MASTER THESIS

The impact of SRI policy on the performance of Dutch pension funds

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Abstract

This study examines the impact of SRI on the performance of Dutch pension funds. Previous studies analyzed the relationship between SRI and performance. They analyzed the relationship between screening intensity and fund performance and often use mutual funds or portfolios that were created by researchers. However, little research has been done on the topic of SRI and pension fund performance. Pension fund performance is measured in two different ways: 1) the excess return, and 2) the Sharpe ratio. The excess returns are determined by comparing the absolute returns of the entire portfolio, the asset class equity, and the asset class fixed-income securities to internal benchmarks and standard benchmarks. The VBDO benchmark is used to determine the SRI scores and consists of four different categories: 1) governance, 2) policy, 3) implementation, and 4) accountability. The data sample that is used in this study consists of the largest 48 pension funds between 2012 and 2015. The regression results show that policy has a significant negative effect on portfolio return and implementation has a significant positive effect on portfolio return. The results are counterintuitive since the results indicate that including SRI in the policy reduces portfolio performance, but implementing the policy increases the portfolio return. Comparing equity return to a standard benchmark shows similar results. After combining the governance, policy, implementation, and accountability score into one SRI score, the results do not show a significant relationship between SRI and pension fund performance. However, when the fixed-income securities returns are compared to a standard benchmark, the results show a significant positive relationship between SRI and fixed-income securities.

Keywords: *Socially responsible investment, SRI, Dutch pension funds, pension fund performance, excess return, portfolio return, equity return, fixed-income securities return, Sharpe ratio*

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1. Introduction

Mutual funds and pension funds are taking up more and more socially responsible investments. Global sustainable investments increased from $22.9 trillion in 2016 to $30.7 trillion in 2018, a 34% increase 34% in two years (GSIR, 2020). Socially responsible investing (SRI) funds differ from conventional funds in their investment approach. SRI funds consider environmental, social and governance (ESG) factors in portfolio selection (GSIR, 2020). The investment approaches that are used by SRI funds are for example positive and negative screening. Negative screening is used to exclude companies from a portfolio that scores poorly on ESG factors and positive screening looks for companies that perform well on ESG factors that can be included in an SRI portfolio (Derwall & Koedijk, 2009).

There are three different hypotheses within the literature about the performance of SRI funds. First, SRI funds have lower performance than conventional funds, because SRI screening limits the diversification potential of SRI funds (Renneboog *et al,.* 2008b). In addition, the screening process is labor-intensive and the cost of the screening process could be paid by the investors (Gil-Bazo *et al, 2010)*. Second, SRI funds outperform conventional funds because SRI screening generates value-relevant information which benefits fund performance (Renneboog *et al.,* 2008b). The last hypothesis suggests that there is no difference between the performance of SRI funds and conventional funds.

Pension funds have to invest socially responsible because of social pressure and regulations. The EU wants pension funds to contribute to the prevention of climate change, therefore they introduced the Sustainable Finance Disclosure Regulation (SFDR) in 2019. The SFDR is aligned with the European Green Deal that aims to make Europe carbon neutral by 2050 and requires pension funds to provide information about how they have integrated sustainability into their investment policy.[1]

Bauer *et al.* (2021) investigated pension funds members' preferences for more sustainable investments and find that two-thirds of the participants are willing to support increased engagement with companies based on certain Sustainable Development Goals (SDGs), even when they expect a lower return. After the fund implemented the choice the majority of participants support the choice.

An article in *Financieel Dagblad* shows that pension funds are under social pressure. Participants of the largest Dutch pension fund ABP demonstrated in front of ABP's head office because in their opinion ABP did not invest sustainably enough. They demanded that the fund sell all its investments in coal, oil, and gas companies.[2] In October 2021, ABP announced to stop investing in fossil fuel

[1] Pensioen Federatie. Europees beleid verantwoord beleggen. Retrieved from: pensioenfederatie.nl/website/themas/europa/europees-beleid-verantwoord-beleggen

[2] Wolzak, M. (2021, June 24). ABP miljarden rijker als het niet fosiel, maar groen had belegd. *Financieel Dagblad,* Retrieved from: fd.nl/beurs/1389308/abp-miljarden-rijker-als-het-niet-fossiel-maar-groen-had-belegd

companies because of protests from participants, municipalities, and educational institutions, and the threat of a lawsuit.[3]

This research contributes to the existing literature by using recent data from VBDO about Dutch pension funds. VBDO assesses the sustainability of Dutch pension funds in four categories: governance, policy, implementation, and accountability. A lot of studies compare portfolios constructed by researchers and not the results of existing funds (Revelli & Viviani, 2015). Previous studies focus on mutual funds, whereas in this study the focus is on Dutch pension funds. Only a few studies focus on the impact of ESG criteria on the performance of pension funds (Hoepner & Schopohl, 2018). Hoepner and Schopohl (2018) examine the impact of ESG exclusion on Swedish and Norwegian pension funds. So far, there is no research done about the relationship between socially responsible investment and the performance of Dutch pension funds.

The goal of the study is to get a better understanding of the impact of socially responsible investing on the financial performance of Dutch pension funds. If the results show that socially responsible investing does not harm the performance of pension funds, regulators can put more pressure on pension funds to invest socially responsible. In addition, pension funds are more willing to invest socially responsibly when it does not harm financial performance. The research question of this study is as follows:

What is the impact of SRI on the performance of Dutch pension funds?

The remainder of this paper is structured as follows. In chapter 2 the theoretical framework is described that consists of background about the Dutch pension system, theories that explain the relationship between SRI and fund performance, followed by empirical evidence about the relationship between SRI and fund performance, and after that the scoring system that is used in this research is discussed. in chapter 3 the research method is explained that consists of the research model, the dependent, independent, and control variables. In Chapter 4 the data collection method and an overview of the data sample are discussed. After that, the results of the research are presented in chapter 5. Chapter 6 contains the conclusion of the research and a discussion of the results.

[3] Wolzak, M. & Groot, J. (2021, October 26). Pensioenbelegger ABP verkoopt olie- en gasbedrijven: 'Noodzakelijke koerswijziging'. *Financieel Dagblad,* Retrieved from: fd.nl/financiele-markten/1417025/pensioenfonds-abp-stapt-uit-fossiele-beleggingen

2. Theoretical framework

2.1 The pension system in the Netherlands

In the Netherlands, the pension system consists of three pillars. The first pillar is the state pension (AOW), a basic pension that is provided by the government to everyone that worked or lived in the Netherlands. The second pillar consists of the occupational pension scheme, which provides an additional income to former employees (Bikker J., 2013). The third pillar is individual pension products provided by insurance companies or banks. Anyone can use these products to supplement their pension and is completely voluntary (VB, 2018).

Occupational pension schemes are managed by pension funds. There are three different types of pension funds. The industry-wide pension fund manages the funds for a specific sector (e.g. civil service, transport sector, or retail sector). The board of industry-wide pension funds consists of representatives from both employers and employees. Second, the company pension funds, which manage the funds for one company. Company pension funds also have a board consisting of representatives from both employers and employees. Thirdly, there are the occupational pension funds for a specific group of professionals, e.g. dentists or medical specialists. The boards of occupational associations are formed by representatives of the occupational associations (Bikker, 2013).

The Dutch Central Bank (DNB) and the Dutch Authority for the Financial Markets (AFM) are the supervisory authorities. DNB monitors whether pension funds are financially healthy and whether they can fulfill their financial obligations in the future. To measure a pension funds' financial position the funding ratio is used that is calculated with the following formula: the value of assets divided by the value of liabilities multiplied by 100%. The minimum funding ratio is 104% and if the funding ratio is below 104%, the pension fund has to submit a recovery plan to the DNB. In addition to monitoring pension funds' financial health, DNB monitors whether pension funds comply with the regulations (VB, 2018)

The AFM monitors the behavior of pension funds. Pension funds have some obligations towards their participants which are stated in the Pensions Act. The Pensions Act states that Pension funds are obliged to properly inform their participants about their pension rights. In addition, they have to send an annual pension statement to their participants and the Pensions Act specifies when information has to be provided to the participants (VB, 2018).

2.1.1 Pension fund investment process

Brinson et al (1995) investigated the investment process of pension funds. Within this study, they divided the investment process into three different categories: investment policy, timing, and security selection. The investment policy is the process to make a long-term strategic asset allocation plan, whereas timing and security selection are part of tactical asset allocation to generate higher returns (Brinson et al., 1995). Brinson et al (1995) concluded that the most important part of the investment process was the investment policy to explain total return. Ibbotson and Kaplan (2000) did a study on asset allocation and fund performance. They concluded that the investment policy explained 90% of the variability of return over time. However, when looking at the variations among funds, the investment policy explained only about 40% of the variation (Ibbotson and Kaplan, 2000). Xiong et al (2010) analyzed the impact of investment policy and active management on variability in performance and concluded that asset allocation and active management are equally important.

Pension funds use asset and liability management studies, in which they consider long-term expected returns, variances, and covariances of asset classes to determine their investment policy (Bikker et al., 2012). Nowadays, Dutch pension funds also have an SRI policy in which they report about their SRI goals and the methods to achieve this.

2.1.2 Asset classes

Dutch pension funds invest in the following asset classes: equity, fixed-income securities, real estate, hedge funds, commodities, and alternative investments. The asset allocation of Dutch pension funds between 2012 and 2016 is shown in Table 1.

Table 1: Dutch pension fund asset allocation (in %)

Asset classes	**2012**	**2013**	**2014**	**2015**	**2016**
Equity	31.1	32.3	33.3	31.9	31.3
Fixed income	51.1	51.5	51.4	52.3	53.4
Real estate	9.7	9.0	8.7	9.4	9.4
Hedge funds	3.2	3.0	2.7	2.5	2.1
Commodities	0.2	0.1	0.1	0.2	0.3
Other	4.7	4.1	3.8	3.7	3.5
Total	100	100	100	100	100

Source: De Nederlandsche Bank

Equity

Pension funds invest about 30% in equity and invest in equity for several reasons (DNB, 2021). As a result of inflation and increasing wages, pension funds try to increase the pension each year. This is

only possible when the pension fund has enough money for it and therefore they need a higher return than fixed-income securities. The risk and return of equity are higher than fixed-income securities. Pension funds have a long-term investment horizon and the risk of equity decreases over time (Spierdijk and Bikker, 2012). The long-term investment horizon and the higher returns of equity make it a suitable asset class for pension funds to invest in.

Fixed-income securities

Pension funds invest on average about 50% in fixed-income securities (DNB, 2021). Fixed-income securities are investments in for example government and company bonds. They provide a fixed periodic payment and eventually the return of principal at maturity. Fixed-income securities have a low risk and low reward. Pension funds invest in fixed-income securities because of the low risk of this asset class. By investing in fixed-income securities, pension funds can match the assets with liabilities. However, the liabilities of pension funds increase over time, and therefore pension funds should not invest all their money in fixed-income securities.

Real estate

Real estate is after fixed-income securities and equity the most popular asset class for Dutch pension funds. Dutch pension funds invest about 9% in real estate (DNB, 2021). For pension funds, real estate is an attractive asset class to invest in because of the risk-reward characteristics and to diversify the portfolio (Brounen et al., 2010).

Hedge funds

Pension funds invest a small amount in hedge funds. Hedge funds use flexible investment strategies to achieve a certain absolute return, regardless of market conditions. Ackermann et al (1999) analyzed the risk and return of hedge funds and concluded that hedge funds consistently outperform mutual funds, but not benchmarks. The returns of hedge funds are high and are more volatile than mutual funds and market indices (Ackermann et al., 1999).

Commodities

Pension funds invest on average between 0.1% and 0.3% in commodities (DNB, 2021). There is a positive relationship between inflation and commodity prices, therefore they can be used to hedge against inflation (Gorton et al., 2012). Commodity prices are volatile, which makes it riskier to invest in. The correlation of commodities with stocks and bonds is low, therefore they can be used to diversify the portfolio (Hoevenaars et al., 2008).

2.2 SRI and fund performance

Pension funds can use different strategies to achieve their SRI goals. First, pension funds can use positive and negative screens to include or exclude companies or countries from the portfolio based on ESG criteria (Schueth, 2003). Examples of negative screens that are used to exclude companies are poor working conditions, abortion, animal testing, or violation of human rights (Renneboog et al., 2008a). Second, pension funds are involved in the companies in which they invest and can encourage them to become more sustainable. This can be done by using voting rights during shareholder meetings or engaging in dialogue with the management about the CSR policy and what they should improve (Schueth, 2003).

Within the literature, there are different views on SRI and fund performance. A positive relationship between SRI and fund performance can be explained by stakeholder theory. Freeman et al (2010) define stakeholders as: "any group or individual who can affect or is affected by the achievement of the organization's objectives". The goal of a company is to create value for all stakeholders, not only shareholders. Managers have to manage the relationship between customers, employees, suppliers, and financiers to create as much value as possible for all stakeholders (Freeman et al., 2010). They have to divide the value among the stakeholders and make trade-offs so that the company can create more value in the future (Freeman et al., 2010).

Stakeholder theory states that companies that are involved in positive activities have a competitive advantage that can lead to higher financial performance (Humphrey & Tan, 2014). Firms that are involved in CSR activities have a better reputation and therefore they are more attractive to potential employees, customers, and business partners (Humphrey and Tan., 2014; Pucheva., 2008). Besides that, they can choose from a larger number of business opportunities and stakeholders are more likely to share information that can lead to innovation and higher efficiency (Harrison et al., 2010).

Many studies analyzed the relationship between CSR and firm performance. According to McWilliams and Siegels (2000), both studies that measured the performance in the short-run and long term found mixed results. The reason that studies found different results is because of misspecified models (McWilliams and Siegel (2000). Saeidi et al (2015) suggest that studies found mixed results because they examined the direct relationship between CSR and firm performance. Therefore, they included three mediators: 1) customer satisfaction, 2) reputation, and 3) competitive advantage in their research model. The results show that CSR enhanced customer satisfaction, reputation, and competitive advantage, customer satisfaction leads to a better reputation and competitive advantage. Higher firm performance is only the result of a better reputation and competitive advantage (Saeidi et al, 2015).

On the other hand, a negative relationship between SRI and fund performance can be explained by modern portfolio theory. Modern portfolio theory is a theory that is used to construct a portfolio that maximizes expected return and at the same time minimizes the amount of risk (Fabozzi et al., 2002). The theory states that through diversification a more efficient investment portfolio can be constructed that has either higher returns at a certain amount of risk or a lower risk at a specific return (Lord, 2020). Modern portfolio theory considers two types of risks: systematic risk and unsystematic risk (Markowitz, 1952). Systematic risk is the market risk of an investment, which is the risk related to the overall stock market and is not diversifiable. Unsystematic risk (also known as "specific risk") is the risk that is related to the volatility of a specific investment (Barnett & Salomon, 2006). Fabozzi et al. (2002) explain the risks of holding highly correlated investments. If the investments are highly correlated, and one of the investments is going broke, the other investment is also going broke, because they are highly correlated to each other (Fabozzi et al., 2002). Diversification offsets the specific risk of an individual investment by another individual investment (Barnett & Salomon, 2006). By increasing the number of stocks in a portfolio, the specific risk can be diversified away.

Negative screening reduces the potential for diversification (Renneboog et al., 2008a). With negative screening, a part or entire sector may be excluded from the investment portfolio which may harm the risk-return of funds (Renneboog et al., 2008a). Several studies investigated the impact of screening on fund performance. Barnett and Salomon (2006) analyzed the relationship between screening intensity and fund performance. The study concluded that there is a curvilinear relationship between screening and fund performance. Increasing the number of screens first results in a decline in performance and after that the performance increases (Barnett and Salomon, 2006). Also, Capelle-Blancard and Monjon (2010) analyzed the impact of screening intensity on fund performance. The results show a negative relationship between screening intensity and fund performance but do not support a curvilinear relationship (Capelle-Blancard and Monjon, 2010). They also concluded that industrial screens (e.g. excluding sin stocks) lead to a decrease in financial performance and that transversal screens had no impact. Lee et al (2010) did a study on screening intensity and fund performance and analyzed the relationship between screening intensity and risk. They found a negative relationship between screening intensity and total risk, a curvilinear relationship between screening intensity and systematic risk, but screening intensity did not have an impact on unsystematic risk (Lee et al., 2010).

Friede *et al* (2015) did a meta-analysis of about 2200 studies on the relationship between ESG criteria and financial performance. The results show that roughly 90% of the studies show a nonnegative relationship and the majority of studies show a positive relationship between ESG criteria and financial performance (Friede *et al.,* 2015).

Hoepner and Schopohl (2018) analyzed the impact of exclusion on pension fund performance. They created a portfolio based on the exclusion list of Swedish AP-funds and the Norwegian government pension fund and compared the results of these portfolios with the funds' benchmark index. The results show that the excluded companies did not harm the fund performance, the only screen that outperformed the funds' benchmark was tobacco (Hoepner and Schopohl, 2018).

Cortez et al. (2008) did a study on the performance of European SRI funds. They compared the results of SRI funds to conventional and socially responsible benchmarks. The study showed that the performance of European SRI funds are similar to conventional and socially responsible benchmarks (Cortez et al., 2008).

Bauer et al (2007) investigated the relationship between SRI fund performance by comparing the results of Canadian ethical funds to conventional mutual funds. They concluded that there is no significant difference between ethical and conventional mutual funds (Bauer et al., 2007).

