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The Norwegian Government Pension Fund Global: "The cost of ethical exclusions"

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Abstract

Our thesis contributes to the literature on SRI by measuring the financial impact of ethical exclusion for the GPFG. We do this by creating a portfolio of excluded companies from the GPFG, and measure its performance against a constructed benchmark. We find that the portfolio of all exclusions has higher cumulative return, and a $ 1 414 648 901 higher total dollar value than benchmark. By splitting the portfolio to one without tobacco companies, and one with only tobacco companies, we find that the portfolio underperforms the benchmark without the tobacco companies. Although we find economical significant evidence for the portfolio of exclusion outperforming the benchmark, we only find statistically significant evidence for the portfolio of tobacco outperforming the benchmark.

1.0 Introduction

The Government Pension Fund Global (GPFG) was set up by the Norwegian government in 1990 to conserve the petroleum revenue, generate high return on its capital and safeguard the wealth for future generations (NBIM website, 2017). The GPFG is managed by the Norges Bank Investment Management (NBIM), on behalf of the Norwegian people. The revenue from the petroleum sector is transferred to the fund, where they are invested in financial assets. The investment objective for the pension fund is to achieve highest possible return with an acceptable level of risk (NBIM, 2016). The ethical guidelines for investment were introduces in 2004, under the premise that the GPFG should reflect the ethical norms of the Norwegian people. The ethical guidelines are used to promote socially responsible investment and provides criteria for observation and exclusion. The GPFG have two potentially conflicting objectives in fulfilling its fiduciary duty to the Norwegian people. It has to generate high earnings on its investment to secure the long-term wealth, and be responsible in its investment to reflect the ethical norms of the Norwegian people. We want to investigate whether pursuing responsible investment strategy harms the financial objective of maximizing profit. More specifically, we want to study the financial cost of ethical exclusion for the GPFG.

Our thesis contributes to the literature of Socially Responsible Investment (SRI). The impact of socially responsible investment on financial performance has been a relevant topic in SRI. However, there are no existing literature on the cost of ethical exclusion for the GPFG, or any funds with similar characteristics. The GPFG is among the largest institutional funds to integrate responsible investment into their investment strategy. The website for NBIM (2017) states that the GPFG has long investment-horizon, limited liquidity need.
These factors distinguish the GPFG from most funds, and thus presents a great opportunity to study the impact of ethical exclusion for a fund of GPFG's characteristics. Our motivation is to find out whether the responsible investment approach has cost the Norwegian people money.

We want to measure the financial impact of ethical exclusion by creating portfolio of excluded companies, and measure its performance against a constructed

benchmark. This portfolio will be basis for our analysis of ethical exclusion. The purpose is to analyze the performance of the excluded companies from the time of exclusion, to the end of 2016. We find that the tobacco industry represents a significant part of the excluded companies since 2009. In order to measure its impact on the overall performance of the portfolio of exclusion, we split it into two separate portfolios. One portfolio without the tobacco companies, and one portfolio with only tobacco companies. A reference benchmark portfolio is created for each portfolio. We compare the portfolios to the specific benchmarks by calculating the risk-adjusted return, cumulative return and the difference in dollar value.

Our investigation find that the portfolio of all excluded companies has higher cumulative return and risk-adjusted performance measures than its benchmark. The cumulative return for the portfolio is 109,77 %, while the benchmark achieves 63,66 %. The difference in dollar value between the portfolio and benchmark is $1 414 648 901. We also find that the tobacco companies have a significant influence on the outperformance, as the cumulative return falls to 56,02 %, and the total dollar value is $ 450 726 721 lower than benchmark when we remove the tobacco companies from the portfolio. The portfolio of tobacco companies has the highest cumulative return and risk-adjusted performance measures. The jensen's alpha calculation resulted in positive, but insignificant alphas for the portfolio of all exclusions and portfolio without tobacco companies. Thus, we find economical but not statistically conclusive evidence that ethical exclusion has cost the GPFG. The portfolio of tobacco companies has statistically significant alpha, and we can conclude that excluding tobacco companies have hurt the financial performance of the GPFG.

The remainder of the thesis is organized as follows. Section 2 provides more information about the concept of socially responsible investment and ethical exclusion, to serve as the background for our research. Section 3 reviews the literature regarding SRI-funds and performance of "sinners". Section 4 presents the theory and hypothesis. Section 5 presents the methodology we used in our research. Section 6 discusses the data collection. Section 7 presents the results. Section 8 concludes our research.

2.0 Background

Principles for Responsible Investment (PRI) website defines Responsible investment (SRI) as an investment approach that incorporates environmental, social and governance (ESG) factors into investment decisions. The ESG factors are used as criteria for measuring sustainability and ethical impact of investment decisions. In doing so, we distinguish between positive and negative externalities. The IMF website (2017) defines externalities as the large effects of consumption, production and investments of individuals and firms that affect all stakeholders. An example of negative externality is pollution. Firms that pollute may have higher financial return through cost savings, but the outcome of their operation harm stakeholders that are not directly involved with the firm. In this case, the neighboring communities. The EGS factors are used to exclude firms that generate negative externalities, such as pollution, human right violations and corruption. The goal with SRI is to pursue both financial and social objectives. The GPFG integrates responsible investment into its investment strategy.

