total	4663.914	2348			

a. Dependent Variable: Unstandardized_Residual_Square

b. Predictors: (Constant), Unstandardized_Predicted_Value_Square

Table 41. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.078	.060		1.294	.196
	Unstandardized_Predicted_Value_Square	4.603	2.097	.045	2.195	.028

a. Dependent Variable: Unstandardized_Residual_Square

Table 42. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0777	.6736	.1929	.06378	2349

Residual	-.63631	59.43801	.00000	1.40793	2349
Std. Predicted Value	-1.807	7.536	.000	1.000	2349
Std. Residual	-.452	42.208	.000	1.000	2349

a. Dependent Variable: Unstandardized_Residual_Square

Table 43. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Governance Index (Gompers et al. (2003)) in the econometrics program ´SPSS´

The R Square in the White test is insignificant equal .002 therefore we assume our model for the Composite Index F-Score and G-Index is robust.

COMPOSITE SCORE FOR THE AGGREGATION OF THE FINANCIAL SCORE (PIOTROSKI (2000)) AND ENTRENCHMENT SCORE (BEBCHUK, COHEN, FERRELL (2009)) USING THE FRAMEWORK OF SAATY (2008)

We have chosen the following parameters of the analysis as the independent variables: market capitalization of the stock, year, and the general industry classification where the stock is classified. Additionally, as with the previous Composite Index for F-Score (Piotroski (2000)) and G-Index (Gompers et al. (2003)), we will add the values for the Financial Score (Piotroski (2000)) and

Entrenchment Index (Bebchuk et al. (2009)) when constructing the Composite Index and the product of Financial Score and Entrenchment Index (F-Score x E-Index).

We have presented the output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´ in the Tables 44, 45, 46, 47 and in the Chart 11.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.113[a]	.013	.011	.5143675

a. Predictors: (Constant), FScore_x_EIndex, General Industry Classification, MARKET CAPITALIZATION, F-SCORE Calculated, Year, E-Index Calculated

b. Dependent Variable: Long excess return

Table 44. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.162	6	2.027	7.662	.000[b]
	Residual	935.269	3535	.265		
	Total	947.431	3541			

a. Dependent Variable: Long excess return

b. Predictors: (Constant), FScore_x_EIndex, General Industry Classification, MARKET CAPITALIZATION, F-SCORE Calculated, Year, E-Index Calculated

Table 45. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.852	4.797		2.054	.040
	Year	-.005	.002	-.036	-2.024	.043
	E-Index Calculated	.045	.023	.160	1.963	.050
	F-SCORE Calculated	.010	.014	.022	.710	.478
	MARKET CAPITALIZATION	-1.266E-009	.000	-.099	-5.785	.000
	General Industry Classification	-.024	.019	-.021	-1.261	.207
	FScore_x_EIndex	-.008	.004	-.159	-1.900	.058

a. Dependent Variable: Long excess return

Table 46. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.459360	.330385	.160596	.0586066	3542
Residual	-1.2209518	17.5008507	0E-7	.5139315	3542
Std. Predicted Value	-10.578	2.897	.000	1.000	3542
Std. Residual	-2.374	34.024	.000	.999	3542

a. Dependent Variable: Long excess return

Table 47. Output of the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) Model Regression in the econometrics program ´SPSS´