Gil-Bazo et al (2009) compared the financial performance of SRI mutual funds to conventional funds and concluded that SRI funds significantly outperformed conventional funds. Fernandez-Izquierdo and Matallin-Saez (2007) found that Spanish SRI funds outperformed conventional funds in Europe. Kempf and Osthoff (2007) used a trading strategy in which they bought stocks with high socially responsible ratings and sold stocks with low socially responsible ratings to analyze the relationship between SRI and portfolio performance. They concluded that using a best-in-class screening approach in combination with several SRI screens leads to the highest abnormal returns (Kempf and Osthoff, 2007).

Renneboog et al (2008b) did a study on SRI funds across the world and compared the performance of mutual funds to conventional funds and benchmarks. They found that many countries strongly underperform compared to benchmark portfolios, but did not underperform to conventional funds. However, in Sweden, Ireland, France, and Japan SRI also underperformed compared to conventional funds. Jones et al (2007) analyzed the performance of SRI funds in Australia and compared the performance to a market benchmark and found that SRI funds underperformed compared to the benchmark.

2.3 Governance and pension fund performance

Several studies investigated the relationship between corporate governance and pension fund performance. To measure the relationship between corporate governance and performance many researchers used a corporate governance index. By constructing a corporate governance index the constructor benchmark governance features against what the constructor considers to be best practices (Bhagat et al., 2008). Gompers et al (2003) constructed a corporate governance index to

measure the relationship between corporate governance and equity prices and found a positive relationship. Brown dan Caylor (2004) constructed a corporate governance index and found a positive relationship between corporate governance and firm valuation. However, Bhagat et al (2008) analyzed a large number of corporate governance indices and concluded that there is no consistent relationship between corporate governance indices and corporate performance.

Besley and Prat (2003) analyzed pension fund governance and the choice between DB and DC plans. In a DB plan, there is no risk for the beneficiaries of the pension plan. When the investment performance of the pension plan is poor, the employer is responsible and has to make additional payments to compensate for this deficit. Beneficiaries do not bear the risk of poor investment performance and therefore there is little conflict of interest between funds and beneficiaries (Kowalewski, 2012). In a DC plan, beneficiaries bear the risk of poor investment performance, as they receive retirement based on the amount they contributed to the fund and the investment performance of the fund (Kowalewski, 2012). Within a DC plan, an agency conflict may arise, because pension funds and beneficiaries have different interests. Due to the differences in DB and DC plans, the optimal governance structure is also different. Besley and Prat (2003) conclude that a DB plan should rely less on trustees, employ trustees that are professional experts, assign asset allocation rights to the sponsor, and have strict funding requirements. A DC plan should rely more on trustees, employ trustees that are insiders, assign asset allocation rights to the beneficiaries (Besly and Prat, 2003).

Cocco and Volpin (2007) analyzed the relationship between governance and performance of DB plans in the U.K. Trustees of a DB plan consists of employee representatives, independent members, or directors of sponsoring companies. Trustees are responsible for asset allocation of the pension plan and schedule the contributions of the sponsoring companies (Cocco and Volpin, 2007). Being a trustee and a director of a sponsoring company can lead to a conflict of interest. These trustees are willing to invest a larger proportion of the assets in equity. The study concludes that trustees who are a director of a sponsoring company act in the interest of their company and not in the interest of the fund beneficiaries (Cocco and Volpin, 2007).

Kowalewski (2012) analyzed the impact of internal and external governance factors on the performance of DC plans. Board size has an impact on fund performance, larger board sizes have poorer communication and decision making (Jensen, 1993). On the other hand, larger board sizes lead to increased monitoring (Jensen, 1993). The age of the board member is used as an indication of self-motivation. Older board members have more self-motivation and are expected to have a positive effect on pension fund performance (Kowalewski, 2012). Kowalewski (2012) concludes that there is a

negative and significant relationship between board size and pension fund performance and between the number of outsiders and fund performance. The study also suggests that age and education level of the board are important factors for pension fund performance (Kowalewski, 2012).

Ammann and Ehmann (2017) did a study on the impact of governance on asset allocation and pension fund performance. Amman and Ehmann (2017) concluded that governance factors do not affect asset allocation decisions. The results showed a positive relationship between governance factors and pension fund performance (Ammann and Ehmann, 2017). Also, Hegde and Shantaram (2013) did a study on governance and risk-taking in DB plans. They analyzed whether good corporate governance leads to more risky investments and found that companies with good corporate governance invest a larger amount of the DB plans assets in equity (Hegde and Shantaram, 2013).

2.4 Scoring model

This chapter describes the scoring model that is used in this study to analyze the relationship between SRI and fund performance.

VBDO uses a scoring model to assess the sustainability of Dutch pension funds. Since 2013, there are four different categories included in the scoring model to assess the sustainability of Dutch pension funds, namely: governance, policy, implementation, and accountability (VBDO, 2013). For each category, a pension fund is given a score between 0 and 5, with 0 being the least sustainable and 5 being the most sustainable.

2.4.1 Governance

The following criteria are used to determine the score for governance about responsible investment. The first criterion that is used is how frequently the responsible investment policy has been discussed in the board. The second criterion is related to the source of information that is used to formulate and evaluate the responsible investment policy and implementation. The third criterion is related to the sustainable targets for asset managers. Some pension funds do not use sustainable targets, other funds use qualitative or quantitative targets. The fourth criterion that is used is if the compensation of asset managers is dependent on responsible investment and sustainability targets or not. The last criterion is related to how the pension fund communicates with its stakeholders (VBDO, 2013).

2.4.2 Policy

To implement a responsible investment policy pension funds must have a clearly defined policy that is publicly available. Therefore, it is important to have a clear description of the policy objectives that cover the whole investment portfolio. There are three criteria used to determine the policy score. The first criterion is related to policy content. To determine the score for this criteria, VBDO looks at the amount of UN Global Compact themes (human rights, labor standards, the environment, and anti-

corruption) that are included in the policy. The second criterion is related to policy volume. Pension funds spread their investments over different asset classes, a good policy has specific criteria and instruments for each asset class. VBDO determines this score based on the percentage of the investment portfolio that the policy covers. The last criterion that is used is whether there are clear key performance indicators included in the policy. Pension funds can have qualitative key performance indicators or quantitative key performance indicators included in their policy (VBDO, 2013).

2.4.3 Implementation

The implementation score shows how well the policy is executed. For each asset class (publicly listed equity, corporate bonds, government bonds, real estate, private equity, and alternative investments) the pension funds receive a score. The overall score for implementation is based on the score of each asset multiplied by the percentage of the portfolio (VBDO, 2013).

Eight questions are used to determine the score for publicly listed equity. The first question is related to how exclusion policy is practiced in the fund. ESG criteria are used to exclude companies as investment opportunities or from the investment portfolio. Funds receive no points if they do not have an exclusion policy, one point if companies are excluded based on one criterion, and two points if more than one exclusion criterion is used.

The second and third questions are combined to one score for ESG integration. The second question is related to ESG integration extent. The score for this question ranges from making ESG-information available for fund managers to systematically integrating ESG-criteria into each investment decision. The third question is related to ESG integration volume. The score for this question ranges from one for pension funds that have implemented ESG-integration to 0-25% of the equity portfolio to four if it is implemented to 75-100% of the equity portfolio (0 points if there is no ESG integration).

The fourth question that is used is positive selection. Positive selection is used to choose the best-performing companies from a group of similar companies based on ESG-criteria. Funds receive points if they use positive selection and the score ranges from one for funds that implement positive selection to 0-10% of their equity portfolio to four points that have implemented it to more than 50% of the equity portfolio.

The fifth question is related to engagement with companies on ESG-criteria issues. Funds receive a point if they participate in engagement activities on ESG-criteria, two points when they also report on these activities, and three points if they can show demonstrable results.

The following two questions are combined to one score for voting. The first question is if the fund votes at annual shareholder meetings of companies in their portfolio. Funds receive more points if

they pay attention to ESG issues and receive a maximum amount of points when they publicly support shareholders' decisions that promote CSR. The second question is related to voting volume. The score for this question ranges from one if voting is implemented to 0-25% of the equity portfolio to four if it is implemented to 75-100% of the equity portfolio (0 points if there is no voting).

The last question is related to impact investing. Funds receive points if they invest in publicly traded companies that promote sustainable development. If they invest <1% of their total equity portfolio in these companies they receive one point, two points if they invest between 1 and 2% of their equity portfolio in publicly-traded sustainable companies, and three points if it is more than 2% of their equity portfolio.

The first six questions that were asked to determine the score for publicly listed equity were also asked to determine the score for corporate bonds. The first four questions that were asked about publicly-listed equity are also asked about government bonds.

Three questions are used to determine the score for real estate. The first question is related to ESG criteria for direct real estate. This question does not apply to all pension funds. Pension funds receive a point if they consider ESG issues in the selection/development of new real estate objects or the maintenance of real estate objects and receive two points if they consider it in both selection/development and maintenance. Funds receive one point if they consider ESG issues in the selection and evaluation of real estate fund managers or publicly listed real estate companies and two points if they choose the most sustainable publicly listed real estate companies. The last question is related to engagement and is similar to question five for publicly listed equity.

For each group (private equity, hedge funds, commodities, and other alternative investments) in the asset class alternative investments, one question is asked. Does the fund consider ESG issues to select/evaluate the investments in this group? Funds receive one point if it is only considered for some of the investments and receive two points if it is considered for all of the investments in that group.

2.4.4 Accountability

The score for accountability is based on 10 questions. The first question that is asked is if the pension fund has a responsibility policy publicly available. In the second question, pension funds are asked if they have a publicly available overview of their investments. The score ranges from one for funds that have a list that covers 0-25% of their total investment portfolio to four for a list that covers 75-100% of the total investment portfolio.

The following six questions are related to the implementation. The first question is about how the fund reports on exclusion policy and excluded companies and countries. Funds receive a point for

having an exclusion policy and two points if they have a list with excluded companies and countries and the reason for exclusion. The second question is if their methodology for ESG-integration is explained. The third question is whether they explained the methodology for positive selection The fourth question is how does the fund report on engagement? The fund receives a point for an engagement policy that has been published, two points if a general overview of activities is included and three points if they also report the concrete result. The fifth question is how does the fund report on voting policy and implementation? The last question is how does the fund report on impact investing?

The last two questions are related to the responsible investment report. The first question is does the pension fund publish a yearly responsible investment report or report about it in the general annual report? The second question is has the responsible investment report been verified by an independent and external auditor? Funds receive one point if the report has been audited by an internal auditor, two points is if parts of the report have been audited by an external auditor, and three points if the entire report has been audited by an external auditor.

2.4.5 Benchmark developments

The VBDO benchmark has developed significantly over the years. In 2014, VBDO did not make fundamental changes to the methodology. The only changes made in 2014, were adding a question about green bonds and a new question related to strategic asset location (VBDO, 2014). VBDO added questions on securities lending and strategic asset location in 2015. There were no fundamental changes made in 2015, and therefore the results can be compared to the years before (VBDO, 2015). In 2016, there were some minor changes to the questionnaire, however, the results can be compared to the previous three years (VBDO, 2016). The changes made to the questionnaire are: 1) adding Private Equity as a separate asset class, 2) merging ESG-integration and positive selection into one question, 3) for government bonds, there is a separation made between emerging and developed markets, and 4) the question related to communication about positive selection has been removed.

In 2017, VBDO made some changes to the methodology, and therefore the results are not comparable to the results of previous years. First, VBDO used a more robust calculation method to calculate the final score. Second, VBDO was stricter in assessing the results and therefore pension funds could have a lower score on a category's performance compared to previous years (VBDO, 2017). In 2018, the methodology did not change and the results can be compared to the results of 2017 (VBDO, 2018).

VBDO revised the methodology in 2019 and added several questions regarding climate change and a question on mortgage investments. Therefore, the scores are not comparable to the previous year (VBDO, 2019). In 2020, VBDO again revised the methodology and made major changes to the

categories governance and policy. In addition, VBDO did some smaller changes to the categories implementation and accountability. Due to this revision, the scores are not comparable to previous years. (VBDO, 2020).

2.5 Hypothesis Development

Based on previous research, the hypotheses can be developed. Several studies analyzed the relationship between SRI and fund performance. This study analyses the relationship between SRI and pension fund performance in the Netherlands.

Companies that are involved in CSR activities have a better reputation than their competitors that are not involved in CSR activities and therefore they are more attractive to potential customers, employees, and business partners (Humphrey & Tan, 2014). This gives them an advantage over their competitors that can lead to higher financial performance (Humphrey & Tan, 2014). Saeidi et al (2015) analyzed this relationship and found that CSR has a positive impact on customer satisfaction, reputation, and competitive advantage. They found a positive relationship between customer satisfaction and reputation, and a positive relationship between reputation and competitive advantage. Saeidi et al (2015) concluded that reputation and competitive advantage leads to higher performance. A lot of studies analyzed the relationship between SRI and mutual fund performance and some studies found a positive relationship (e.g. Gil-Bazo et al., 2009; Frenandez-Izqueierdo and Matallin-Saez, 2007; Kempf and Osthoff, 2007). Because CSR leads to higher firm performance and previous studies that found a positive relationship between SRI and fund performance, it is expected that pension funds that invest socially responsible also have a higher performance. To test the impact of SRI on pension fund performance, the following hypothesis is formulated:

Hypothesis 1: There is a positive relationship between SRI and pension fund performance.

On the other hand, there are also disadvantages of SRI that can lead to lower performance. Pension funds use negative screening to exclude companies or sectors from their investment portfolio. Investing opportunities with higher performance might be excluded from the portfolio and besides that, it reduces the potential for diversification (Renneboog et al., 2008a). Several studies analyzed the relationship between screening criteria and fund performance and found mixed results. Barnett and Salomon (2006) found a curvilinear relationship between screening intensity and fund performance and Capelle-Blancard (2010) found a negative relationship. Other studies that investigated the relationship between SRI and fund performance compared the performance of SRI funds to conventional funds or a benchmark. In a meta-study about ESG criteria and financial performance, Friede et al (2015) concluded that only 10% of the studies show a negative relationship (e.g. Renneboog et al., 2008b; Jones et al., 2007). Because SRI can lead to a lack of

diversification and several studies found a negative relationship between screening and fund performance, SRI might harm pension fund performance. To test this, the following hypothesis is formulated:

Hypothesis 2: There is a negative relationship between SRI and pension fund performance.

3. Method

3.1 Research model

This chapter describes the research method that is used in this study. First, the research methods that are used in previous research about SRI and performance are described. After that, the research model and variables that are used in this study are explained. Finally, the sample size and data collection method are described. Table 2 gives an overview of the methods that are used in previous research about SRI and performance.

Table 2: Overview of methods in previous studies

Source	Methods
Governance and pension fund performance	
Ammann and Ehmann (2017)	Multiple regression and Tobit regression
Kowalewski (2012)	OLS regression, fixed effects, and Tobit regression
Screening criteria and mutual fund performance	
Barnett and Salomon (2006)	Multiple regression
Capelle-Blancard and Monjon (2010)	Multiple regression
Renneboog et al (2008b)	Multiple regression
SRI and fund performance	
Bauer et al (2006)	Simple and multiple regression
Fernandez-Izquierdo and Matalin-Saez (2007)	Multiple and cross-sectional regression
Jones et al. (2008)	Multiple regression

Ordinary least square (OLS) regression is one of the most frequently used data analysis methods to analyze the relationship between independent variables and a dependent variable. Two types can be distinguished: simple regression and multiple regression. It is called simply regression when there is only one metric independent variable and one metric dependent variable and when there are more independent variables it is called multi regression analysis. In this study, there are several independent variables and therefore a multi regression analysis is used.

To apply a multiple regression analysis, there a several rules of thumb. First, the sample size should be at least a sample of 50 observations and preferably 100 observations. The sample size has to be larger when there are more independent variables. The preferred sample size should be 15 to 20 observations per independent variable to get more significant results. Second, both the dependent and independent variables have to be metric. Third, there has to be linearity between dependent and independent variables. Fourth, a constant variance of the residual. Fifth, the residuals have to be independent. Finally, the residuals are distributed normally. To assess whether these assumptions are met descriptive statistics and graphical analyses such as residual plots and normal distribution plots are used.

Other studies that analyzed the relationship between SRI and fund performance often use multiple regression (Ammann and Ehmann, 2017; Bauer et al., 2006; Barnett and Salomon, 2006; Capelle-Blancard and Monjon, 2010; Jones et al., 2008; Kowalewski, 2012; Renneboog et al., 2008b). The model used in this study is similar to the model that is used by Ammann and Ehmann (2017) and is as follows:

$$Perf_{i,t} = \beta_0 + \beta_1 Governance_{i,t} + \beta_2 Policy_{i,t} + \beta_3 Implementation_{i,t} + \beta_4 Accountability_{i,t} + \beta_5 Ln(Size)_{i,t} + \beta_6 RatioAP_{i,t} + \beta_7 AMCosts_{i,t} + \beta_8 Year_{i,t} + \beta_9 Fund_{i,t} + e_{i,t}$$

3.2 Dependent variable

The dependent variable $Perf_{i,t}$ is the performance of Dutch pension fund i at year t, which is measured in two different ways. To measure the profitability of the investments the excess return is used, similar to Ammann and Ehmann (2017). To calculate the excess return, the following formula is used:

$$Excess\ return_{i,t} = absolute\ return_{i,t} - benchmark\ return_{i,t}$$

Pension funds have internal benchmarks and compare the returns to this benchmark to evaluate how they perform. In this study, the internal benchmarks are used to calculate the excess return. Pension funds create their own benchmark that deviates from standard benchmarks to fairly assess their results (Broeders and De Haan, 2020). For example, when a pension fund does not invest in a certain industry, they exclude that industry from their own created benchmark (Broeders and De Haan, 2020). Pension funds have an internal benchmark for each asset class. To analyze the impact of SRI on financial performance the excess return is calculated for 1) the entire investment portfolio, 2) the asset class equity, and 3) the asset class fixed-income securities.