There are several methods used to practice responsible investment. Among the main tools used by the GPFG are active ownership and investment screen. GPFG practice active ownership by using their voting rights "to safeguard the fund's investment, and promote sustainable development and good corporate governance" (GPFG Responsible Investment, 2016 page 9). CalPERS is among the most successful funds in this field, and is touted as the leading examples of active ownership. The investment screens consist of negative and positive screen. Renneboog, Horst and Zhang (2008a) defines negative screening as a practice that exclude specific stocks and industries based on social, environmental and ethical criteria. Positive screening is defined as selecting stocks that meet superior corporate social responsibility (CSR) standards, to include in the portfolio. GPFG practice negative screening through ethical exclusion.

The GPFG employ observation and ethical exclusion as a tool for being socially responsible, and act in accordance to the ethical guidelines. Norges Bank makes the decision to exclude companies based on the advice from the Council on Ethics. The website for etikkraadet (2017) states that The Council on Ethics evaluates whether the fund's investment in companies are inconsistent with the ethical guidelines, and comes with a recommendation for exclusion.

The ethical guidelines provide product-based and conduct-based criteria for observation and exclusion. Companies that violates the criteria, either directly or through entities they control, will be investigated. Product-based criteria states that GPFG should not invest in companies that produces tobacco, weapons that violates fundamental humanitarian principles through their normal use and companies that sell military equipment to states that are under restrictions . Mining and power producers that derive a large portion of its income from thermal coal have later been included in the guidelines. Conduct-based criteria is used to exclude companies that contribute to or are responsible for gross corruption, environmental damage, human right violation and other form of violation of fundamental ethical norm (Finansdepartementet, 2017)

3.0 Literature review

There are no existing literature related to the cost of ethical exclusion for the GPFG, or other funds with similar characteristics. However, the literature on the concept and the cost/benefit of SRI is relevant to our study. The excluded companies and industries based on SRI are often considered "sinners", as their business produce negative externalities. The performance of the sinners is of large importance to our study, given the potential cost/benefit of excluding them for the GPFG. The opposite of "sinners" are considered "saints". These are the firms that produce positive externalities. In this section, we will review and summarize the results for the literature on the performance of SRI funds and the performance of "sinners" and "saints". We start by presenting relevant theories from articles and critical reviews on SRI, and then proceed to review and summarize the articles that study the performance of SRI funds and "sin" stocks.

Renneboog, Horst and Zhang (2008a) wrote a literature review on SRI. We focus on their review of the firm-level analysis of SRI. They find that a central question in the literature is, should the firm aim to maximize shareholder value or social value. Shareholder value is maximized through profits. Social value is measured through net externalities. Firms that practice corporate social responsibility (CSR) will try to increase social value by generating positive externality. (Renneboog et al, 2008) finds different theories regarding the potential tradeoff. Some authors argue that firms that focus on CSR might have sub-optimal financial performance,

and may not survive in a competitive market. On the literature in support of CSR, they find that reducing potential conflict between the firm and stakeholders will benefit the firms by reducing the cost of conflicts. One example is corporations that pollute may hurt the shareholders in the future, through new regulations and potential litigation costs. Robert D. Klaasen and Curtis P. Mclaughlin (1996) found that environmental management was related to financial performance. By using an event study, they found significant positive abnormal return for positive environmental events like awards. They also found a correspondingly negative abnormal return for environmental crisis, such as spills. Focusing on social value can thus maximize the shareholder value in the long run.

Bauer, Koedijk and Otten (2005) analyzes the performance of SRI funds, and compare them to the conventional mutual funds. They extend on earlier literature by investigating the investment styles of SRI funds, and control for the size, book-to-market and momentum factors using the Carhart 4-factor model. They use a sample of ethical funds from US, UK and Germany, and compare them to a sample of conventional funds with matching size and age characteristics. Their paper found no statistically significant differences in risk-adjusted return between the ethical funds and conventional funds after controlling for investment style.

Renneboog, Horst and Zhang (2008b) also studied the performance of SRI funds in comparison to conventional funds. Among their main contributions to the literature are the larger dataset of SRI funds from all over the world, and the influence of screening intensity and criteria on the risk-adjusted returns. They present two alternative hypothesis, the first is that SRI funds underperforms conventional funds, and higher screening intensity reduces the performance of SRI funds. The second is that SRI funds outperforms conventional funds, and higher screening intensity enhances the performance. Among the variables used for measuring screening activity are SRI status, activism policy, community involvement. They also measure screening intensity with number of ethical, sin and environmental screens. Their research find that the SRI funds underperforms domestic benchmarks in many countries, but do not find statistically significant negative alphas in most countries when they are measured against conventional fund, except in France, Ireland, Sweden and Japan. They also find that screening

intensity affect the risk-adjusted returns. With all else equal, one additional screen results in 1 % lower 4-factor risk-adjusted per annum for the fund.

Hong and Kacperczyk (2009) studied the effect of social norms on market by analyzing the performance of "sin" stocks. They hypothesized that norm-constrained investors that abstain from investing in sin stocks pay a financial cost. Among the reasons are potential litigation cost. The sin stocks in their sample consist of companies in the gaming, tobacco and alcohol industry, collectively known as the "Triumvirate of Sin". A time-series regression is used to analyze the prices and returns on a portfolio that long sin stocks and short their comparables after adjusting for predictors of stock return, using the period of 1965 - 2006. The comparable stocks are collected from the industry groups meals and hotel, soda, fun and food. The first regression estimate use CAPM and get an alpha of 25 bps per month, and is statistically significant at 10 % level. The two factor and three factor model with SMB and HML gives an alpha of 30 and 26 bps per month respectively, both significant at 5 % level. The last model with MOM gives 26 bps per month with a significance at the 5 % level.