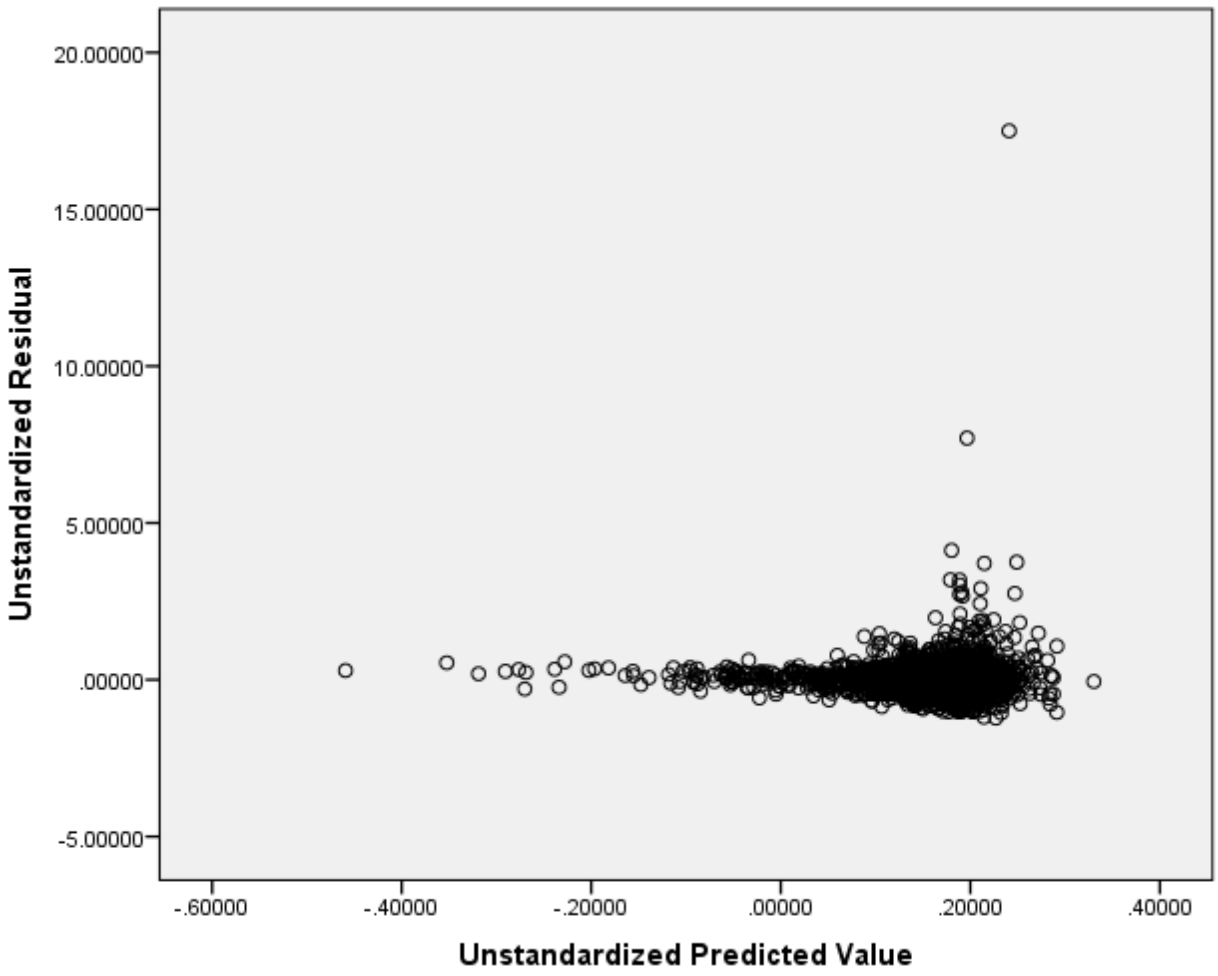

Chart 11. Unstandarized Residual / Unstandarized Predicted Value for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009))

We have conducted the **White test regression** for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´. We have presented the Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the

Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´ in the Tables 48, 49, 50, 51.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.050[a]	.003	.002	5.27488

a. Predictors: (Constant), Unstandardized_Predicted_Value_Square

b. Dependent Variable: Unstandardized_Residual_Square

Table 48. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	250.942	1	250.942	9.019	.003[b]
	Residual	98498.155	3540	27.824		
	Total	98749.097	3541			

a. Dependent Variable: Unstandardized_Residual_Square

b. Predictors: (Constant), Unstandardized_Predicted_Value_Square

Table 49. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.300	.208		-1.445	.148
	Unstandardized_Predicted_Value_Square	19.310	6.430	.050	3.003	.003

a. Dependent Variable: Unstandardized_Residual_Square

Table 50. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N

Predicted Value	-.3003	3.7744	.2641	.26621	3542
Residual	-3.68877	305.45938	.00000	5.27413	3542
Std. Predicted Value	-2.120	13.187	.000	1.000	3542
Std. Residual	-.699	57.908	.000	1.000	3542

a. Dependent Variable: Unstandardized_Residual_Square

Table 51. Output of the White test regression for the Composite Index based on the aggregation of the Financial Score (Piotroski (2000)) and the Entrenchment Index (Bebchuk et al. (2009)) in the econometrics program ´SPSS´

The R Square in the White test is insignificant and equal .003, therefore we assume our model for the Composite Index based on the aggregation of the F-Score (Piotroski (2000)) and the E-Index (Bebchuk et al. (2009)) is robust.

COMPARISON OF THE INVESTMENT STRATEGIES

To compare the investment strategies, we have assured that all the analysis has been performed on the same set of data of 2920 US companies for the same study period of 2002-2015.

Each strategy portfolio has been constructed in the equivalent way. We were constructing the long-short portfolio based on the boundary values of each strategy. Further we have assured that our models are robust. Considering these factors, we will conduct a fair comparison between the strategies.

We will divide our comparison in two parts. First, we will compare the strategies to pick the best strategy. After that we will compare the results of the winning strategy with the benchmark. We have chosen S&P 500 Index returns as our benchmark.

S&P 500 is an American stock market index based on the market capitalizations of 500 large companies having common stock listed on the NYSE or NASDAQ. The S&P 500 index components and their weightings are determined by S&P Dow Jones Indices. It differs from other U.S. stock market indices, such as the Dow Jones Industrial Average or the Nasdaq Composite index, because of its diverse constituency and weighting methodology. It is one of the most commonly followed equity indices, and many consider it one of the best representations of the U.S. stock market, and a bellwether for the U.S. economy.

For the performance comparison, we will use the compounded annual returns between 2002 and 2015. We will also compare the average annual returns.

For the risk analysis, we will use the Sharpe ratio, that we have calculated based on the annual returns of the strategies.

We will look at the Matrix of all the indexes total market adjusted returns per year along with the average and compounded returns and Sharpe ratio (Table 52).

Year	E-Index	G-Index	F-Score	Composite Index E-Index	Composite Index G-Index	S&P 500 Index
2002	0.339344826	0.067408383	0.585178173	0.352228367	0.349136204	0.2714
2003	0.157569096	0.009474558	0.260067143	0.176075459	0.223059611	0.098
2004	0.056861117	-0.065664581	0.142071014	0.067952694	0.12055848	0.0261
2005	0.07213145	-0.108410224	0.106788922	0.091680254	0.13970927	0.1153
2006	0.050025373	-0.079309045	0.071319877	0.118783679	0.071562184	0.0046
2007	-0.079220613	0.246594806	-0.257860004	-0.156362657	-0.359046446	-0.3992
2008	-0.178476776	-0.491239116	0.117606123	-0.230653558	0.22332185	0.2583
2009	-0.120019395	-0.194311632	0.275430799	-0.044800548	-0.02258627	0.1476
2010	0.039680171	-0.03590275	0.013370821	0.035529909	-0.151763149	0.0198
2011	-0.084691227	-0.221101973	0.117024023	-0.037741009	0.054238276	0.1587
2012	-0.073050574	-0.374460029	0.265176386	-0.009430105	-0.239164495	0.321
2013	0.033405127	-0.154915258	0.107919654	0.068835074	-0.007263141	0.1345
2014	-0.01417434	0.027933086	0.03781038	0.011885974	0.042177867	0.0134
2015	0.028798389	-0.18304605	0.090763225	0.029077138	-0.084861688	0.1158
Returns						
Average	0.016298759	-0.111210702	0.13804761	0.033790048	0.025648468	0.09180714
Compounded	1.135214794	0.140777443	5.139479124	1.412799672	1.114819492	2.78820281
Sharpe Ratio	0.126454071	-0.602851413	0.748978227	0.241559887	0.13444588	0.53180928

Table 52. Matrix of all the indexes total market adjusted returns per year along with the average and compounded returns and Sharpe ratio.