The second way studies measured the performance of pension funds is through the Sharp ratio (Ammann and Ehmann, 2017; Kowalewski, 2012). The Sharp ratio is calculated with the following formula:

$$Sharpe_i = \frac{\mu_i - Rf}{\sigma_i}$$

μ_i is the mean return of pension fund i for 5 years. The annual average yield of 10-year Netherlands government bonds is used for Rf. The pension funds' volatility (σ) is determined by using the annual returns for 5 years. For example, the annual returns from 2008 to 2012 have been used to calculate the volatility of pension fund i in 2012.

3.3 Independent variables

Within this study, there are four independent variables. The independent variables are *Governance*, *Policy, Implementation,* and *Accountability.* VBDO annually assesses Dutch pension funds in those four categories and gives each category a score between 0 and 5 (VBDO, 2013). Chapter 2.4 explains how VBDO determines the scores for each category.

3.4 Control variables

There are several control variables included in the model that can affect pension fund performance. Other studies about pension fund performance included fund size as a control variable (Huang and Mahieu, 2012; Broeders et al., 2019; Ammann and Ehmann, 2017; Kowalewski, 2012). There are several explanations why larger funds outperform smaller funds, such as more expertise in selecting asset managers, economies of scale in investment costs, and better monitoring of asset managers (Broeders et al., 2019). Ammann and Ehmann (2017) and Kowalewski (2012) measured the fund size as the natural logarithm of the pension fund assets (*LN(Size)*).

RatioAP is the percentage of pensioners and is included as a control variable. Pension funds with a higher percentage of pensioners have a different risk profile that might affect fund performance indirectly (Ammann and Ehmann, 2017).

AMCosts are the asset management costs. Both Kowalewski (2012) and Ammann and Ehmann (2017) include asset management costs in their model because these costs might harm fund performance. The asset management costs are measured as the management costs in % of total assets.

Two dummy variables are included in the model to control for time fixed effects and fund type. *Year* is a dummy variable to distinguish between the years 2012 to 2015. *Type* is a dummy variable to distinguish between the fund types: company pension funds (OPF), industry pension funds (BPF), occupational pension funds (BRF), and general pension funds (APF). Most companies belong to the fund types company pension funds and industry pension funds. Companies that belong to occupational pension funds are for example medical specialists, general practitioners, and physiotherapists.[4]

[4] Rijksoverheid (2022). Pensioenovereenkomsten en Pensioenfondsen. Retrieved from: https://www.rijksoverheid.nl/onderwerpen/pensioen/pensioenovereenkomsten-en-pensioenfondsen

4. Data collection

This study uses a dataset with annual information about the 48 largest Dutch pension funds between 2012 and 2015. The largest 48 pension funds represent about 92% of the total assets in the Dutch pension sector (VBDO, 2019). The timeframe 2012-2015 has been chosen, because of the developments in the VBDO benchmark. The first year VBDO included the categories governance, policy, implementation, and accountability in their benchmark was 2013 (VBDO, 2013). VBDO changed its benchmark significantly in 2017 and the results of the benchmarks after 2016 cannot be compared to previous years. Therefore, only the results of the benchmarks between 2013 and 2016 can be used.

To collect data about Dutch pension funds governance, policy, implementation, and accountability scores are the VBDO annual reports (VBDO, 2013-2016). These annual reports have a ranking table with the scores for each category. The second source that is used to collect data is the pension funds' annual reports. The annual reports have a multi-year overview with the value of assets, the value of liabilities, total members, number of pensioners, asset management costs, and financial returns. The annual reports also have a table with returns and benchmark returns for each asset class. The third data source is DNB, which has a database with yearly data of individual pension funds and contains data such as total members, pensioners, and asset management costs. However, this dataset does not have data available from 2012 to 2014, and therefore this data is collected from annual reports. Historical data from Netherlands 10-year bonds is used to determine the risk-free rate. This data is online available and collected from investing.com. The register of pension funds contains information about the fund type. Netherlands 10-year bonds data is collected from investing.com and fund type data is collected from exelerating.com.

4.1 Data sample

VBDO assesses yearly the largest 50 Dutch pension funds. In 2014, they only assessed 49 pension funds, because two pension funds were merging. Two pension funds were liquidated in the period between 2012 and 2015 and were excluded from the sample. Four pension funds did not have annual reports from 2012 to 2015. Another 4 pension funds did not have the annual reports from 2012 and 2013 and pension funds did not have the annual report of 2012. Pension funds that did not have an annual report available for the period 2012 to 2015 were excluded from the sample.

Pension funds reported differently about their investment returns. Some funds did not have a portfolio benchmark return, other pension funds did not have a benchmark for equity or fixed-income securities. When the benchmark return is missing, the excess return of the portfolio, equity,

or fixed-income securities could not be calculated. As a result, there are differences in the number of observations for portfolio return, equity return, and fixed-income securities return.

The Sharpe ratio is calculated with annual returns for five years. Pension funds often have the historical returns of the last 5 years included in their annual report, but some funds only have the returns of the last 3 years included in their report. As a result, there are 151 observations for the Sharpe ratio (Table 3).

4.2 Descriptive statistics

Boxplots and histograms are used to identify outliers within the data sample. The excess portfolio return had two extreme outliers, respectively 9.5% and 4.8%. Delta Lloyd mentioned In their annual report that the return and benchmark return could not be compared and therefore these values are excluded from the data. Also, the variables equity return, fixed-income securities, and Sharpe ratio had extreme outliers. Because these outliers were true outliers they have been winsorized at the 2.5^{th} and 97.5^{th} percentile.

Table 3 shows the descriptive statistics of the variables. The mean portfolio excess return is 0.47% which is higher than the excess return of prior research (Ammann and Ehmann, 2017). The standard deviation of the excess return is similar to the study of Ammann and Ehmann (2017). The difference in mean excess portfolio return can be explained by the fact that Ammann and Ehmann (2017) used Swiss pension funds and in this stud used Dutch pension funds. Dutch pension funds outperformed their equity benchmark on average by 0.68% with a standard deviation of 1.24% and the fixed-income securities benchmark by 0.19% with a standard deviation of 0.87%.

The Sharpe ratio has a mean of 0.97 and is higher compared to previous studies by Ammann and Ehmann (2017) and Kowalewski (2012). The difference in means can be explained by the risk-free rate that is used to calculate the Sharpe ratio. Kowalewski (2012) used Polish T-bills as risk-free assets and Ammann and Ehmann (2017) used the annual average yield of 10-year Swiss bonds as risk-free rates. The risk-free rates they used are higher and might explain the difference in the mean of the Sharpe ratio. The standard deviation of the Sharpe ratio is 0.46 and is lower than the standard deviation Kowalewski (2012) found and similar to Ammann and Ehmann (2017). Kowalewski (2012) used monthly returns to calculate the Sharpe ratio that might explain the higher standard deviation.

Dutch Pension funds obtained a score between 0.20 and 4.61 for SRI. The average score for SRI is 2.54 with a standard deviation of 0.99. Pension funds obtained on average 2.86 points on the governance score and the standard deviation is 1.18. No pension fund obtained a score lower than 0.3. The average policy score was 2.95 points with a standard deviation of 1.24. Pension funds obtained on average the lowest amount of points on the category implementation with an average

score of 2.18 and a standard deviation of 1.01. No pension fund obtained less than 0.3 points, however, there was neither a pension fund that obtained the maximum score. In the category accountability pension funds obtained on average 2.9 points and the category had a standard deviation of 1.08. The independent variables in this study are not used in prior research and therefore the data cannot be compared to previous studies.

The mean natural logarithm of assets is 8.71 (6063 million) with a standard deviation of 1.10. Ammann and Ehmann (2017) had an average fund size of 1891 million with a standard deviation of 4305.6 million. The average fund size used in this study is larger than in the study of Ammann and Ehmann. The difference in average fund size can be explained by the sample that is used in this study. In this study the largest 50 Dutch pension funds are used, Amman used 2073 Swiss pension funds so smaller pension funds are included in their sample. Dutch pension funds have a mean percentage of pensioners of 0.27 and a standard deviation of 0.15 and are similar to the study of Ammann and Ehmann (2017). The asset management cost has a mean value of 0.4% with a standard deviation of 0.17%. The asset management costs are higher than the asset management costs of Swiss pension funds, which on average spend 0.165% on asset management costs (Ammann and Ehmann, 2017).

Table 3: Descriptive statistics

Dependent Variables						
Variable	N	Minimum	Maximum	Mean	Median	Std. Deviation
Raw return portfolio	159	-4.16	28.5	8.33	6.7	7.21
Raw return equity	156	1.30	24.10	12.78	13.95	5.17
Raw return fixed-income securities	154	-7.90	34.53	6.30	5.10	8.13
Excess portfolio return	159	-2.1	2.8	0.47	0.4	0.77
Excess equity return	156	-2.3	5.0	0.68	0.6	1.24
Excess fixed income securities return	154	-2.51	3.32	0.19	0.11	0.87
Sharpe Ratio	151	0.03	2.75	0.98	0.94	0.46
Independent variables						
SRI	171	0.20	4.61	2.54	2.50	0.99
Governance	171	0.50	5.00	2.86	2.8	1.19
Policy	171	0.00	5.00	2.95	2.9	1.23
Implementation	171	0.30	4.20	2.18	2.1	1.01
Accountability	171	0.00	5.00	2.89	2.9	1.08
Control variables						
LN(Size)	171	6.94	12.77	8.92	8.71	1.10
RatioAP	171	0.03	0.60	0.27	0.26	0.15
AMCosts	171	0.09	0.93	0.40	0.38	0.17

The descriptive statistics by fund type are shown in Appendix A. There are some differences between industry-wide pension funds and company pension funds. Industry-wide pension funds obtained on average 3.2 points on governance compared to 2.43 for company pension funds. Industry-wide pension funds also obtained on average about 1 point higher on policy, implementation, and accountability than company pension funds.

There are some differences between years. In 2012, pension funds outperformed their fixed-income securities benchmark on average by 0.42% compared to an average of 0.19% in the period between 2012 and 2015. In addition, pension funds obtained on average a lower score for governance in 2012.

In 2013, pension funds outperformed their equity benchmark on average by 0.87%, which is higher than the average of 0.68% in the period between 2012 and 2015.

In 2014, the mean portfolio excess return was 0.37%, which is lower than the portfolio excess return in the other years. Pension funds outperformed their fixed-income securities benchmark on average by 0.09% in 2014 which is also lower than in the other years. In addition, pension funds received on average a higher score for governance in 2014.

In 2015, the mean portfolio excess return was 0.53% and was higher than in the other years. Pension funds outperformed their equity benchmark on average by 0.41% in 2015, which is lower than the equity outperformance in the other years. In 2015, pension funds outperformed their fixed-income securities benchmark on average by 0.11%, which is also lower than the average outperformance of the fixed-income securities benchmark.

5. Results

In this chapter, the results of the regression analysis are described. First, the Pearson Correlation Matrix is shown and correlations between variables are analyzed and the regression analysis assumptions are tested. After that, the results of the regression analysis to test the hypothesis and robustness tests are described.

5.1 Bivariate analysis

The Pearson correlation matrix shows the relationship between two variables and is used to identify correlations that might affect the results of the regression analysis. The results of the bivariate analysis can be found in Table 4. There is a positive significant correlation between excess return portfolio and excess return equity and also between excess return portfolio and excess return fixed-income securities. This can be explained by the fact that portfolio return is a combination of the performances of the asset classes. It is likely that funds that outperform the equity benchmark or fixed-income securities benchmark also outperform the portfolio benchmark because the portfolio benchmark is a combination of the benchmarks of each asset class multiplied by the weighting factor of that asset class.

There is a positive significant relationship between the independent variables governance, policy, implementation, and accountability. These correlations are expected because the criteria used to determine the scores for these variables are related to the other variables. For example, one of the criteria that is used to determine the governance score is related to the source of information that is used to formulate and evaluate the responsible investment policy and implementation. One of the criteria that are used to determine the policy score is whether pension funds have specific criteria and instruments for each asset class. This affects the implementation score because funds receive more points when they implement the policy to a larger percentage of the investment portfolio. The criterion used to determine the accountability score is related to policy and implementation, so it can be expected that the policy and implementation score affect the accountability score.

The control variable LN(Size) shows a significant positive relationship with the independent variables governance, policy, implementation, and accountability. This means that larger funds receive a higher score on governance, policy, implementation, and accountability. LN(Size) also shows a significant positive relationship with Sharpe Ratio. This indicates that larger firms have a lower risk than smaller funds. The control variable asset management costs have a positive significant relationship with LN(Size), Sharpe ratio, excess

Table 4: Pearson's Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12
1 Excess return portfolio	1											
2 Excess return equity	0.493**	1										
3 Excess return Fixed-income securities	0.515**	0.104	1									
4 Sharpe	-0.091	-0.134	0.029	1								
5 SRI	0.090	0.016	0.093	0.148	1							
6 Governance	0.048	-0.047	0.098	0.218**	0.838**	1						
7 Policy	0.008	-0.020	0.053	0.059	0.841**	0.625**	1					
8 Implementation	0.129	0.056	0.102	0.131	0.962**	0.736**	0.735**	1				
9 Accountability	0.060	0.019	0.059	0.113	0.898**	0.715**	0.717**	0.825**	1			
10 LN(Size)	0.054	0.103	0.057	0.298*	0.400**	0.362**	0.315**	0.393**	0.333*	1		
11 RatioAP	0.016	0.140	0.047	0.042	-0.098	-0.073	-0.116	-0.072	-0.113	0.038	1	
12 AMCosts	0.032	0.143	0.165*	0.179*	0.254*	0.164*	0.264**	0.232**	0.247**	0.210**	0.054	1

*Note: ***, **, and * indicate significance at 1%, 5%, and 10% respectively.*

return fixed-income-securities and with the independent variables governance, policy, implementation, and accountability. The correlation between asset management costs and LN(size) indicates that larger funds spend more money on asset management. The correlation between asset management costs and Sharpe indicates that funds that spend more money on asset management have a higher Sharpe ratio and therefore a higher risk-reward ratio. This correlation can be explained by two reasons. First, more asset managers can increase the risk-reward ratio. Second, larger funds spend more money on asset management and larger funds have a higher risk-reward ratio than smaller funds.

5.2 Assumptions

A multiple regression analysis must meet the following four assumptions. First, there is a linear relationship between the dependent and independent variables. Second, there is no multicollinearity between the independent variables. Third, the variance of the residuals is constant. Fourth, the residuals are normally distributed.

The first assumption is tested with scatterplots of the independent variables. To detect nonlinearity, a Loess Curve has been fitted through the scatterplots. The scatterplots are shown in Appendix B. The Loess curve shows a weak positive linear relationship between implementation and excess return portfolio and between the independent variables governance, policy, implementation and accountability with excess return fixed-income-securities.

VIF values are determined to test the second assumption. This assumption is met when the VIF values are less than 10. The VIF values are shown in Appendix C and are between 1.030 and 4.320. All the VIF values are less than 10 and meet the assumption that there is no multicollinearity.

To test if the variance of the residuals is constant scatterplots of the residuals are used. The scatterplots of the residuals are shown in Appendix D. From these scatterplots it can be concluded that the variance of the residuals is constant. When the absolute value of the studentized residuals is larger than 3, it can be called an outlier. The scatterplots of the dependent variables excess return portfolio and Sharpe ratio has 2 outliers. The scatterplots of the dependent variables excess return equity and excess return fixed-income securities have 4 outliers.

The last assumption is tested with histograms and normal probability plots of the residuals. The histograms and P-P plots are shown in Appendix E. The histograms and P-P plots of the Sharpe ratio show a perfectly normal distribution. The P-P plots of the portfolio return, equity return, and fixed-income securities return deviate from a perfect normal distribution but are still considered a normal distribution.

5.3 OLS regression results

This study tests two hypotheses: 1) *There is a positive relationship between SRI and pension fund performance,* and 2) *There is a negative relationship between SRI and pension fund performance.* The results of the OLS regression to test the relationship between SRI and pension fund performance are shown in Table 5. The results in table 5 show a significant negative relationship between policy and excess portfolio return and a significant positive relationship between implementation and excess portfolio return. It was expected that fund size would have a positive effect on fund performance and asset management costs would harm fund performance. However, the control variables size and asset management costs do not show a significant relationship with excess portfolio return. The adjusted R^2 is -0.005 and indicates that the model is not a good fit. Ammann and Ehmann (2017) also found a low adjusted R^2 when comparing the returns to an internal benchmark.

The models for excess equity return and excess fixed-income securities return have a low adjusted R^2, respectively 0.031 and 0.040. The model for excess equity return does not show a significant relationship between the dependent and independent variables. The model for excess return fixed-income securities shows that policy has a significant negative relationship with excess return fixed-income securities. The results do not show that the control variables size, percentage of pensioners, and asset management costs are related to the excess return. This is similar to the results of Ammann and Ehmann (2017).

Table 5: OLS regression results with independent variables governance, policy, implementation, and accountability

Variable	Portfolio return	Equity return	Fixed-income securities return	Sharpe
Governance	-0.045	-0.187	0.220	0.155
Policy	-0.304*	-0.220	-0.330**	-0.191
Implementation	0.448**	0.265	0.225	0.102
Accountability	-0.039	0.047	-0.091	0.028
LN(Size)	0.048	0.132	-0.009	0.277***
RatioAP	-0.068	0.038	0.041	-0.041
AMCosts	0.020	0.135	0.106	0.143**
Year dummy	Yes	Yes	Yes	Yes
Fund dummy	Yes	Yes	Yes	Yes
Observations	158	155	153	150
Adjusted R^2	-0.005	0.031	0.040	0.396

*Note: This table shows the standardized coefficients. ***, **, and * indicate significance at 1%, 5%, and 10% respectively.*

Ammann and Ehmann (2017) found a significant positive relationship between governance and the Sharpe ratio. The results in this study do not show a significant relationship between the independent variables and the Sharpe Ratio. The difference in results can be explained by the fact that the model that Ammann and Ehmann (2017) used, has an adjusted R^2 of only 0.045. In this study, The Sharpe ratio model has an adjusted R^2 of 0.396 and indicates that 39.6% of the variance

can be explained by the model. The results also show that the control variables size and asset management costs have a significant positive effect on the Sharpe ratio.