Durand, Koh and Limkriangkrai (2013) continues from HK by further investigating whether social norms can act as incentives rather than sanctions. The comparables used in Hong and Kacperczyk (2009) are not specifically considered ethical, but rather natural comparables to the sin stocks. In order to see if social norms can provide incentives to pursue activities that are considered virtuous, they identify stocks that are considered saints to compare them to the sin stocks. The saint stocks in their analysis are companies from the MSCI KLD400 Social Index. The purpose is to find any contrasting properties between saints and sinners. They also run a run a time-series regression. They start by performing the same regression as HK that long sin stocks and short comparables stocks, but they slightly modify the comparables group by removing the saint stocks from the portfolio. The alphas were significant in all cases except with the four-factor model, thus confirming the findings from Hong and Kacperczyk (2009). To examine the performance of saints, they change the long portfolio from sinners to saints, and short the comparables. Although the sin stocks positive risk-adjusted returns, they did not find any correspondingly negative risk-adjusted returns for the saint stocks.

4.0 Theory and hypothesis

The GPFG started to implement ethical guidelines in 2004, and the first exclusion wave occurred in 2005 with companies like Northrup Grumman and Boeing. The guidelines have since been updated to include other determinants for exclusion such as pollution. The increased attention to ethical norms in financial investment has led to a large number of firms being excluded from the GPFG. Exclusion based on social norms rather than financial rationalization can have a significant impact on the GPFG's returns. GPFG are among the first large institutional long-term investors to integrate an ethical guideline in its management. Most socially responsible funds are mutual funds and pension funds that differ from the GPFG in size and investment horizon. This presents a great opportunity to examine the effect of socially responsible investment for a fund of GPFG's characteristics.

As presented in section 2 and 3, there are different theories regarding the impact of responsible investment. Hong and Kapcernyk (2009) found that "sin" stocks outperformed their comparable stocks in their study. Tobacco was among the main constituents in their study, and it represents a significant part of the excluded companies for the GPFG. We also found that responsible investment can benefit the fund in the long run by reducing the cost of conflicts, especially in the environmental criteria. These are the issues we want to investigate in relation to the GPFG. In this thesis, we will solely focus on the financial impact of ethical exclusion, and not the social impact or a combination of both. The question we attempt to answer is the following:

Problem definition: What is the financial impact of ethical exclusion for the GPFG?

We want to find out whether the ethical exclusion has cost the GPFG, and the Norwegian people, higher returns on its investment. We come up with the following hypothesis.

Hypothesis:

H_0: Ethical exclusion has not cost the GPFG.

$H_{A:}$ Ethical exclusion has cost the GPFG.

5.0 Methodology

5.1 Main

This section will explain how we attempt to measure the financial impact of ethical exclusion. We start by briefly explaining the methodology for our research, before going in depth on how it set up in the sub-sections.

In order to measure the financial impact, we examine the performance of the excluded companies since the exclusion from the GPFG. We do this by creating three portfolios to use in our research. The first portfolio will include all excluded companies from the GPFG since the first exclusion wave in 2005. This will be the main portfolio used to determine the cost of ethical exclusion for GPFG. Given the large weight of tobacco companies in our sample, we split the portfolio into two separate portfolios. One without the tobacco companies, and one with only tobacco companies. We measure the performance of the portfolios separately. To analyze the performance of the portfolios, we construct a suitable benchmark to match the characteristics of the individual portfolios. We will also include the GPFG Equity portfolio in our analysis. The performance metrics we use follow the Global Investment Performance Standards (GIPS), used by the GPFG. GIPS are voluntary standard that are based on fundamental principles for full disclosure and fair representation of investment performance (CFA Institute, 2010). We will also perform a regression analysis to get more insight about the relationship between the portfolio and the benchmark and GPFG equity portfolio. We decompose the risk to distinguish between the systematic and unsystematic risk. We include a moving average analysis to track the movements of the portfolios during the sample period.

5.2 Portfolio and benchmark construction

To construct the portfolio of excluded companies, we will look at dollar value of total holdings by NBIM in excluded companies and the date of exclusion announcements. Since we do not have the exact exclusion dates, we add excluded companies to the portfolio one full quarter prior to announcement dates, at the end of the month. Total holdings in companies are reported by NBIM at the end of the year on 31 December. We adjust the initial holdings amount with total return of the company during the period between 31 December and the inclusion date. For

example, if company ABC's exclusion is announced on August 2005, we will add it to the portfolio at the end of March 2005 with the dollar amount reported in total holdings by NBIM as of 31 December 2004, adjusted for three month returns. When a new exclusion is announced, we will add it in similar manner to the portfolio and rebalance weights after new exclusions.