Based on the above data we can conclude that the worst strategy in our comparison is the strategy based solely on the G-Index. This is the only loosing strategy. The Sharpe ratio of -0.60 indicates that it will consistently lose money.

The strategy based on the E-Index, though profitable, has a low Sharpe ratio of 0.126 and the lowest positive average annual returns. Also, the compounded returns show a modest profit of 13% over the period of 13 years. The average compounded return is only 1%.

The results of the investment strategies based on the Governance scores confirm the demise of the edge this approach held over the market over the period of Gompers et al. (2003) research.

Then we have the Composite Index strategies.

The Composite Index strategy based on the G-Index and the Financial Score is a very interesting construct. It aggregates the profitable strategy based on the Financial Score and the loosing strategy based on the G-Index. It fulfils the premise of the "fund-of-funds" to limit the investors risk, but it also limits the profits. This strategy achieved 0.025648468 average annual returns and 11,48% profit over the period of 13 years. Sharpe ratio is also very modest at 0.13444588.

The Composite Index strategy based on the E-Index and the Financial Score is next in our comparison. It aggregates two profitable strategies. It holds the spot of our second-best model with the compounded annual returns of 41,28%. The Sharpe ratio is equal 0.241559887. Since we are calculating the risk-adjusted returns the performance and risk profile of this strategy is very good.

Our winning strategy is the strategy based on the Financial Score (Table 53). It is winning across the board with all the parameters. The compounded returns amass to 513, 95% over 13 years. Sharpe ratio 0.748978227 is very high and determines high probability of achieving the above market results. We will focus on the qualities of this strategy in the next part where we will compare it with the real-world benchmark.

Place in ranking	Name of the strategy
1	Financial Score
2	Composite Index based on the Financial Score and E-Index
3	Composite Index based on the Financial Score and G-Index
4	E-Index
5	G-Index

Table 53. The ranking of the strategies where ´1´ is the best one.

Our winning strategy based on the Financial Score. S&P 500 index has achieved the total of 278,82% of compounded returns in our analysis period versus 513, 95% of the Financial Score. This value looks impressive in comparison. However average investor doesn't look solely on the returns. The crucial factor is risk that investor is willing to take.

We have calculated the Sharpe ratio for the S&P 500 index for the period 2002-2015. The value of it is 0.53180928. F-Score based strategy has a Sharpe ratio of 0.748978227. The rule of Sharpe ratio is that the higher the Sharpe ratio the better. That means that the strategy could generate a higher return on a risk-adjusted basis than the benchmark.

Now we will look at the benchmark adjusted returns of the strategy (Table 54).

Year	F-Score	S&P 500 Index	Benchmark adjusted returns
2002	0.585178173	0.2714	0.313778173
2003	0.260067143	0.098	0.162067143

2004	0.142071014	0.0261	0.115971014
2005	0.106788922	0.1153	-0.008511078
2006	0.071319877	0.0046	0.066719877
2007	-0.257860004	-0.3992	0.141339996
2008	0.117606123	0.2583	-0.140693877
2009	0.275430799	0.1476	0.127830799
2010	0.013370821	0.0198	-0.006429179
2011	0.117024023	0.1587	-0.041675977
2012	0.265176386	0.321	-0.055823614
2013	0.107919654	0.1345	-0.026580346
2014	0.03781038	0.0134	0.02441038
2015	0.090763225	0.1158	-0.025036775

Table 54. Benchmark adjusted returns of the Financial Score strategy

F-Score strategy outperformed the market for 7 out of 13 years. The worse year for F-Score strategy was clearly 2007, and yet it beat the benchmark by 0.141339996.