5.4 Robustness tests

Several robustness tests have been conducted to test the validity of the results. The independent variables in Table 5 show mixed results. The adjusted R^2 of the model excess portfolio return, excess equity return, and excess fixed-income securities return are low. In addition, the independent variables governance, policy, implementation, and accountability are correlated.

First, the scores for governance, policy, implementation, and accountability are combined into one SRI score. Similar to VBDO, the weighting factors for the variables to determine the SRI score are governance (16.67%), policy (16.67%), implementation (50%), and accountability (16.67%).

Table 6 shows the regression results with the independent variable SRI. The models' excess portfolio return, excess equity return, and excess fixed-income securities return do not show a significant relationship between the SRI score and the dependent variables, and the adjusted R^2 is very low. Also, the Sharpe ratio model does not show a significant relationship between SRI and Sharpe ratio. The adjusted R^2 of this model is similar to the models used in chapter 5.3.

Table 6: OLS regression results with independent variable SRI

Variable	Portfolio return	Equity return	Fixed-income securities return	Sharpe
SRI	0.096	-0.063	0.052	0.104
LN(Size)	0.048	0.125	0.008	0.284***
RatioAP	-0.055	0.064	0.027	-0.047
AMCosts	-0.002	0.123	0.093	0.127*
Year dummy	Yes	Yes	Yes	Yes
Fund dummy	Yes	Yes	Yes	Yes
Observations	158	155	150	150
Adjusted R^2	-0.030	0.014	0.019	0.396

*Note: This table shows the standardized coefficients. ***, **, and * indicate significance at 1%, 5%, and 10% respectively.*

Second, the independent variables are added one by one to the regression model because of the high correlation between the independent variables. The results in table 7 show that there is no significant relationship between implementation and excess return portfolio when implementation is the only independent variable included in the model. After adding policy to the regression model, there is a significant positive relationship (at the 1% level) between implementation and excess return portfolio and a significant negative relationship (at the 5% level) between policy and excess return portfolio. The adjusted R^2 improves from -0.018 to 0.007. After adding governance to the regression model, the adjusted R^2 reduces to 0.002. There is still a significant positive relationship

Table 7: OLS regression, independent variables are added one by one

Variable	Portfolio return				Equity return				Fixed-income securities return				Sharpe			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Implementation	0.171	0.410***	0.430***	0.448**	0.015	0.223	0.286*	0.265	0.078	0.256*	0.184	0.225	0.096	0.180	0.114	0.102
Policy	No	-0.336**	-0.310*	-0.304*	No	-0.292**	-0.211	-0.220	No	-0.257*	-0.347**	-0.330**	No	-0.114	-0.188	-0.191
Governance	No	No	-0.054	-0.045	No	No	-0.175	-0.187	No	No	0.197	0.220	No	No	0.164	0.155
Accountability	No	No	No	-0.039	No	No	No	0.047	No	No	No	-0.091	No	No	No	0.028
LN(Size)	0.028	0.045	0.050	0.048	0.098	0.113	0.129	0.132	0.000	0.016	-0.003	-0.009	0.287***	0.293***	0.275***	0.277***
RatioAP	-0.062	-0.064	-0.069	-0.068	0.067	0.057	0.040	0.038	0.025	0.018	0.038	0.041	-0.049	-0.052	-0.040	-0.041
AMCosts	-0.005	0.020	0.019	0.020	0.123	0.134	0.135	0.135	0.095	0.106	0.105	0.106	0.129*	0.136*	0.144**	0.143**
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	158	158	158	158	155	155	155	155	153	153	153	153	150	150	150	150
Adjusted R^2	-0.018	0.007	0.002	-0.005	0.012	0.032	0.037	0.031	0.022	0.035	0.044	0.040	0.395	0.394	0.400	0.396

*Note: This table shows the standardized coefficients. ***, **, and * indicate significance at 1%, 5%, and 10% respectively.*

Table 8: OLS regression results with bootstrapping

Variable	Portfolio return		Equity return		Fixed-income securities return		Sharpe	
	Beta	Std. error	Beta	Std. error	Beta	Std. error	Beta	Std. error
Governance	-0.029	0.095	-0.193	0.161	0.159	0.116	0.060	0.037
Policy	-0.188**	0.093	-0.221	0.176	-0.232**	0.102	-0.071	0.055
Implementation	0.340***	0.120	0.327	0.212	0.195	0.131	0.047	0.107
Accountability	-0.027	0.119	0.054	0.173	-0.072	0.093	0.012	0.063
LN(Size)	0.033	0.067	0.145	0.090	-0.007	0.080	0.114***	0.037
RatioAP	-0.357	0.445	0.318	0.546	0.235	0.507	-0.132	0.219
AMCosts	0.090	0.418	0.973	0.618	0.533	0.393	0.382**	0.179
Adjusted R^2	-0.005		0.031		0.040		0.396	

Note: Results are based on 2000 bootstrap samples. This table shows the unstandardized coefficients.
***, **, and * indicate significance (2-tailed) at 1%, 5%, and 10% respectively.

between implementation and excess return portfolio and a significant negative relationship between policy and excess return portfolio (reduced to the 10% level). After adding the last independent variable, the adjusted R^2 is reduced to -0.005. There is a significant positive relationship at the 5% level instead of the 1% level between implementation and excess return portfolio and a significant negative relationship between policy and excess return portfolio. This regression model is most accurate when the independent variables governance and accountability are not included in the model.

The results in table 7 do not show a significant relationship between implementation and excess return equity. After adding policy to the regression model, the results show a significant negative relationship between policy and excess return equity. When governance is added to the model, the relationship between policy and excess return equity is not significant anymore. However, the results show a significant positive relationship between implementation and excess return equity. This may be explained by the correlation between the independent variables. After adding accountability to the regression model, the adjusted R^2 was reduced from 0.037 to 0.031 and the model does not show a significant relationship between the independent variables and excess return equity.

The OLS regression results in table 7 show a positive significant relationship between implementation and excess return fixed-income securities and a negative significant relationship between policy and excess return fixed-income securities. After adding governance to the model, the model shows a significant negative relationship (at the 5% level) between policy and excess return fixed-income securities. However, this model does not show a significant relationship between implementation and fixed-income securities. When also accountability is included in the model, the adjusted R^2 reduces from 0.044 to 0.040 and still shows a significant negative relationship between policy and excess return fixed-income securities.

The OLS regression results with the dependent variable Sharpe ratio do not show a significant relationship between the independent variables and the Sharpe ratio. All Sharpe ratio models in Table 7 show that size and asset management costs have a significant positive effect on the Sharpe ratio.

Third, bootstrapping is used to generate 2000 data samples based on the available data to validate the model. The results are presented in Table 8. Table 5 shows a significant negative relationship between policy and excess portfolio return and a significant positive relationship between implementation and excess portfolio return. The results in Table 8 show a positive significant relationship between implementation and excess return portfolio at the 1% level, the beta is 0.340

with a standard error of 0.120. Table 5 also shows that policy has a significant negative effect on fixed-income securities return. The beta coefficient for policy is -0.188 with a standard error of 0.093 and is significant at the 5% level.

The OLS regression results in table 5 show a significant negative relationship between policy and excess return fixed-income securities. The bootstrapping results in Table 8 also show a significant negative relationship between policy and excess return fixed-income securities.

Table 5 shows that size and asset management costs have a significant positive effect on the Sharpe ratio. The bootstrapping results also show a positive significant relationship between size and the Sharpe ratio and between asset management costs with the Sharpe ratio. Size has a beta of 0.114 with a standard error of 0.037 and asset management costs have a beta of 0.382 with a standard error of 0.179

Fourth, the excess return of the portfolio, equity, and fixed-income securities was determined by comparing the absolute return to internal benchmarks. Instead of using internal benchmarks, the absolute returns are compared to standard benchmarks. For equity, the standard benchmark that is used is the MSCI World Index, for fixed-income securities the FTSE World Government Bond index is used. The portfolio return is compared to a combination of the MSCI World Index and FTSE World Government Bond Index. Chapter 2.1.2. shows that pension funds invest on average about 30% in equity and 50% in fixed-income securities. Therefore, the weighting factors that are used to calculate a benchmark for the portfolio are MSCI World Index (37.5%) and fixed-income securities (62.5%).

The regression results are shown in Table 9. It can be seen that there is no significant relationship between the independent variables and portfolio return. The adjusted R^2 of this model is 0.656 and is higher than the adjusted R^2 when comparing the portfolio return to internal benchmarks. This model has a high adjusted R^2, because of the year dummy that is included in the model. When the year dummy is excluded from the model, the adjusted R^2 has a value of 0.037 and the results show a significant negative relationship between policy and portfolio return and a significant positive relationship between implementation and portfolio return.

There is a significant negative relationship between policy and equity return and a significant positive relationship between implementation and equity return. The adjusted R^2 has a value of 0.797, which indicates that 79.7% of the variance can be explained by the model. When the year dummy is excluded from the model, the adjusted R^2 has a value of 0.286 and the results still show a

significant negative relationship between policy and equity return and a significant positive relationship between implementation and equity return.

The model for fixed-income securities shows that governance and accountability have a significant positive effect on fixed-income securities and the model has an adjusted R^2 of 0.505.

Table 9: OLS regression results with returns compared to standard benchmarks

Variable	Portfolio return	Equity return	Fixed-income securities return
Governance	0.036	-0.003	0.171*
Policy	-0.086	-0.192**	-0.084
Implementation	-0.023	0.132*	-0.168
Accountability	0.079	0.082	0.245**
LN(Size)	0.051	0.060	0.068
RatioAP	0.029	-0.031	0.043
AMCosts	0.026	-0.002	0.040
Year dummy	Yes	Yes	Yes
Fund dummy	Yes	Yes	Yes
Observations	170	161	160
Adjusted R^2	0.656	0.797	0.505

*Note: This table shows the standardized coefficients. ***, **, and * indicate significance at 1%, 5%, and 10% respectively.*

The previous regression shows mixed results. Therefore, the independent variables are combined to one SRI score. The results do not show a significant relationship between the independent variable and portfolio return and between the independent variable and equity return. The results show that there is a significant positive relationship between SRI and fixed-income securities.

Table 10: OLS Regression results with independent variable SRI and returns compared to standard benchmarks

Variable	Portfolio return	Equity return	Fixed-income securities return
SRI	0.004	0.030	0.130*
LN(Size)	0.050	0.057	0.058
RatioAP	0.030	-0.021	0.033
AMCosts	0.022	-0.009	0.047
Year dummy	Yes	Yes	Yes
Fund dummy	Yes	Yes	Yes
Observations	170	161	160
Adjusted R^2	0.659	0.788	0.485

*Note: This table shows the standardized coefficients. ***, **, and * indicate significance at 1%, 5%, and 10% respectively.*

6. Conclusion and discussion

Several studies analyzed the relationship between SRI and performance. A lot of studies analyzed the relationship between screening intensity and fund performance and use mutual funds or portfolios that were created by researchers. However, little research has been done in the field of SRI and pension fund performance. Studies that analyzed the relationship between SRI and pension fund performance used Swiss, Polish, Swedish, and Norwegian pension funds. Prior research did not examine the relationship between SRI and Dutch pension funds. Therefore, the following research question has been formulated:

What is the impact of SRI on the performance of Dutch pension funds?

To answer this question, the following two hypotheses have been formulated. First, there is a positive relationship between SRI and pension fund performance that can be explained by stakeholder theory. Stakeholder theory states that companies that are involved in positive activities have a competitive advantage that can lead to higher financial performance. On the other hand, there is a negative relationship between SRI and pension fund performance that can be explained by modern portfolio theory. Modern portfolio states that through diversification a more efficient investment portfolio can be constructed. However, SRI can lead to a lack of diversification by excluding certain companies or an entire sector as an investment opportunity.

The pension fund performance is measured in different ways: 1) the excess return, and 2) the Sharpe ratio. The excess return is determined by comparing the absolute returns of the entire portfolio, the asset class equity, and the asset class fixed-income securities to internal benchmarks.

The results are validated in four different ways: 1) the independent variables governance, policy, implementation, and accountability are combined to one SRI score, 2) the absolute returns are compared to standard benchmarks, 3) the independent variables are added one by one to the regression model, and 4) bootstrapping.

The data sample that is used in this study consists of the largest 48 pension funds between 2012 and 2015. The regression results show that policy has a significant negative effect on portfolio return and implementation has a significant positive effect on portfolio return. The results are counterintuitive since the results indicate that including SRI in the policy reduces portfolio performance, but implementing the policy increases the portfolio return. This can be explained by the fact that the independent variables policy and implementation are correlated and the low adjusted R^2. After combining the independent variables to one SRI score, the results do not show a significant relationship between SRI and portfolio return. When the portfolio return is compared to standard

benchmarks, there is no significant relationship between the independent variables and portfolio return. Adding the independent variables one by one to the regression model shows that there is a significant positive relationship between implementation and portfolio return and a significant negative relationship between policy and portfolio return. However, when the independent variable policy is not included in the model the results do not show a significant relationship between implementation and portfolio return. The bootstrapping results support the positive relationship between implementation and portfolio return and the negative relationship between policy and portfolio return.

The regression results do not show a significant relationship between the independent variables and equity return. When standard benchmarks are used, the model shows a significant negative relationship between policy and equity return and a significant positive relationship between implementation and equity return. These results are similar to what the portfolio return model showed. This model has an adjusted R^2 of 0.797 and the correlation between the independent variables is likely the reason for these results. Combining the independent variables to one SRI score does not show a significant relationship between SRI and equity return. Adding the independent variables one by one indicates a significant negative relationship between policy and equity return when the independent variables policy and implementation are included in the model. However, after adding governance to this model the results do not longer show a significant relationship between policy and equity return, but show a significant positive relationship between implementation and equity return. When also the fourth independent variable is added to the model, the results do not show a significant relationship between the independent variables and equity return.

The regression results show a significant negative relationship between policy and fixed-income securities. However, the model has a low adjusted R^2. After combining the governance, policy, implementation, and accountability scores to one SRI score the model does not show a significant relationship between SRI and fixed-income securities return. When the fixed-income securities return is compared to a standard benchmark, the model shows that the variables governance and accountability have a significant positive effect on fixed-income securities return and the model has an adjusted R^2 of 0.505. Even when the independent variables are combined to one SRI score, the model shows a significant positive relationship between SRI and fixed-income securities.

The second way pension fund performance is measured is the Sharpe ratio. The results do not show a significant relationship between the independent variables and the Sharpe ratio. The control variables size and asset management costs have a significant positive effect on the Sharpe ratio. Also, after

combining the independent variables to one score for SRI, the model does not show a significant relationship between SRI and Sharpe ratio.

Based on the results, the first hypothesis "*there is a positive relationship between SRI and pension fund performance"* can be rejected. The models showed different results, the only model that shows a significant positive relationship between SRI and fund performance is the model of fixed-income-securities when the return is compared to a standard benchmark. The second hypothesis "*there is a negative relationship between SRI and pension fund performance"* is also rejected. No model showed a significant negative relationship between SRI and fund performance.

To answer the research question, SRI does not affect the performance of Dutch pension funds. This is similar to what Friede et al (2015) found in their meta-analysis of about 2200 studies. They found that 90% of the studies show a nonnegative relationship between ESG criteria and financial performance. Based on the results found in this study, investing in companies that are involved in positive activities does not lead to higher performances and SRI does not lead to a lack of diversification. Pension funds invest money on behalf of the beneficiaries, their goal is to pay a decent pension to the beneficiaries when they retire and do not have to maximize the returns. Through shareholder engagement, pension funds have an important role. Conversations with the management of companies can lead to changes within companies related to corporate social responsibility. Pension funds can decide to exclude companies from their investment portfolio when companies do not want to change.

This study has several limitations. First, there are about 250 pension funds in the Netherlands, but only the largest 48 Dutch pension funds were included in this study. The largest 48 Dutch pension funds represent about 90% of the total assets in the pension sector. The other pension funds were not included in this study, because VBDO scores were used and VBDO did not assess the smaller pension funds. Second, the Sharpe ratio is calculated based on annual returns. When monthly returns were used, the results could be different. However, the monthly returns were not available. Third, pension fund performance is measured by comparing the returns to internal benchmarks and standard benchmarks. Pension funds have an internal benchmark for each asset class and the entire investment portfolio. To compare the portfolio returns to a standard benchmark, it is assumed that the pension funds' portfolio consists of 37.5% equity and 62.5% fixed-income securities. This is a simplification of reality because pension funds also invest in other asset classes, and asset allocation between pension funds differs. To get more accurate results, benchmarks of all asset classes should be used and asset allocation should be taken into account.

In this study, the VBDO benchmark is used to determine the SRI score. However, the benchmark has been developed over time and the scores after 2016 cannot be compared to previous years. For future

research, it would be interesting to look at other factors that are related to SRI. For example, MSCI gives mutual funds and ETFs an ESG rating based on the holdings of the fund, a similar rating could also be used for pension funds. Another variable that would be interesting to analyze is the effect of screening criteria on pension fund performance.