The following equations will be used to calculate total return of the portfolio in each month:

$$r_p = \sum_{i=1}^{n} w_i \, r_i$$

where r_p is return on the portfolio of excluded companies, w_i and r_i is weight and return respectively on excluded company *i.*

We will construct all-cap and large-cap comparison benchmarks in similar manner as we described above. To construct the benchmarks, we use FTSE country specific equity indices of the countries to which the excluded companies belong. We choose FTSE indices since NBIM reports in their annual return and risk report 2016 that they use FTSE global all-cap index as their main reference on equity . The constructed benchmarks will represent the equity market in those countries. When we add an excluded company to the portfolio, we add the FTSE all-cap index of the company's country origin to the benchmark portfolio. If we add a British company to the portfolio, we add the FTSE UK All-Cap to the benchmark portfolio. We add the same dollar amount adjusted for the return of the FTSE country index between the date of reported holdings and inclusion. We will approach in similar manner when we construct large-cap benchmark.

5.3 Total dollar value

The invested dollar amount of the individual company will change with the company's returns for the following months. The total dollar value for the portfolio will be the sum of the dollar values of each company in the portfolio. The benchmark indices will follow the same procedure, and the total benchmark portfolio value will be the sum of the dollar value of each FTSE index.

We will then proceed to calculate the difference in total dollar value of the portfolio and benchmark at the end of the sample period, which is 31 December 2016. We take the total value of portfolio, and subtract it by the total value of benchmark. The difference will reflect the potential loss/gain of ethical exclusion for the GPFG. If the portfolio value is higher than benchmark, the difference will be the financial cost of excluding the companies in the portfolio for the GPFG. If the portfolio value is lower than benchmark, the GPFG will financially benefit from excluding the companies in the portfolio.

5.4 Performance metrics

The calculations for performance metrics will be explained in three sub-sections. The basis for our analysis in this section will be the cumulative return and the risk-adjusted performance measures. We follow the GIPS standard used by the GPFG.

5.4.1 Arithmetic average and standard deviation:

We calculate the arithmetic average return and the standard deviation of the portfolios. The calculations are reported on an annualized basis. This provides a general impression of how the portfolios have performed during the sample period, and provide input for the risk-adjusted return calculation.

5.4.2 Cumulative return

To calculate the cumulative return of the companies, we adopt the methodology from GIPS used by the GPFG. GIPS requires that the portfolios use time-weighted rate of return (CFA Institute, 2012). The time-weighted return (TWR) is used to eliminate the effect of external flows of capital. The portfolio gets an inflow of capital at the time of each exclusion wave for the GPFG. The weights and composition of stocks in the portfolio changes with every inclusion of new companies. We use the weighted average of asset returns to calculate the return of the portfolio for each period. We also calculate the monthly holding period return of assets by controlling for cash flows to ensure that the portfolio returns are accurate. We use the same methodology to calculate the time-weighted return for benchmark. Time-weighted return, as the name implies, put appropriate weights according to the duration of the sub-period. In our case, all returns will receive

equal weights to reflect the monthly frequency of our data. The time-weighted return assumes that all cash distribution is reinvested into the portfolio. The returns are geometrically linked to calculate the cumulative return, using the following equation:

$$TWR = \left[\prod_{i=1}^{n}(1 + r_i)\right] - 1$$

The value calculated will show how much the cumulated return of the portfolio during the sample period. The annualized absolute return (AR) is calculated using the annualized geometrical mean return. Since we have over 12 monthly observations, we use the following equation to calculate the annualized geometric mean return.

$$AR = \left[(1 + TWR)^{\frac{12}{n}}\right] - 1$$

n is the number of monthly returns in our sample. In the portfolio of exclusions, we use 141 monthly observations to calculate the cumulative return. To calculate the annualized return, we take (1+ TWR) to the power of (12/141). The annualized geometric mean return often differs from the arithmetic average because it considers the effect of compounding. Larger fluctuations result in higher discrepancy between the arithmetic and geometric mean (Bodie, Z., Kane, A., & Marcus, A. J. 2014). Although the arithmetic average is considered a good estimate for future predictions, the geometric mean presents a more realistic measure of historical portfolio performance

5.4.3 Risk-adjusted return measures

We use the Sharpe ratio, M^2 and Jensen's alpha as our risk-adjusted performance measures. The Sharpe ratio is among the most common performance measures for risk-adjusted return, and was developed by William F. Sharpe in 1966. We use Sharpe ratio to measure the risk-reward tradeoff of the portfolios. The Sharpe ratio is calculated by dividing the excess return over to total volatility of the portfolio. We follow the same formula used by the GPFG in their reporting (NBIM, 2010).

The excess return is the arithmetic average return of the portfolio subtracted by the risk-free rate. We use the annualized rate of the 3-month US treasury bills as a proxy for the risk-free rate. The total volatility is the standard deviation of the portfolio. The calculated Sharpe ratio is the excess return per unit of risk.

$$SR = \frac{\bar{r}_p - \bar{r}_f}{\sigma_p}$$

The portfolio with the highest Sharpe ratio has the higher risk-adjusted return. However, the numerical value of the difference in ratio is difficult to interpret. This issue is solved by using M^2. The M^2 measure is derived from the Sharpe ratio, as it measures the return over the total risk of the portfolio. It is set up by creating an adjusted portfolio with positions in the managed portfolio and T-bills to match the volatility of the benchmark. We use a slightly altered version of the M^2 measure by using the GPFG fixed income portfolio as the quasi risk-free asset. The adjusted portfolio will be a composite of the portfolio and GPFG fixed income portfolio. We create an adjusted portfolio to match the volatility of GPFG equity and benchmark, with the purpose of finding the difference in return for the same unit of total risk.