Based on the above arguments we can recommend the Financial Score based strategy as a valid investment strategy for the real-world applications. Not only it is robust, but it also clearly presents the edge over the market and achieves the above-market returns.

FURTHER RESEARCH

Our results of the annual risk-adjusted returns of the constructed Scores (Piotroski (2000), Gompers et al. (2003), Bebchuk et al. (2009), Saaty (2008)) suffer from certain limitations: a sample selection bias, limited data quality in the Datastream, no consideration of the following market mechanisms: actual trading, real-time stock spreads, transaction costs, income taxes, reference-day risk (Dimitrov et al.

(2007)). Therefore, we would suggest for future research to address all the limitations we have encountered in our Master Thesis to increase the validity of the obtained results.

Consistent with Gompers et al. (2003), Bebchuk et al. (2009), Bebchuk et al. (2013), we have followed the standard approach in constructing the governance indices by giving each of the governance provisions an equal weight and not making this weight conditional on the presence (or absence) of other provisions that might interact with it. Our suggestion for future research would be to explore the possibility of improving the G-Score (Gompers et al. (2003)) and E-Score (Bebchuk et al. (2009)) by determining which of the provisions of the governance indices are more important than others and by considering which interactions among them are important (e.g., a combination of a staggered board and a poison pill provides a powerful defence against hostile takeovers).

The G-Index (Gompers et al. (2003)) and the E-Index (Bebchuk et al. (2009)) consist of only external governance provisions. Therefore, we would suggest for future research to consider internal factors in constructing governance indices. According to Cremers and Nair (2005), both internal and external governance provisions are important.

LIMITATIONS

We encountered the limited financial and governance data quality. Due to some information unavailability in the Datastream, we could not apply the full approaches to compute the aggregate Financial Score (Piotroski (2000)), the Governance Index (Gompers, Ishii, and Metrick (2003), the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009), Composite Score to aggregate the Financial Score (Piotroski (2000)) and the Governance Score (Gompers, Ishii, and Metrick (2003)) using the framework

of Saaty (2008), Composite Score to aggregate the Financial Score (Piotroski (2000)) and Entrenchment Score (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008).

The Datastream source does not provide information about one of the nine financial signals of the Financial Score (Piotroski (2000)): the issue of Seasoned Equity Offerings over the prior year. The issue of Seasoned Equity Offerings over the prior year signals the inability of a financially distressed firm to generate sufficient internal funds (Myers and Majluf (1984), Miller and Rock (1985)). Thus, the nonissue of Seasoned Equity Offerings is treated by Piotroski as a “good” signal for future firm performance and is assigned “1” for the calculation of the aggregate Financial Score, otherwise “0”. Consequently, our calculated Financial Score (Piotroski (2000)) will be downward biased, i.e., our aggregate Financial Score of Piotroski (2000) would have been “9” instead of “8” if a company had only “good” signal realizations. Due to data unavailability for Seasoned Equity Offerings, we will assign firms with the F-Scores of 7 or 8 into “High F-Score Firms” that are expected to have the best subsequent stock performance. We will assign firms with the F-Score of 0 or 1 into “Low F-Score firms” and expect them to have the worst subsequent return performance.

Due to data unavailability in the Datastream for the computation of the Governance Score (Gompers, Ishii, and Metrick (2003)), we computed the Governance Score (Gompers, Ishii, and Metrick (2003)) based on 13 corporate governance provisions instead of the 24 governance provisions of Gompers, Ishii, and Metrick (2003). Basically, we obtained data for 11 governance provisions. Additionally, we assume that if a company has a "supermajority voting requirement" provision, then it also has the following 2 provisions: limits to amend charters, and limits to amend bylaws. Limits to amend charters, and limits to amend bylaws usually take the form of the “Supermajority voting requirement” (Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009)). Thus, if a company has a "supermajority voting" provision it has a Governance score of “3” based on the assumption.