7. References

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Appendix A – Descriptive statistics

Table 11: Descriptive statistics by fund type

	Industry pension fund (BPF)	Company pension fund (OPF)
Portfolio return		
Minimum	-0.8	-2.1
Maximum	2.8	2.8
Mean	0.43	0.44
Median	0.30	0.40
Std. deviation	0.63	0.94
N	83	62
Equity return		
Minimum	-2.30	-2.30
Maximum	5.0	5.0
Mean	0.61	0.70
Median	0.62	0.50
Std. deviation	1.21	1.34
N	80	62
Fixed-income securities return		
Minimum	-2.51	-2.20
Maximum	3.32	3.32
Mean	0.22	0.023
Median	0.18	0.00
Std. deviation	0.68	0.99
N	80	60
Sharpe ratio		
Minimum	0.03	0.07
Maximum	2.75	1.96
Mean	0.99	0.96
Median	0.89	0.98
Std. deviation	0.53	0.37
N	76	61
Independent variables		
Governance		
Minimum	0.8	0.5
Maximum	5	4.8
Mean	3.2	2.43
Median	3.3	2.30
Std. deviation	1.19	1.07
N	83	74
Policy		
Minimum	1.7	0
Maximum	5.0	5.00
Mean	3.50	2.34
Median	3.90	2.10
Std. deviation	1.01	1.22

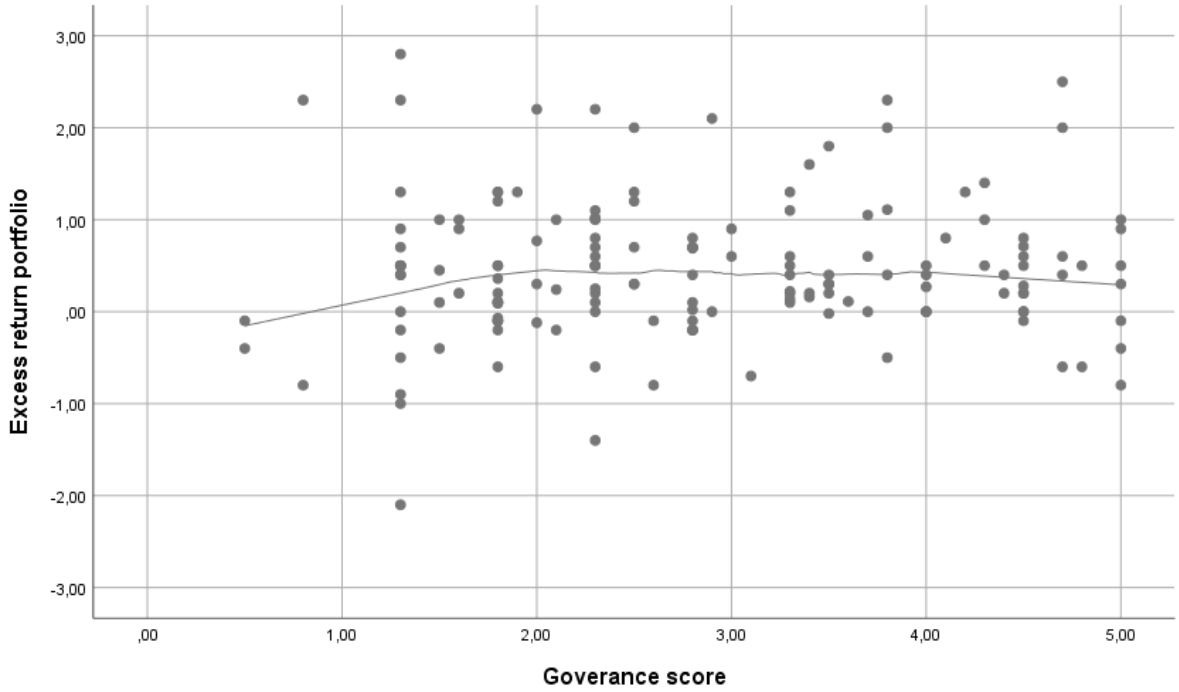
N	83	74
Implementation		
Minimum	0.60	0.30
Maximum	4.20	4.10
Mean	2.66	1.60
Median	2.70	1.45
Std. deviation	0.89	0.92
N	83	74
Accountability		
Minimum	1.50	0
Maximum	5.00	4.30
Mean	3.46	2.25
Median	3.50	2.20
Std. deviation	0.93	0.95
N	83	74
Control variables		
LN(Size)		
Minimum	7.53	6.94
Maximum	12.77	10.17
Mean	9.23	8.59
Median	8.92	8.59
Std. deviation	1.32	0.78
N	83	74
RatioAP		
Minimum	0.03	0.08
Maximum	0.60	0.56
Mean	0.21	0.31
Median	0.21	0.30
Std. deviation	0.13	0.14
N	83	74
AMCosts		
Minimum	0.09	0.11
Maximum	0.76	0.81
Mean	0.45	0.33
Median	0.47	0.33
Std. deviation	0.15	0.16
N	83	74

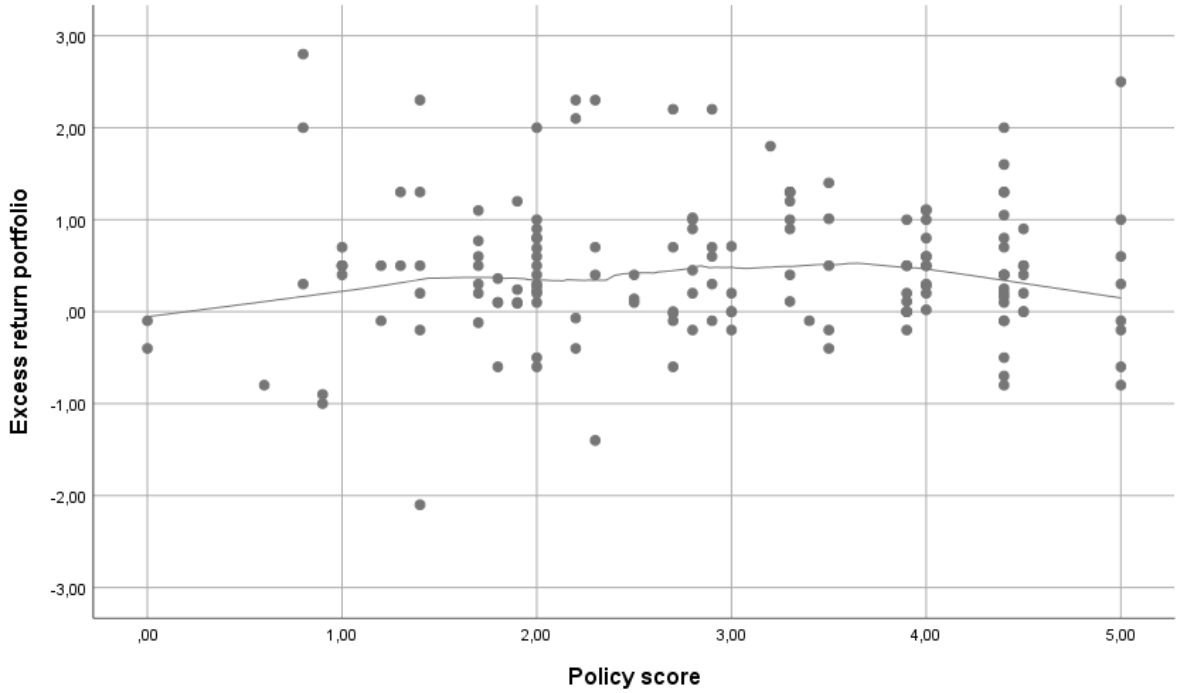
Table 12: Descriptive statistics by year

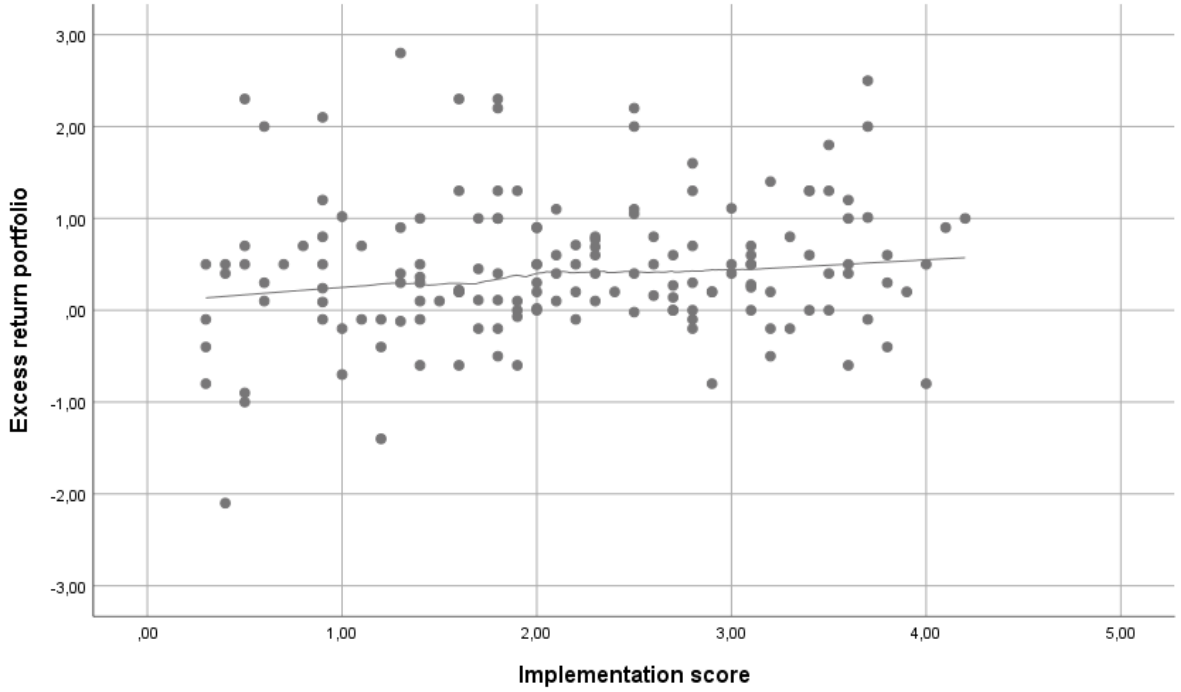
	2012	2013	2014	2015
Portfolio return				
Minimum	-2.10	-1.40	-1.00	-0.80
Maximum	2.80	2.10	2.80	1.80
Mean	0.45	0.52	0.37	0.53
Median	0.40	0.43	0.21	0.50
Std. deviation	0.99	0.67	0.87	0.53
N	36	38	42	43
Equity return				
Minimum	-2.30	-1.50	-1.40	-2.30
Maximum	5.00	4.25	5.00	4.90
Mean	0.67	0.87	0.41	0.80
Median	0.71	0.90	0.20	0.70
Std. deviation	1.61	1.14	1.11	1.09
N	34	37	42	43
Fixed-income securities return				
Minimum	-2.51	-1.60	-2.20	-1.20
Maximum	3.32	2.00	3.32	1.80
Mean	0.42	0.20	0.09	0.11
Median	0.20	0.20	0.00	0.20
Std. deviation	1.27	0.62	0.91	0.58
N	33	37	42	42
Sharpe ratio				
Minimum	0.03	0.56	0.69	0.45
Maximum	2.75	2.05	2.19	2.19
Mean	0.57	1.22	1.21	0.82
Median	0.33	1.23	1.20	0.78
Std. deviation	0.65	0.30	0.30	0.27
N	29	36	42	44
Independent variables				
Governance				
Minimum	0.80	1.30	0.50	0.50
Maximum	4.70	5.00	5.00	5.00
Mean	2.28	2.86	3.91	3.21
Median	2.00	2.50	2.80	3.30
Std. deviation	1.08	1.17	1.26	1.12
N	38	41	46	46
Policy				
Minimum	1.00	1.00	0.00	0.00
Maximum	5.00	5.00	5.00	5.00
Mean	3.31	3.40	2.51	2.70
Median	3.30	3.90	2.35	2.40
Std. deviation	1.17	1.10	1.21	1.25
N	38	41	46	46
Implementation				
Minimum	0.30	0.40	0.30	0.30
Maximum	3.70	4.10	3.80	4.20
Mean	1.99	2.10	2.12	2.47

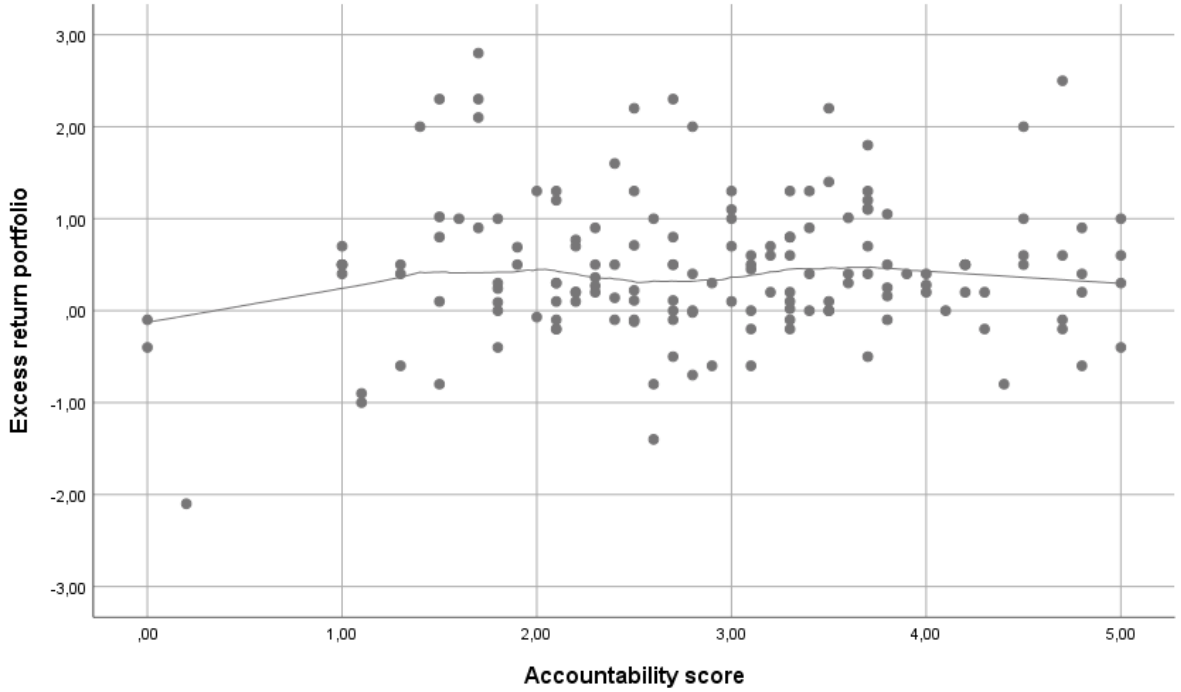
Median	1.80	2.00	2.05	2.40
Std. deviation	1.01	1.05	0.96	1.01
N	38	41	46	46
Accountability				
Minimum	0.20	1.00	0.00	0.00
Maximum	4.80	5.00	5.00	5.00
Mean	2.73	2.95	2.68	3.17
Median	2.70	3.20	2.60	3.30
Std. deviation	1.06	1.08	1.08	1.08
N	38	41	46	46
Control variables				
LN(Size)				
Minimum	7.03	6.94	7.13	7.18
Maximum	12.55	12.61	12.75	12.77
Mean	8.85	8.83	8.97	8.99
Median	8.58	8.61	8.84	8.85
Std. deviation	1.12	1.12	1.09	1.10
N	38	41	46	46
RatioAP				
Minimum	0.03	0.03	0.03	0.04
Maximum	0.60	0.60	0.59	0.58
Mean	0.27	0.27	0.28	0.28
Median	0.25	0.26	0.27	0.26
Std. deviation	0.15	0.15	0.15	0.15
N	38	41	46	46
AMCosts				
Minimum	0.12	0.12	0.11	0.09
Maximum	0.78	0.93	0.81	0.72
Mean	0.41	0.43	0.39	0.40
Median	0.38	0.39	0.36	0.38
Std. deviation	0.18	0.19	0.16	0.16
N	38	41	46	46