We use the solver function in excel to find the appropriate weights in the adjusted portfolio that yields the same standard deviation as the benchmark and GPFG equity. The return of the adjusted portfolio is calculated as the weighted average of the returns from the portfolio and GPFG fixed income portfolio. The advantage of the M^2 measure is that the numerical value of difference is more intuitive. The M^2 is calculated by subtracting the annualized mean return of the adjusted portfolio from the benchmark, using the following equation:

$$M_p^2 = r_{p^*} - r_b$$

Where the r_{p^*} is the total return of the adjusted portfolio, and r_b is the return of benchmark or GPFG Equity. The M^2 will provide a numerical value of how much the portfolio outperforms/underperforms the benchmark given the same unit of risk.

Jensen's alpha measures the performance of the portfolio relative to a market index (Brooks, 2014). It is a risk-adjusted performance measure that represents the average return on a portfolio above or below that predicted by the capital asset pricing model (CAPM). The equation of Jensen's alpha is:

$$\alpha_p = \overline{r}_p - \left[\overline{r}_f + \beta_p\left(\overline{r}_m - \overline{r}_f\right)\right]$$

where $\overline{r}_p$ is realized annual return of the portfolio, $\overline{r}_m$ is the realized annual return of the benchmark, $\overline{r}_f$ is the annual risk-free rate of return, β_p is the beta coefficient of the portfolio with respect to constructed market index. The equation in the brackets on the right-hand side is the CAPM. To estimate the alpha, we use the constructed benchmark as a proxy for the market index and the equation above is rearranged to following equation:

$$R_{p,t} - R_{f,t} = \alpha_p^j + \beta\left(R_{m,t} - R_{f,t}\right) + u_{p,t}$$

Where $R_{p,t}$ is return on portfolio over time, $R_{m,t}$ is return on benchmark portfolio over time, $R_{f,t}$ is the risk-free rate, β is the OLS estimate of the slope coefficient in the CAPM and $u_{p,t}$ is the disturbance term. Jensen's alpha measured on a monthly level is the OLS estimate of the alpha in the regression above, that being α_p^j.

A positive alpha indicates that the portfolio has outperformed the benchmark, and negative alpha indicates underperformance. A 95 percent confidence interval around the alpha will be constructed using the OLS standard error of the intercept in the regression.

5.5 Regression

To have further insight on relation with the market and the portfolio of excluded companies, we will perform regression analysis. We will run a regressions model using OLS estimation, where we regress returns on the portfolio on the benchmark portfolio and GPFG equity portfolio separately. The following equation will be used in regression:

$$y_t = \alpha + \beta\chi_t + \varepsilon_t$$

where y_t is returns on portfolio of excluded companies, χ_t is the return on GPFG equity portfolio or benchmark portfolios. α is the intercept, β is the slope coefficient and ε_t is the residual.

The beta coefficient explains the portfolio's sensitivity to movements in the benchmarks. It is calculated by using the following equation, with the r_b and r_p denoting the benchmark return and portfolio return respectively.

$$\beta = \frac{COV(r_p, r_B)}{VAR(r_B)}$$

A beta of 1 indicates that the portfolio moves in the same direction and has the same volatility as the benchmark. A beta over 1 will indicate that the portfolio is more sensitive to the benchmark, while a beta of under 1 indicates less sensitivity.

To determine the significance of the regression, we will perform t-test. T-test evaluates how significant the estimated coefficient is on chosen levels. The p-value must be lower than desired significance level to reject the null hypothesis of that coefficient being zero. (i.e. the coefficient has no effect on the dependent variable).

By estimating the regressions, we will be able to evaluate the degree to which our portfolio is explained by movements in returns of GPFG equity and benchmark portfolios. Return on the portfolio, as it is with other securities, will be dependent on nonsystematic risk, the residual ε_t. Thus, it is necessary to be specific about how the residuals are generated to test for regression validity. We will perform tests on the residuals, which are described below.

The first test we will run is the White's general test for heteroscedasticity. To test if there is autocorrelation in the residuals we will perform Breusch-Godfrey serial autocorrelation LM test with 12 lags since we have monthly data (Brooks, 2014). Lastly, to test for normality we will perform Bera-Jarque test. Presence of heteroscedasticity and autocorrelations in the residuals can lead to wrong

estimates of the standard errors (Brooks, 2014) and thus, wrong inferences can be made about whether a coefficient is significant or not.

5.5.1 Risk decomposition

Performance of the portfolio's excess return depends on two components, impact of market movements and movements independent of the market. (Litterman, 2003). To evaluate the degree to which the portfolio's risk is related to the market index, we will decompose the risk components. First, we run the following regression:

$$R_p - R_f = \alpha_p + \beta_p(R_m - R_f) + \varepsilon_p$$

Where $(R_p - R_f)$ is the excess return of the portfolio of excluded companies, $(R_m - R_f)$ is the excess return of the market index. The long-run expected return is measured by the term α_p and the exposure to the market index is β_p. Unexplained movements are captured by the residual, ε_p. The equation above describes the linear dependence of portfolio's excess return on changes in the market, represented by the excess returns of constructed benchmark portfolios. Total risk of the portfolio is obtained by the following equation:

$$\sigma_p = \sqrt{\beta_p^2 \sigma_M^2 + \sigma^2(e_p)}$$

Where σ_p is the total risk of portfolio of excluded companies, β_p is the exposure to the market index, σ_M is the volatility of the market index and $\sigma(e_p)$ is the volatility of the residual. (Litterman, 2003). The systematic risk component of the portfolio depends on its exposure to the market and the volatility in the market, which is captured by $\beta_p^2 \sigma_M^2$. The risk component unrelated to the market movements is explained by the volatility of the residual, $\sigma^2(e_p)$.