We also makede an additional assumption regarding one of the obtained governance provisions for the computation of the G-Score of Gompers: “Equal voting rights”. Due to unavailability of “Unequal voting

rights” in the Datastream data provider for the computation of the Governance Index (Gompers, Ishii, Metrick (2003)), we assume that if a company has an “Equal voting rights” provision, then it does not have an “Unequal voting rights” provision. Following the methodology of Gompers, Ishii, and Metrick (2003), such a company receives “0”, otherwise “1”.

The data unavailability for the remaining 11 governance provisions of Gompers, Ishii, and Metrick (2003) in the Datastream data provider will lead to a downward biased Governance Score. If we had data available on additional 11 governance provisions for the calculation of the G-Score (Gompers, Ishii, and Metrick (2003)), we would have added one point for any additional governance provision that reduces shareholder rights (increases management power). Thus, we would have had much more companies with the higher G-Score, i.e., we would have assigned much more companies with the weakest shareholder rights into “Dictatorship portfolio” (G-Score>=14) and sell them following the methodology of Gompers, Ishii, and Metrick (2003). Due to data unavailability on additional 11 governance provisions in the Datastream, we will place companies with the “weakest shareholder rights” (G-Score>=8) in the Dictatorship portfolio. We will place companies with the “strongest shareholder rights” (G-Score<=3) in the Democracy portfolio.

We have obtained governance data for the 6 governance provisions of the E-Index of Bebchuk, Cohen, Ferrell (2009). We assume for the calculation of the E-Score of Bebchuk, Cohen, Ferrell (2009) that if a company has a "supermajority voting requirement" provision, then it also has the following 2 provisions: limits to amend charters, and limits to amend bylaws.

Another limitation we encounter is a sample selection bias, i.e., after the ´data pruning´ process of the financial and governance data a small number of companies has been selected. Thus, we had to make different above-mentioned assumptions for the computation of the F-Score (Piotroski (2000), G-Score (Gompers, Ishii, Metrick (2003), E-Score (Bebchuk, Cohen, Ferrell (2009)).

We also encountered that the obtained results for all the necessary computed Scores are only theoretical. Our obtained results for all the necessary Scores could be influenced because we did not

consider the following market mechanisms to earn the abnormal returns: actual trading, transaction costs. Additionally, we did not consider stock spreads in the real time. We did not consider reference-day risk. According to Dimitrov and Govindaraj (2007), Acker and Duck (2007), there are substantial variations in the estimated monthly returns, variances, and betas across series using different original (reference) days of the same month.

Due to limited financial and governance data availability in the Datastream data provider, we mixed the US based companies from all the different indexes and could not choose a single market index to adjust for risk the obtained annual returns for each index of Piotroski (2000), Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, Ferrell (2009), Saaty (2008). Thus, we used the S&P500 returns for adjusting the total yearly indexes returns to emulate the market-adjusted returns of the indexes.

The thesis constrains on size prevented us from using more complex and detailed analysis frameworks in our analysis of the strategies and their comparison. For instance, we believe that using CAPM (capital asset pricing model) framework would contribute greatly to the quality of the analysis.

CONCLUSIONS

We have computed the aggregate F-Score (Piotroski (2000)), the G-Index (Gompers, Ishii, and Metrick (2003)), the E-Index (Bebchuk, Cohen, Ferrell (2009)), the Composite Score to aggregate the Financial Score (Piotroski (2000)) and the Governance Score (Gompers, Ishii, and Metrick (2003)) using the framework of Saaty (2008), Composite Score to aggregate the Financial Score (Piotroski (2000)) and Entrenchment Score (Bebchuk, Cohen, Ferrell (2009)) using the framework of Saaty (2008).