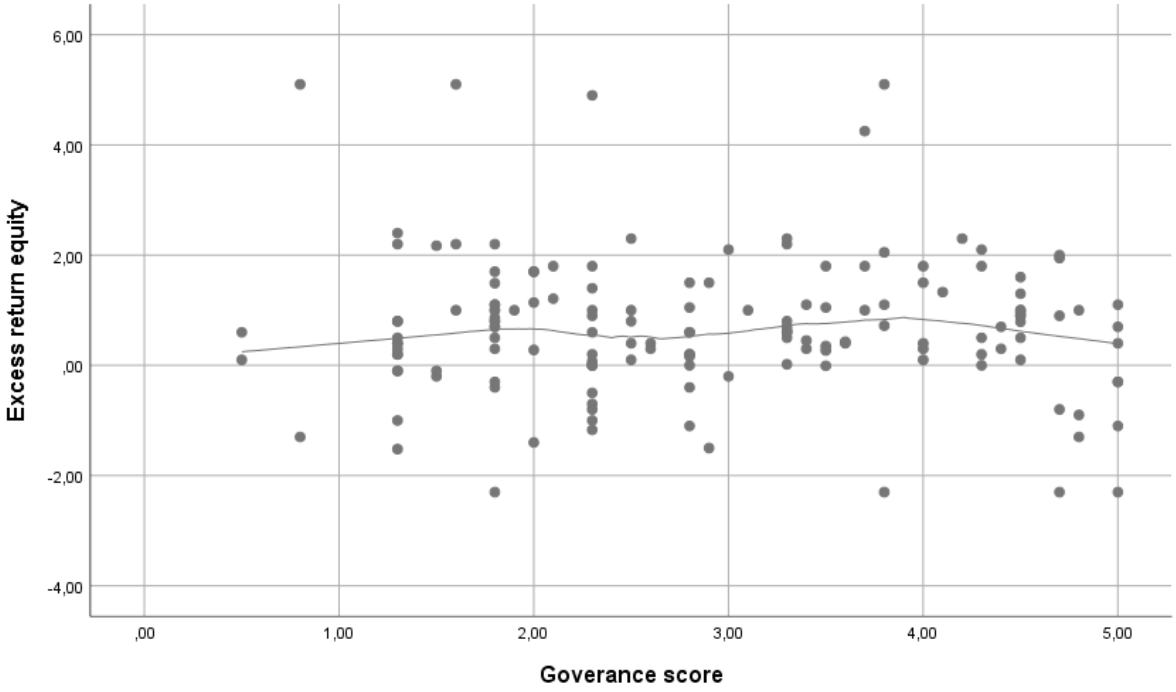
Appendix B – Scatterplots

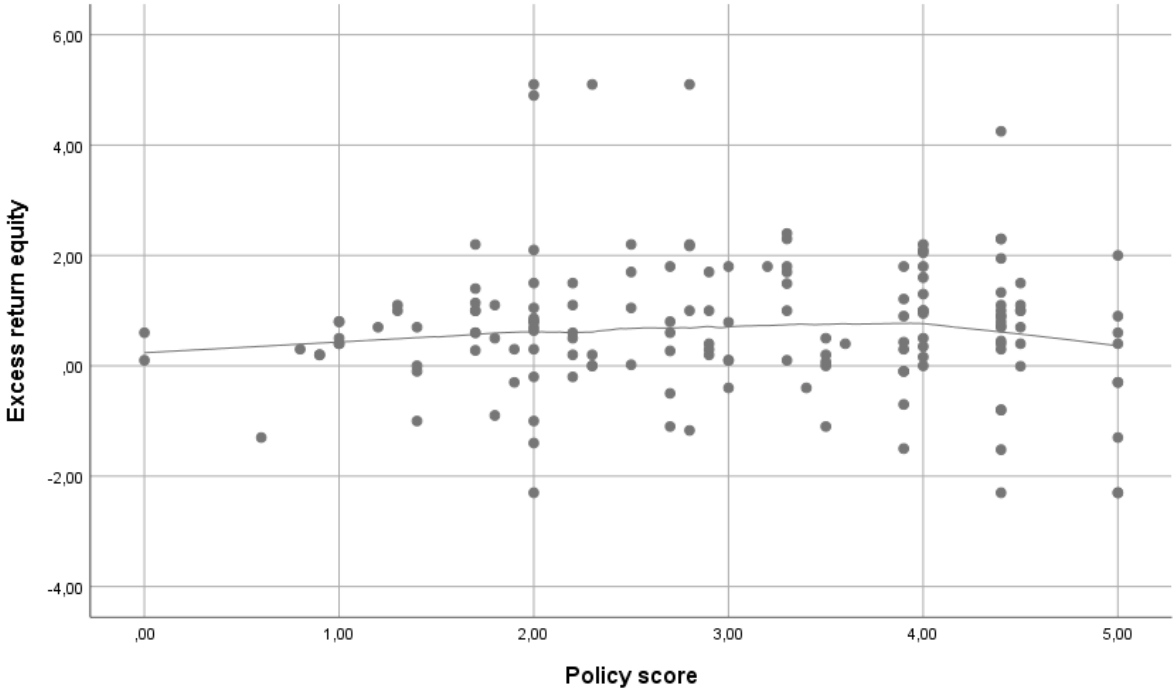


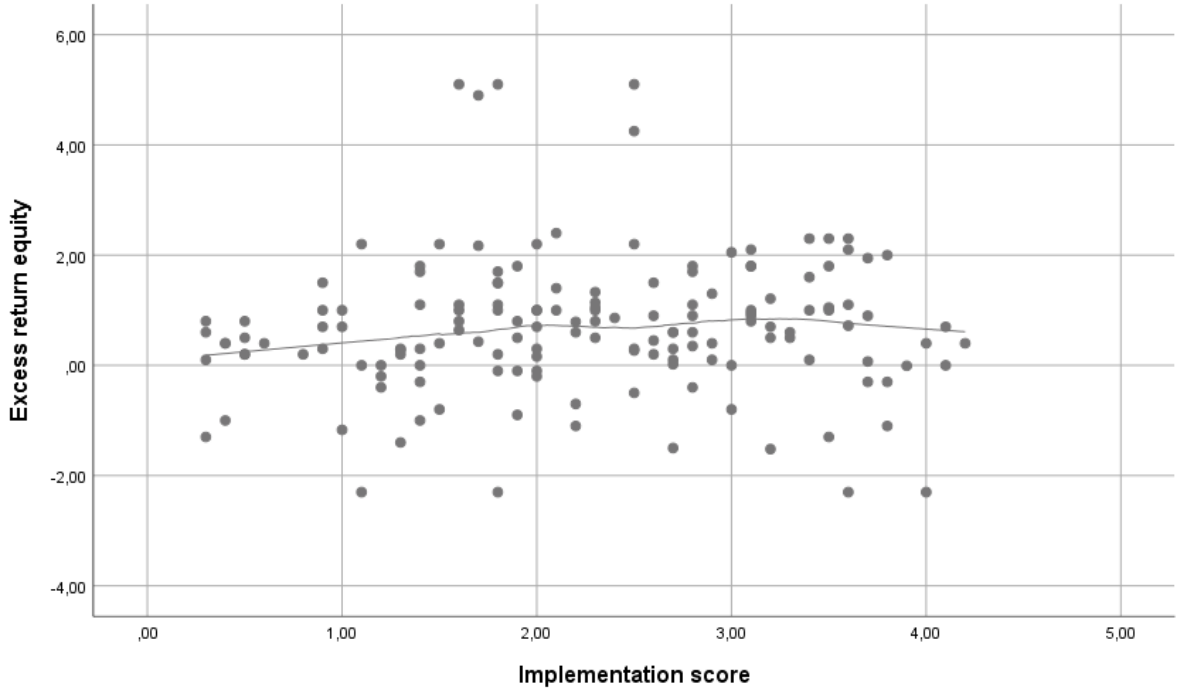


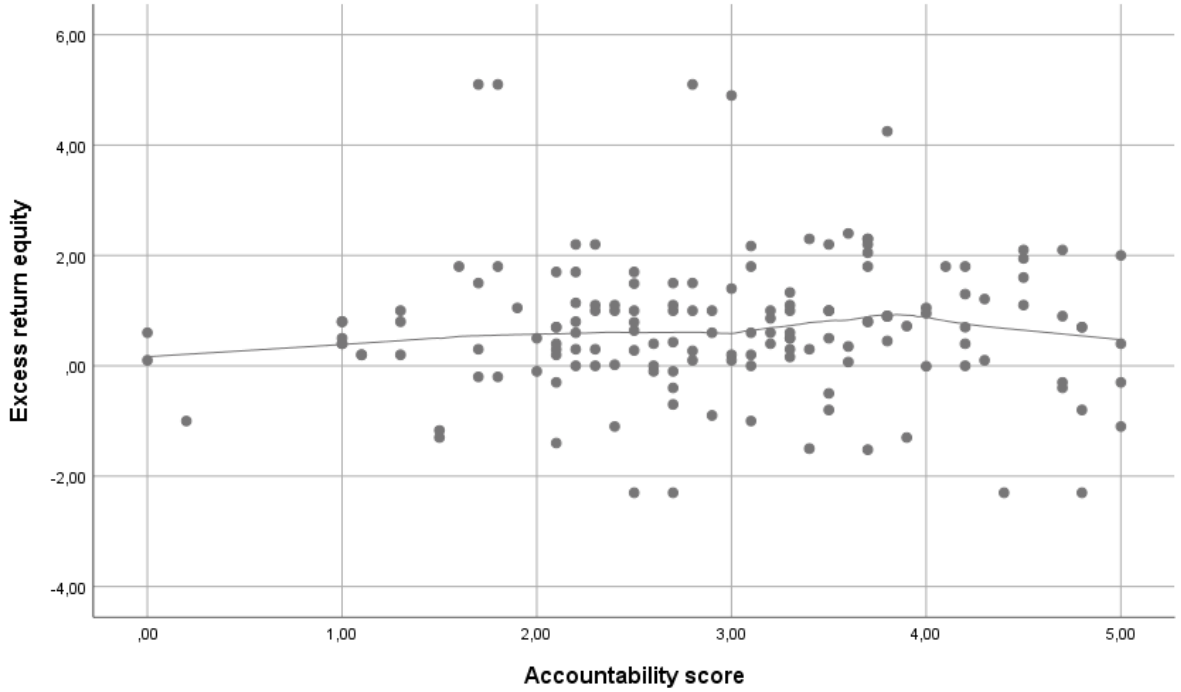

3,00
2,00
1,00
,00
-1,00
-2,00
-3,00
Excess return portfolio
,00
1,00
2,00
3,00
4,00
5,00
Implementation score

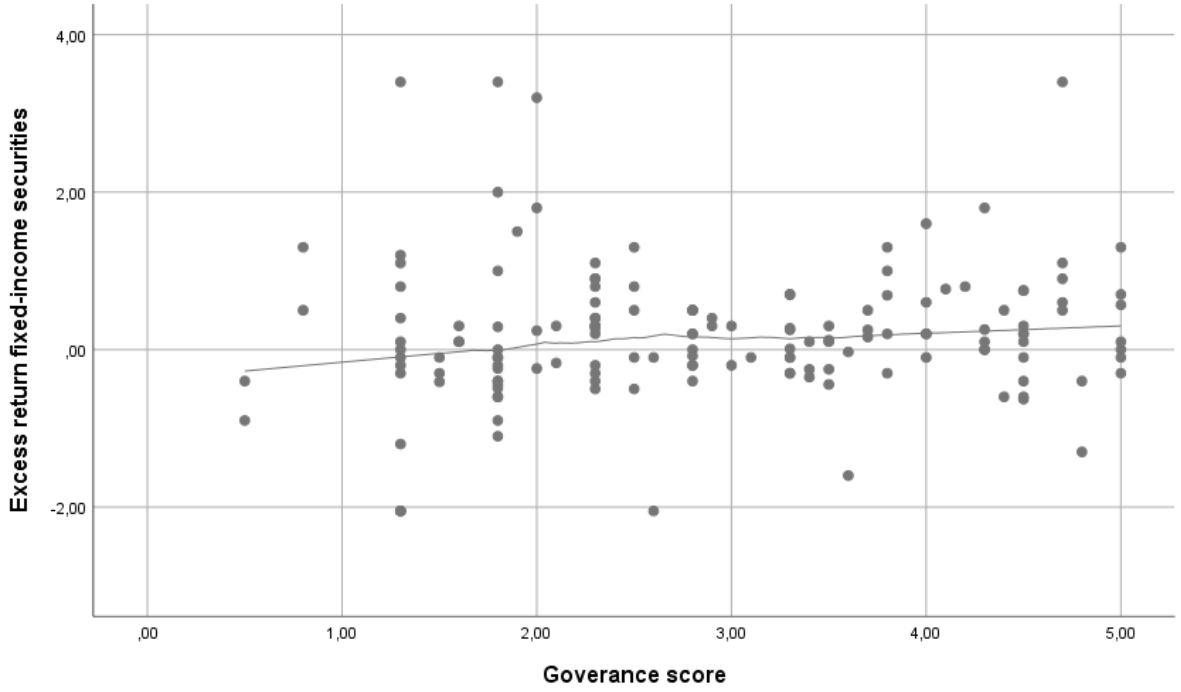

3,00
2,00
1,00
,00
-1,00
-2,00
-3,00
Excess return portfolio
,00
1,00
2,00
3,00
4,00
5,00
Accountability score

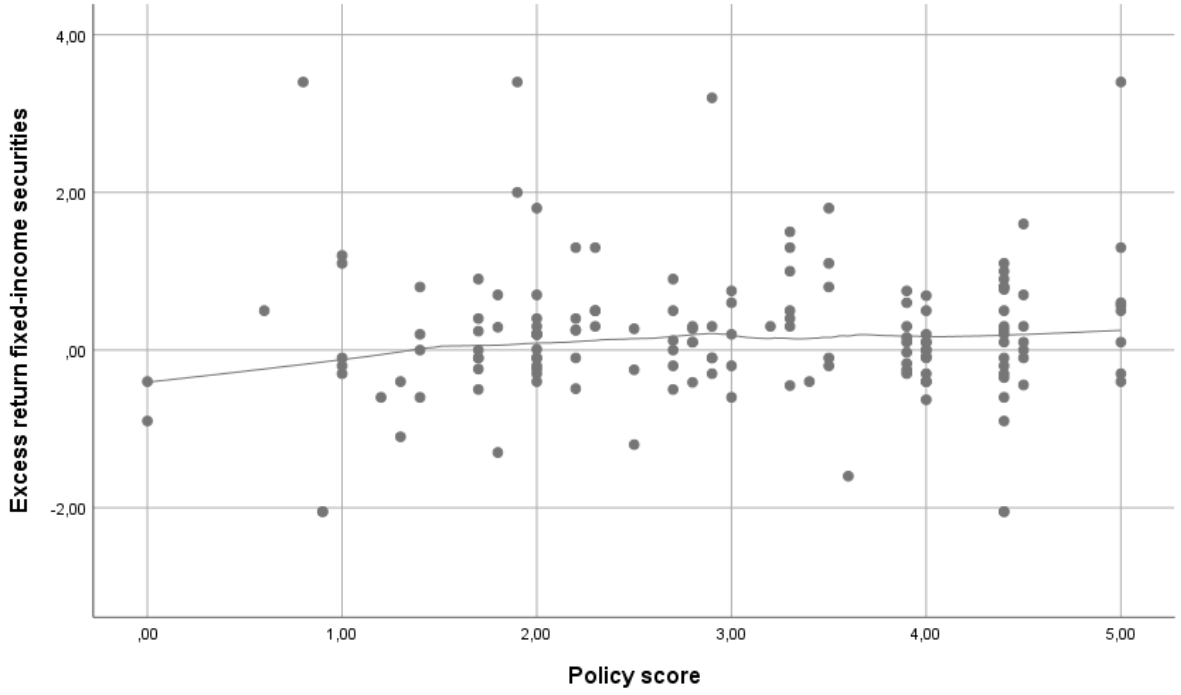

Excess return equity
6,00
4,00
2,00
,00
-2,00
-4,00
,00
1,00
2,00
3,00
4,00
5,00
Goverance score

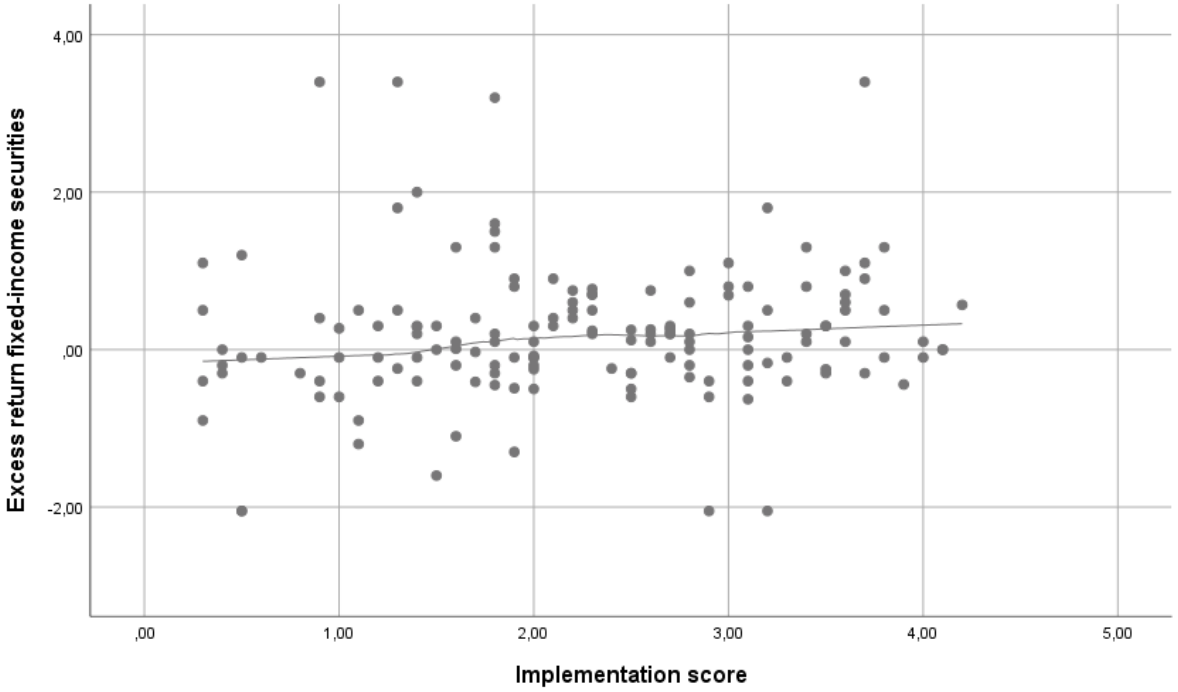

Excess return equity
6,00
4,00
2,00
,00
-2,00
-4,00
,00
1,00
2,00
3,00
4,00
5,00
Policy score