5.6 Rolling average

To evaluate the overall movements in our portfolio, constructed benchmarks and GPFG equity portfolio, we will look at the 24-month rolling averages in returns and standard deviations of the portfolios. We will simply calculate the average of the past 24 observations in standard deviations and returns. The average is

recomputed each month by dropping the oldest observation and adding the newest. We use the rolling average graph to track the movements of the portfolios. A simple rolling average levels out volatility and makes it easier to view the trend on a graph and thus, we will be able to identify if the portfolio is in an uptrend or downtrend relatively to benchmarks and GPFG equity portfolio.

6.0 Data

We collect monthly total return for the companies excluded from the fund in the period 1 January 2005 until 31 December 2015 from DataStream and calculate simple returns. The list of excluded companies and exclusion announcements are published by NBIM on their website.

Total return index tracks both the capital gains of a security and assumes that any cash distributions such as dividends are reinvested back into the security. Total return indexes are converted to common currency by DataStream, which is USD in our case. In total, there are 48 excluded companies in our sample. A list of the 48 companies that have been excluded from the fund is presented on appendix 1.

A criterion we use for including the excluded companies in our portfolio, is that they have returns for at least one year after the exclusion. A large exclusion wave occurred throughout 2016, with 66 companies being excluded, but we do not have a full year return for the companies after exclusion. Another criterion is that NBIM provides holdings record of excluded companies to include the company in our portfolio. Our sample period begins one full quarter prior to the first announcement of exclusion of the companies in our sample and ends one full year after last exclusion. Therefore, our sample period begins 31 March 2005 and ends 31 December 2016.

The benchmarks are constructed by collecting total return indexes of FTSE all-cap and large-cap equity indices of the countries which excluded companies belong. Except for Peru, Czech Republic, Russia, Malaysia, India and Indonesia where only FTSE all-cap equity indices were available on DataStream. A list of the countries is found in appendix 3. As risk-free rate, we collect 3-month US Treasury bill from DataStream.

NBIM publishes historical record of returns on the GPFG which is updated every quarter of the year and can be collected from their website. Returns are reported monthly in basket currency, Norwegian Kroner and United States Dollar. Government pension fund global equity fund's monthly returns are reported separately in USD, as well as their fixed income portfolio. We collect monthly dollar returns on equity fund from NBIM's website.

6.1 Problems in our data

There are limited data on reported holdings of excluded companies by NBIM which limits our sample to 48 companies. Excluded companies which NBIM doesn't report last holdings on are not in our sample. We had also problems finding the re-inclusion of companies after being excluded. The holdings report for the GPFG do not show the companies after the exclusion. So we have not re-included any companies after being excluded in our portfolio.

7.0 Results

The results will be presented in three sub-sections. The first sub-section will present the results for the portfolio of all exclusions. This portfolio will be the basis of our analysis, as it considers all exclusions. Section 7.2 presents the results for the portfolio without tobacco and portfolio with only tobacco companies. We find that the tobacco companies had a significant influence on the returns for the portfolio of all exclusion. This section will measure the performance of both portfolios separately. Section 7.3 provides a robustness check by using the FTSE Large-Cap indicies, to see whether it changes the results from section 7.1 and 7.2.

7.1 All exclusions

7.1.1 Total portfolio value

Total portfolio value of portfolio of excluded companies and all-cap constructed benchmark portfolio are illustrated on figure 1 below. The total value of portfolio of excluded companies is considerably larger than benchmark portfolio at the end of our sample period. After mid-2010, there are only two months where the total value of all-cap benchmark portfolio exceeds value of portfolio of excluded companies, that being the first two months of 2014.