Due to financial data unavailability for one of the financial signals for F-Score of Piotroski (2000), i.e., the issue of Seasoned Equity Offerings, and the governance data unavailability for the remaining 11 provisions of Gompers et al. (2003) in the Datastream, we calculated the proportional F-Score (Piotroski (2000)) and G-Index (Gompers et al. (2003)). We also made some assumptions for the computation of all the necessary indices.

We have compared the results of applying the models on the selection of 2920 US based companies between year 2002 and year 2015.

We have conducted extensive robustness check for these models based on the White test (White (1980)). Based on the White test analysis results, all the models in the analysis are robust.

After comparing the models based on the performance basis and risk factors, we have concluded that the best model proposed for the selected data is the model proposed by Piotroski – Financial Score.

We also concluded that the synthetic indexes constructed using Saaty's framework can, in some cases, provide the investors with the tool to mitigate investment risk.

We have compared Financial Score model to the real-world benchmark S&P500 and concluded that Financial Score model in many cases beat the market and provided above market returns.

APPENDIX

APPENDIX 1. CORPORATE GOVERNANCE PROVISIONS

This appendix describes the governance provisions of the Governance Index (Gompers, Ishii, Metrick (2003)) and the Entrenchment Index (Bebchuk, Cohen, Ferrell (2009)). These descriptions are given in alphabetical order and are similar to Rosenbaum (1998).

Antigreenmail. Greenmail refers to a transaction between a large shareholder and a company in which the shareholder agrees to sell his stock back to the company, usually at a premium, in exchange for the promise not to seek control of the company for a specified period of time. Antigreenmail provisions prevent such arrangements unless the same repurchase offer is made to all shareholders or approved by a shareholder vote. Such provisions are thought to discourage accumulation of large blocks of stock because one source of exit for the stake is closed, but the net effect on shareholder wealth is unclear [Shleifer and Vishny 1986; Eckbo 1990]. Most firms and states perceive Antigreenmail as a takeover "defense," we treat Antigreenmail like the other defenses and code it as a decrease in shareholder rights.

Blank Check preferred stock is stock over which the board of directors has broad authority to determine voting, dividend, conversion, and other rights. While it can be used to enable a company to meet changing financial needs, its most important use is to implement poison pills or to prevent takeover by placing this stock with friendly investors.

Business Combination laws impose a moratorium on certain kinds of transactions (e.g., asset sales, mergers) between a large shareholder and the firm, unless the transaction is approved by the Board of Directors. Depending on the State, this moratorium ranges between two and five years after the shareholder's stake passes a prespecified (minority) threshold.

Bylaw and Charter amendment limitations limit share holders' ability to amend the governing documents of the corporation. This might take the form of a supermajority vote requirement for charter or bylaw amendments, total elimination of the ability of shareholders to amend the bylaws, or the ability of directors to amend the bylaws without shareholder approval.

Control-share **Cash-out laws** enable shareholders to sell their stakes to a "controlling" shareholder at a price based on the highest price of recently acquired shares.

A **Classified Board** (or **"staggered" board**) is one in which the directors are placed into different classes and serve overlap ping terms. Since only part of the board can be replaced each year, an outsider who gains control of a corporation may have to wait a few years before being able to gain control of the board.

Compensation Plans allow participants in incentive bonus plans to cash out options or accelerate the payout of bonuses if there should be a change in control.

Director indemnification Contracts are contracts between the company and particular officers and directors indemnifying them from certain legal expenses and judgments as a result of their conduct. Some firms have both **"Indemnification" in their bylaws or charter** and these additional indemnification "Contracts."

Cumulative Voting allows a shareholder to allocate his total votes in any manner desired, where the total number of votes is the product of the number of shares owned and the number of directors to be elected. By allowing them to concentrate their votes, this practice helps minority shareholders to elect directors. Cumulative Voting and Secret Ballot (see below) are the only two provisions whose presence is coded as an increase in shareholder rights, with an additional point to the Governance Index if the provision is absent.