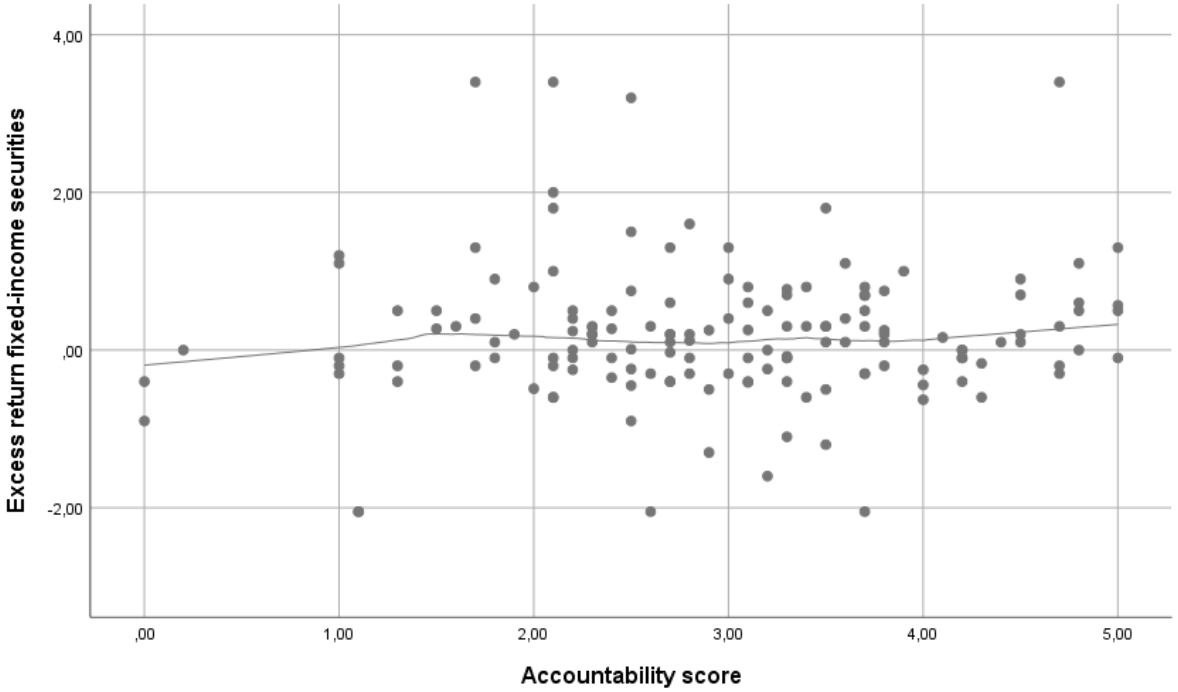

Excess return equity
6,00
4,00
2,00
,00
-2,00
-4,00
,00
1,00
2,00
3,00
4,00
5,00
Implementation score

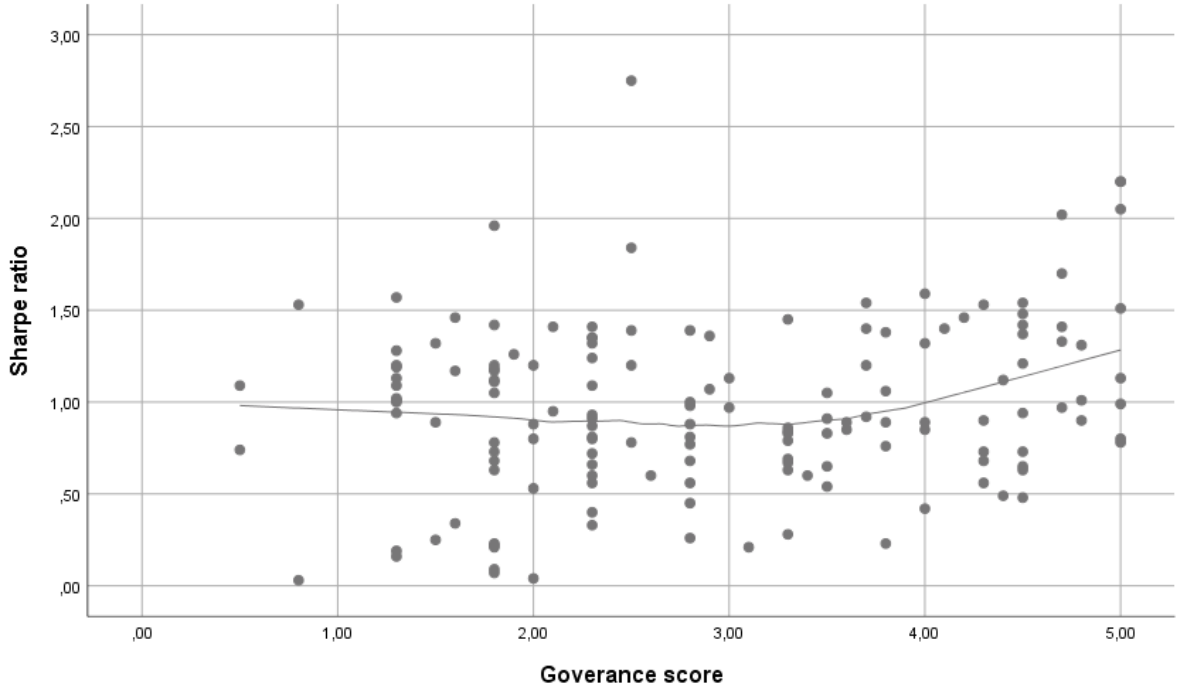

Excess return equity
6,00
4,00
2,00
,00
-2,00
-4,00
,00
1,00
2,00
3,00
4,00
5,00
Accountability score

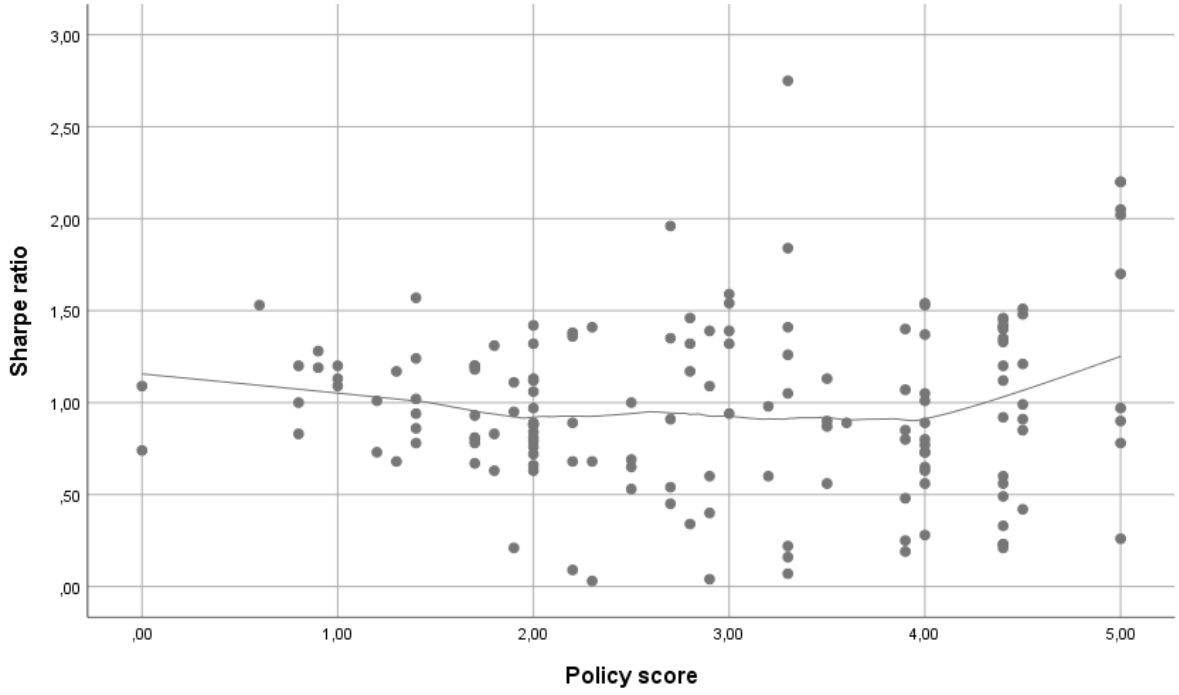

Excess return fixed-income securities
4,00
2,00
,00
-2,00
,00
1,00
2,00
3,00
4,00
5,00
Goverance score

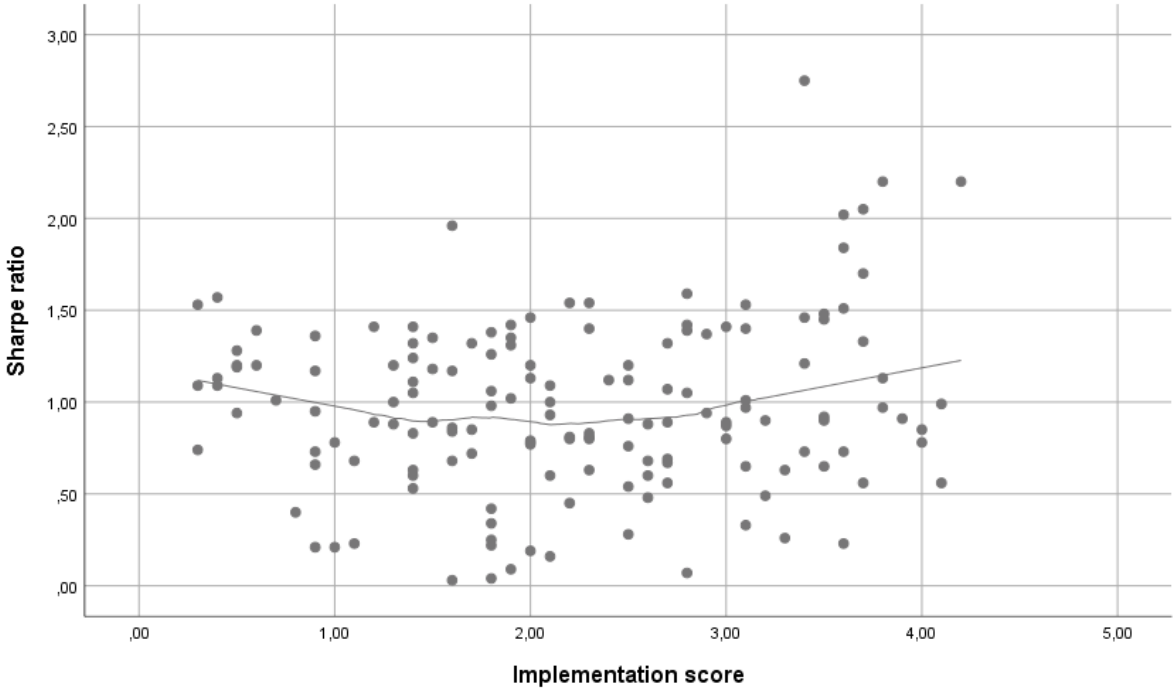

Excess return fixed-income securities
4,00
2,00
,00
-2,00
,00
1,00
2,00
3,00
4,00
5,00
Policy score

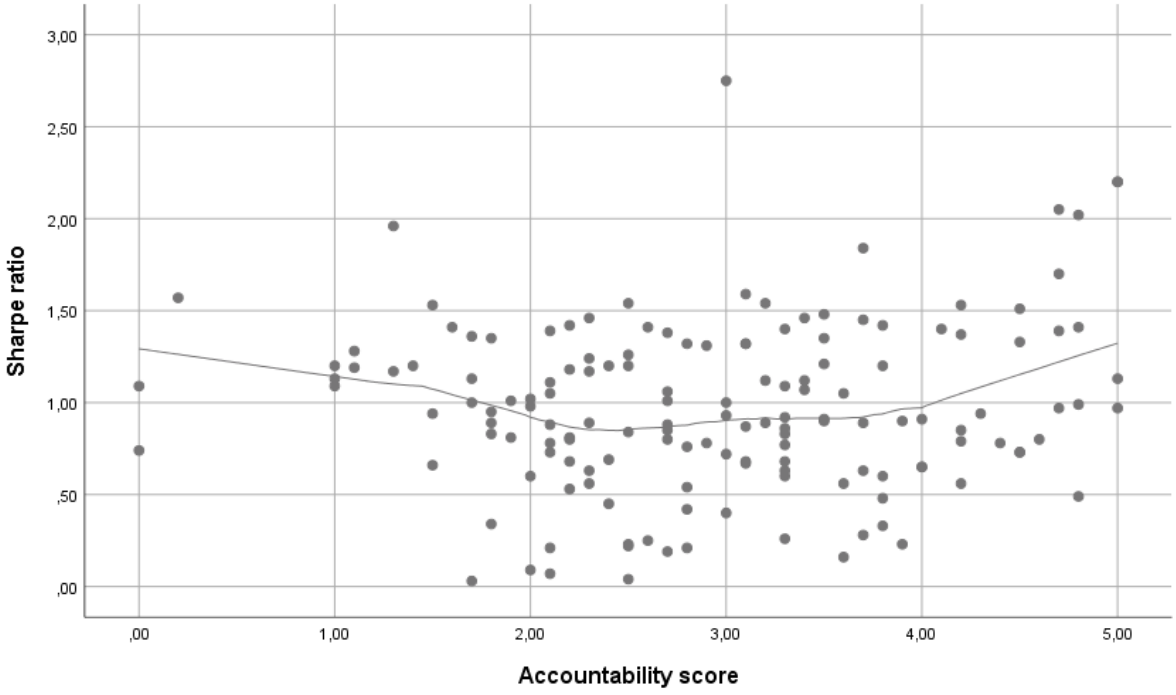

Excess return fixed-income securities
4,00
2,00
,00
-2,00
,00
1,00
2,00
3,00
4,00
5,00
Implementation score


Excess return fixed-income securities
4,00
2,00
,00
-2,00
,00
1,00
2,00
3,00
4,00
5,00
Accountability score


Sharpe ratio
3,00
2,50
2,00
1,50
1,00
,50
,00
,00
1,00
2,00
3,00
4,00
5,00
Goverance score


Sharpe ratio
3,00
2,50
2,00
1,50
1,00
,50
,00
,00
1,00
2,00
3,00
4,00
5,00
Policy score


Sharpe ratio
3,00
2,50
2,00
1,50
1,00
,50
,00
,00
1,00
2,00
3,00
4,00
5,00
Implementation score


Sharpe ratio
3,00
2,50
2,00
1,50
1,00
,50
,00
,00
1,00
2,00
3,00
4,00
5,00
Accountability score

Appendix C – VIF values

Variable	VIF
Governance	2.386
Policy	2.544
Implementation	4.320
Accountability	4.001
RatioAP	1.030
AMCosts	1.135
LN(Size)	1.249

Dependent Variable: Excess return portfolio

Variable	VIF
Governance	2.479
Policy	2.464
Implementation	4.086
Accountability	3.818
RatioAP	1.032
AMCosts	1.117
LN(Size)	1.335

Dependent Variable: Excess return equity

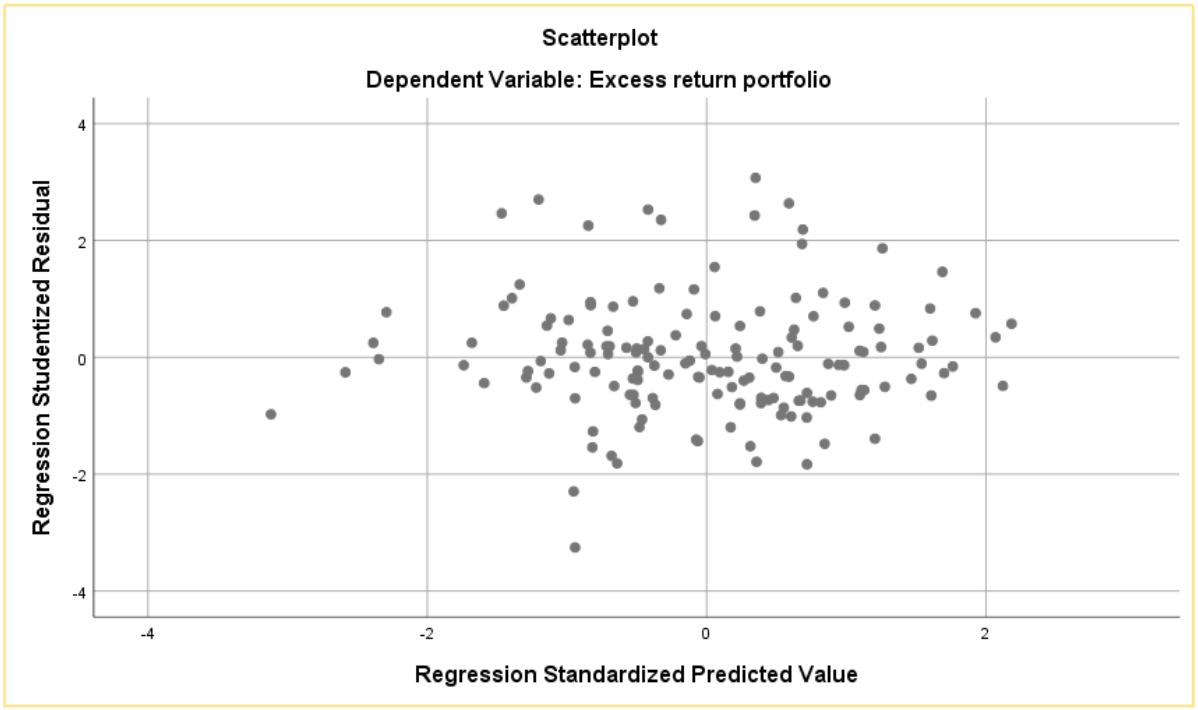
Variable	VIF
Governance	2.449
Policy	2.448
Implementation	4.041
Accountability	3.811
RatioAP	1.030
AMCosts	1.117
LN(Size)	1.350