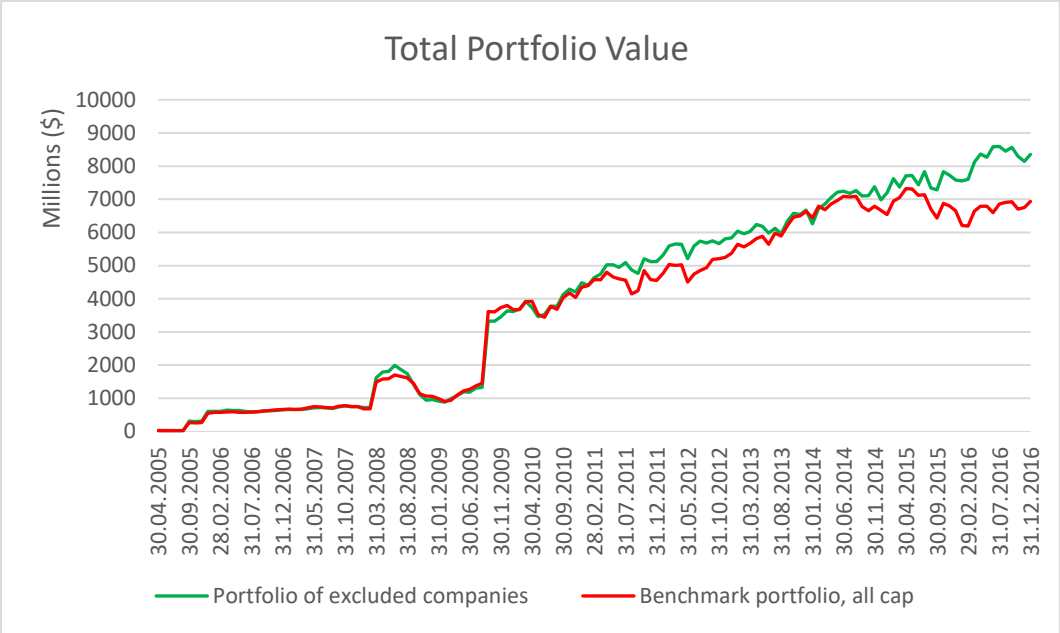

Figure 1: Total portfolio value of portfolio of excluded companies and all-cap benchmark portfolio

Figure 2 illustrates the difference between total value of benchmark portfolio and portfolio of excluded companies. As we can see from the graph, the difference is relatively small at the beginning of the sample period, but grows to large amount by to the end of the sample period. Total value of the portfolio has grown to the value of $8 349 415 231 by the end of December 2016, while the value of all-cap benchmark portfolio has grown to $6 934 766 330. The portfolio is valued $1 414 648 901 higher than the benchmark at the end of the sample period. This value represents the cost of ethical exclusion for the GPFG. In this case, we find GPFG lost $1 414 648 901 by ethical exclusion. Total return of the portfolio of excluded companies, all-cap benchmark portfolio and GPFG equity is found in appendix 2.

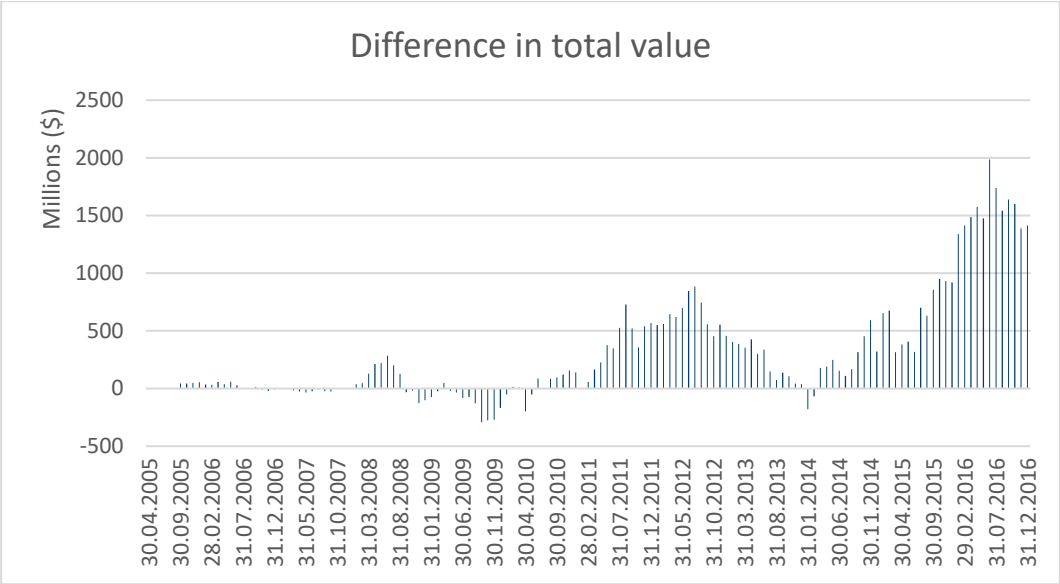

Figure 2: Difference in total value between portfolio of excluded companies and all-cap benchmark portfolio

7.1.2 Performance metrics

	Portfolio of excluded co.	All-cap Benchmark	GPFG Equity
Annual			
Arithmetic average	7,89 %	5,68 %	7,46 %
Geometric mean	6,51 %	4,28 %	6,07 %
Total			
Time weighted return	109,77%	63,66%	99,82%

Table 1: Arithmetic return and geometric mean of the portfolios

Table 1 presents the arithmetic average for the portfolios. The portfolio of excluded companies has an arithmetic average return of 7,89 %, which is higher than both the GPFG Equity and benchmark with 7,46% and 5,68% respectively. The cumulative return is calculated as time-weighted return. The portfolio gained a time-weighted return of 109,77 %, while the benchmark and GPFG Equity had 63,66% and 99,82 % respectively. The time-weighted return show the compounded growth rate of the initial investment during the sample period. This can be illustrated as a 1 000 000 $ initial investment in the portfolio at time 31.03.2005, will result in 2 097 705 $ by 31.12.2016. The annualized absolute performance return is calculated as the annualized geometric mean.

	Portfolio of excluded co.	All-cap Benchmark	GPFG Equity
Average	7.89%	5,68 %	7,46 %
Std. Dev.	17,37 %	17,04 %	17,41 %
Risk free	1,17 %	1,17 %	1,17 %
Sharpe ratio	0,39	0,26	0,3611

Table 2: Sharpe ratio

The Sharpe ratio for the portfolio is higher than the benchmark (table 2). With the US T-bills as proxy for risk free, we get a Sharpe ratio of 0,39 and 0,26 for the portfolio and benchmark respectively. The difference in standard deviation between the portfolios are relatively small, but the higher mean return results in steeper capital market line for the portfolio. The Sharpe ratio shows that the portfolio outperformed benchmark, as the portfolio yields higher return per unit of total risk. The portfolio has also a slightly higher Sharpe ratio than the GPFG equity portfolio. Thus, the argument can be made that ethical exclusion has cost the GPFG higher risk-adjusted return.