Directors' Duties provisions (also called **“Expanded constituencies provision”**) allow directors to consider constituencies other than shareholders when considering a merger. These constituencies may

include, for example, employees, host communities, or suppliers. This provision provides boards of di rectors with a legal basis for rejecting a takeover that would have been beneficial to shareholders. This provision provides boards of di rectors with a legal basis for rejecting a takeover that would have been beneficial to shareholders.

Fair-Price provisions require a bidder to pay to all shareholders the highest price paid to any during a specified period of time before the commencement of a tender offer, and do not apply if the deal is approved by the board of directors or a supermajority of the target's shareholders.

Golden Parachutes are severance agreements that provide cash and noncash compensation to senior executives upon an event such as termination, demotion, or resignation following a change in control. They do not require shareholder approval. While such payments would appear to deter takeovers by increasing their costs, one could argue that these parachutes also ease the passage of mergers through contractual compensation to the managers of the target company (Lambert and Larcker 1985). While the net impact on managerial entrenchment and shareholder wealth is ambiguous, the more important effect is the clear decrease in shareholder rights. In this case, the "right" is the ability of a controlling shareholder to fire management without incurring an additional cost.

Limitations on director **Liability** are charter amendments that limit directors' personal liability to the extent allowed by state law. They often eliminate personal liability for breaches of the duty of care, but not for breaches of the duty of loyalty or for knowing violation of the law.

Pension Parachutes prevent an acquirer from using sur plus cash in the pension fund of the target to finance an acquisition. Surplus funds are required to remain the property of the pension fund and to be used for plan participants' benefits.

Poison Pills provide their holders with special rights in the case of a triggering event such as a hostile takeover bid. If a deal is approved by the board of directors, the poison pill can be revoked, but if the deal is not approved and the bidder proceeds, the pill is triggered. Typical poison pills give the holders

of the target's stock other than the bidder the right to purchase stock in the target or the bidder's company at a steep discount, making the target unattractive or diluting the acquirer's voting power.

Under a **Secret Ballot** (also called **"Confidential voting"**), either an independent third party or employees sworn to secrecy are used to count proxy votes, and the management usually agrees not to look at individual proxy cards. This can help eliminate potential conflicts of interest for fiduciaries voting shares on behalf of others, and can reduce pressure by management on shareholder-employees or shareholder-partners. Cumulative Voting (see above) and Secret Ballots are the only two provisions whose presence is coded as an increase in shareholder rights, with an additional point to the Governance Index if the provision is absent.

Executive **Severance** agreements assure high-level executives of their positions or some compensation and are not contingent upon a change in control (unlike Golden or Silver Parachutes).

Silver Parachutes are similar to Golden Parachutes in that they provide severance payments upon a change in corporate control, but differ in that a large number of a firm's employees are eligible for these benefits.

Special Meeting limitations either increase the level of shareholder support required to call a special meeting beyond that specified by state law or eliminate the ability to call one entirely. Such provisions add extra time to proxy fights, since bidders must wait until the regularly scheduled annual meeting to replace board members or dismantle takeover defenses. This delay is especially potent when combined with limitations on actions by written consent.

Supermajority requirements for approval of mergers are charter provisions that establish voting requirements for mergers or other business combinations that are higher than the thresh old requirements of state law.

Unequal Voting rights limit the voting rights of some shareholders and expand those of others. Under time-phased voting, shareholders who have held the stock for a given period of time are given more

votes per share than recent purchasers. Another variety is the substantial-shareholder provision, which limits the voting power of shareholders who have exceeded a certain threshold of ownership.

Limitations on action by **Written Consent** can take the form of the establishment of majority thresholds beyond the level of state law, the requirement of unanimous consent, or the elimination of the right to take action by written consent. Such requirements add extra time to many proxy fights, since bidders must wait until the regularly scheduled annual meeting to replace board members or dismantle takeover defenses. This delay is especially potent when combined with limitations for calling special meetings.

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