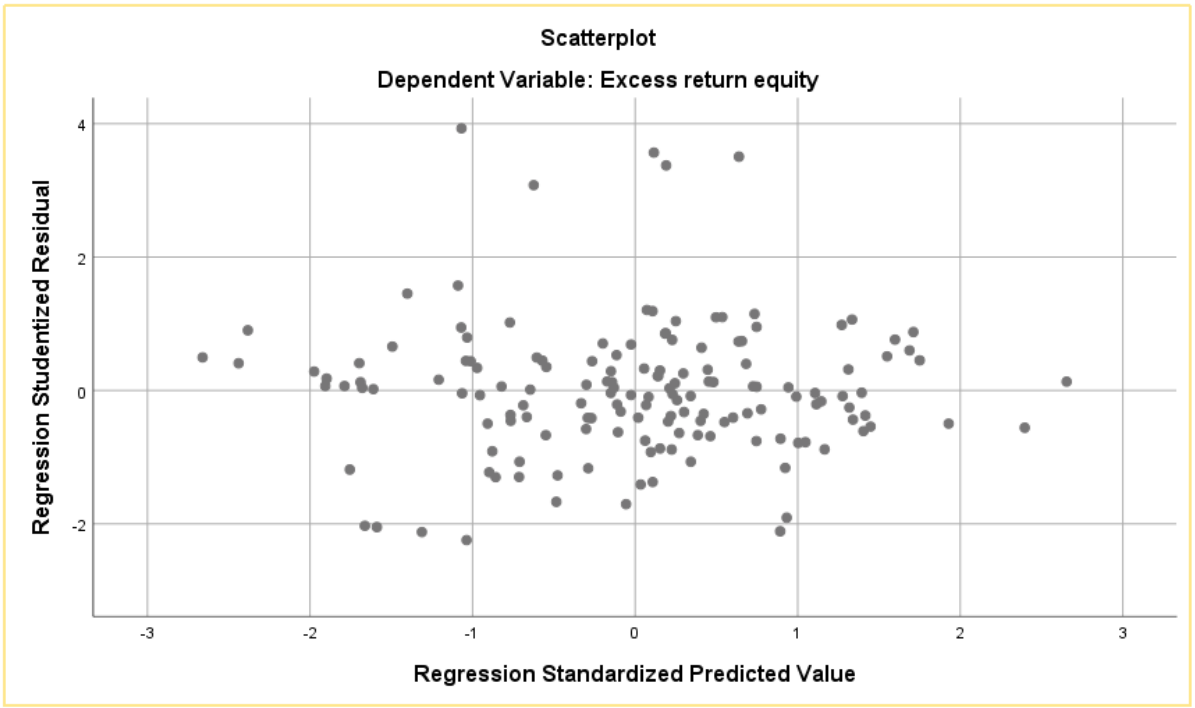
Dependent Variable: Excess return fixed-income securities

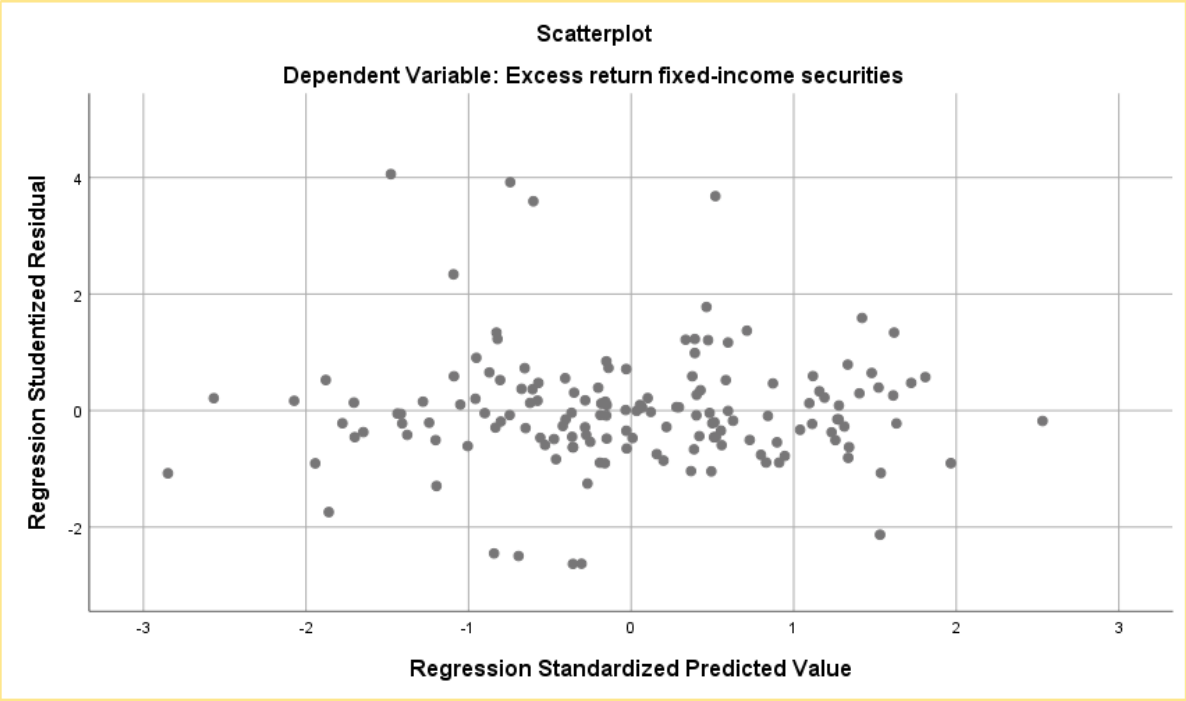
Variable	VIF
Governance	2.814
Policy	2.554
Implementation	4.114
Accountability	4.079
RatioAP	1.037
AMCosts	1.135
LN(Size)	1.247

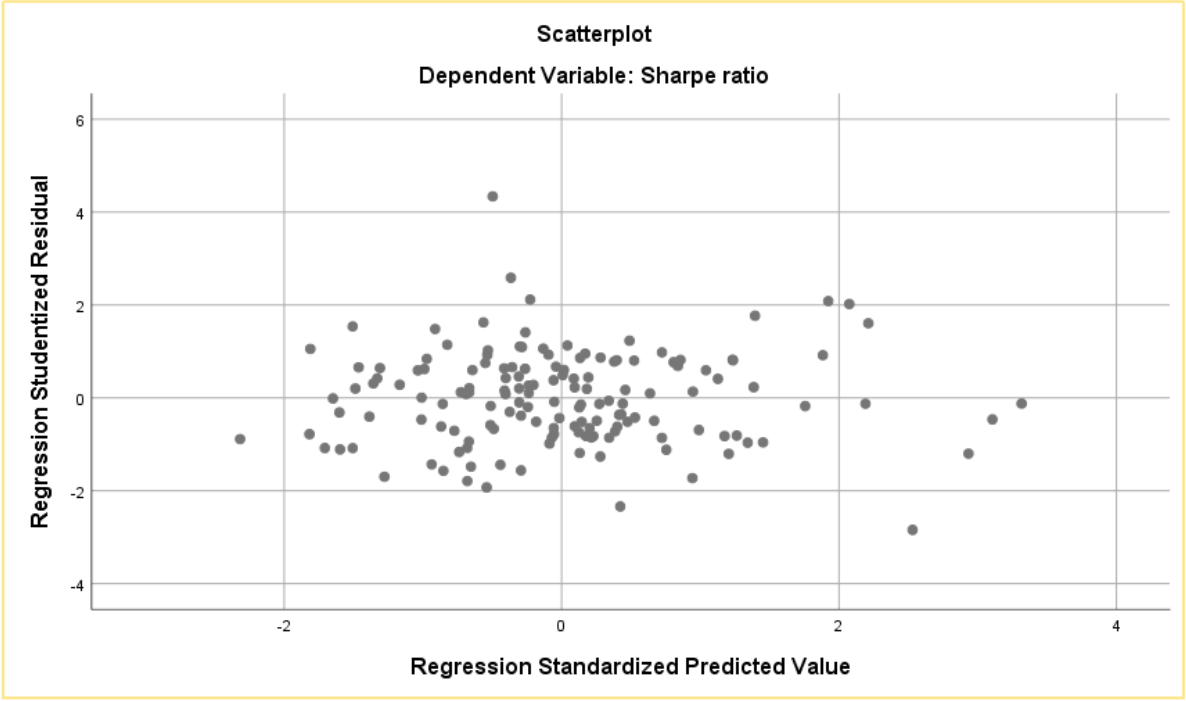
Dependent Variable: Sharpe Ratio

Appendix D – Scatterplots of the residuals

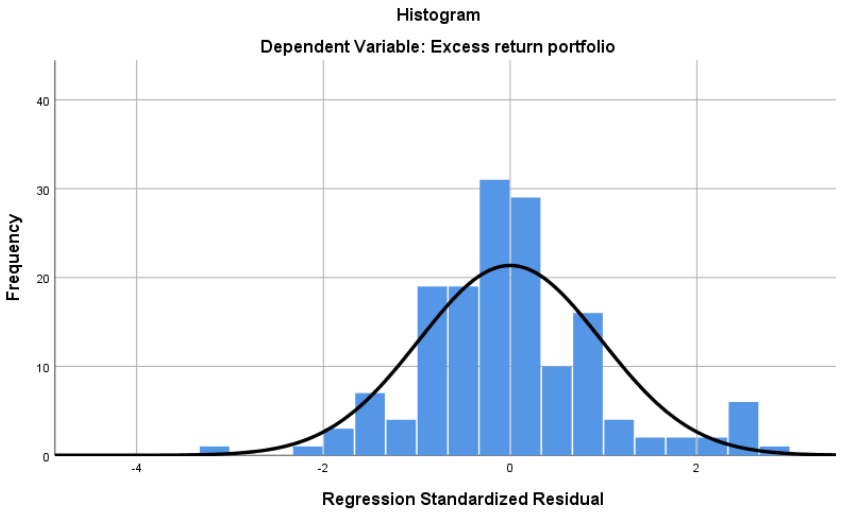


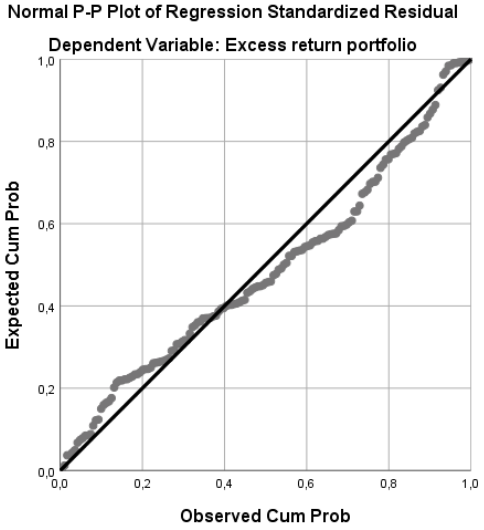


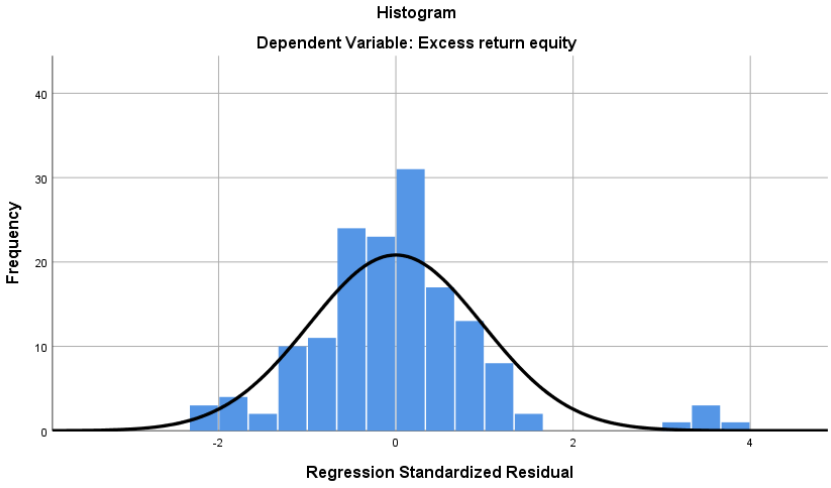

Scatterplot
Dependent Variable: Excess return fixed-income securities
Regression Studentized Residual
Regression Standardized Predicted Value
4
2
0
-2
-3
-2
-1
0
1
2
3

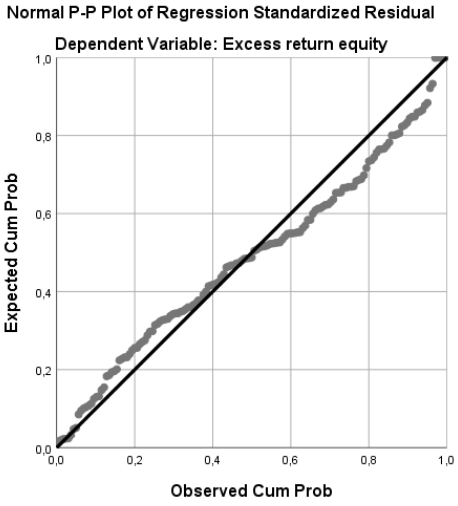

Scatterplot
Dependent Variable: Sharpe ratio
Regression Studentized Residual
Regression Standardized Predicted Value
6
4
2
0
-2
-4
-2
0
2
4

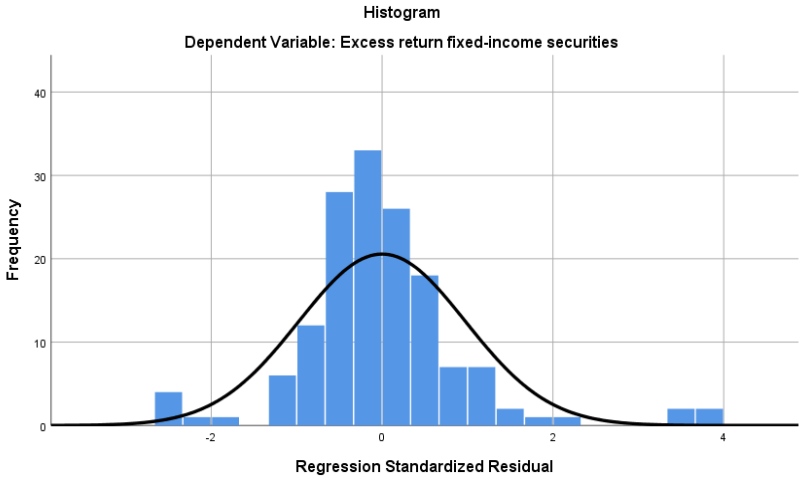
Appendix E - Histograms and P-P plots

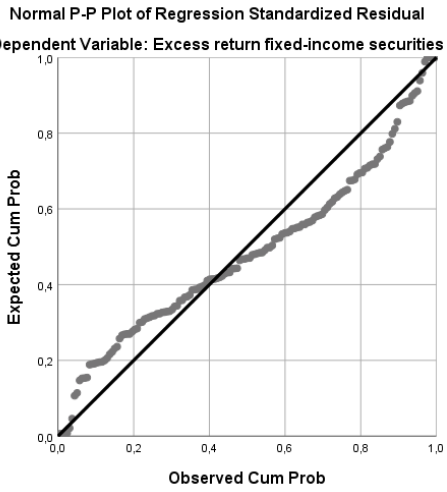


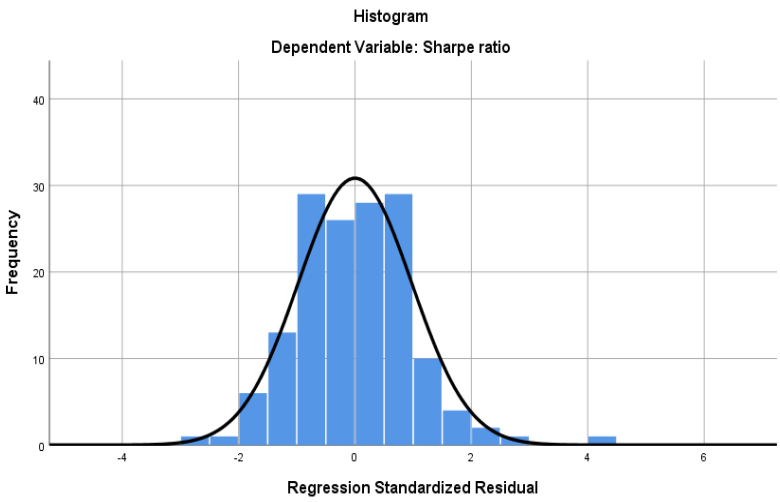


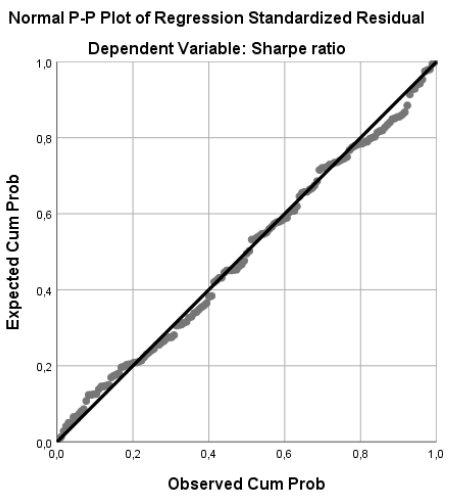









Histogram
Dependent Variable: Sharpe ratio
Frequency
Regression Standardized Residual
40
30
20
10
0
-4
-2
0
2
4
6


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Sharpe ratio
Expected Cum Prob
Observed Cum Prob
1,0
0,8
0,6
0,4
0,2
0,0
0,0
0,2
0,4
0,6
0,8
1,0