Portfolio to GPFG Equity		*Portfolio to benchmark*	
	Weights		Weigths
Portfolio	*100,20 %*	Portfolio	*98 %*
Fixed Income	-0,20 %	Fixed Income	2 %
	Return		Return
Adjusted portfolio	7,90 %	Adjusted portfolio	7,74 %
Equity	7,46 %	Equity	5,68 %
M2	0,44 %	**M2**	2,06 %

Table 3: M^2 measures

We calculate the M^2 to see the difference in return for the same unit of risk. We created an adjusted portfolio with the portfolio and GPFG fixed income to yield the same standard deviation as the benchmark. Table 3 shows the weights and return for the adjusted portfolios. The portfolio of exclusions and benchmark have a monthly standard deviation of 5,02 % and 4,92 % respectively. The appropriate weights in the adjusted portfolio that yields the same standard deviation as the benchmark, is 98 % invested in the portfolio and the remaining 2 % invested in the GPFG fixed income portfolio. The adjusted portfolio yields an annualized

average return of 7,74 %, while the benchmark has 5,68 %. The M^2 is 2,06 %. The portfolio outperforms the benchmark by 2,06 % for the same unit of total risk as the benchmark. When we use the M^2 on the portfolio and GPFG equity, we find that portfolio has slightly lower standard deviation than benchmark. The monthly volatility is 5,02 % and 5,03 % for the portfolio and benchmark. So the adjusted portfolio has a short position on the fixed income of -0,2 %, and 100,2% on the portfolio. We get a M^2 value of 0,44 %.

From our analysis, we find that the portfolio have been able to deliver higher cumulative return and risk-adjusted return measures than the benchmark. The outperformance suggest that the GPFG has lost money by ethical exclusions. We calculate the Jensen's alpha by running a regression to find the excess return over the return predicted by the CAPM market model.

The Jensen's alpha calculation shows that the portfolio yields a positive annualized alpha of 2,86 %, but it is not statistically significant. Regression outputs from estimation of Jensen's alpha are displayed in table 4.

Portfolio return	Coef.	Std. Err.	t-value	p-value	R-squared of regression
Beta	0,85	0,0473	18,05	0,0000	0,70
Alpha	0,0024	0,0023	1,0220	0,3086	
Annualized Alpha	2,86 %				

Table 4: Regression outputs, Jensen's Alpha

OLS inference relies on the assumption of normally distributed residuals. Time series returns on the benchmark portfolios, GPFG equity portfolio and portfolio of excluded companies exhibit non-normal distributions which translates into non-normal distributed residuals when we estimate alpha. As argued by Kosowski (2006) large positions in specific industries may cause cross-correlation in returns and rejection of normality. The portfolio of excluded companies has large positions in few industries, such as the tobacco- and aerospace & defense industry. The alpha we have estimated has been drawn from non-normal distributions. Thus, we find economical evidence for the outperformance, but we

do not have conclusive evidence to statistically prove that the portfolio outperformed the benchmark.

7.1.3 Regression and risk decomposition

We regress portfolio returns first on the constructed all-cap benchmark returns and then on the GPFG equity returns. The OLS estimates beta coefficient of 0,85 in both cases and shows that coefficients are significant at 1% level. We detect heteroscedasticity and non-normality in the residuals which is caused by three extreme outliers (Appendix 4). We observe extreme negative returns on all three portfolios in September, October and November 2008 that violates the normality of the returns (Appendix 5). As we recall, there was a worldwide financial crisis during that period. Our goal is to capture how portfolio of excluded companies is related to the market movements. Therefore, statistically, we find it reasonable to control for the effect of the extreme observations. We introduce a control variable (dummy variable), D_t, which takes the value 1 on September, October and November 2008 and 0 otherwise. We include the dummy variable in the regression:

$$y_t = \alpha + \beta_1 \chi_t + \beta_2 D_t + u_t$$

We regress portfolio returns on all-cap benchmark- and GPFG equity returns separately. OLS estimates are displayed in the table 5.

	Coef.	Std. Err.	t-value	p-value	R-squared of regression
Portfolio returns					
Benchmark, all cap	0,74	0,0467	15,73	0,000	0,76
Dummy	-0,0900	0,0159	-5,97	0,000	
Constant	0,0051	0,0021	2,3960	0,018	
Portfolio returns					
GPFG equity	0,73	0,0446	16,43	0,000	0,77
Dummy	-0,0915	0,0155	-5,89	0,000	
Constant	0,0039	0,0021	1,90	0,060	

Table 5: Regression outputs of portfolio relation to all-cap benchmark and GPFG equity

By including the control variable, the residuals are normally distributed. Regressions also gets a high R-squared. Beta coefficient on all-cap benchmark and GPFG equity have decreased from 0,85 to 0,74 and 0,73 respectively and both coefficients are significant at 1% level. Both dummy variables are statistically significant as well.

The beta coefficient of 0,74 implies that 1% increase in the benchmark portfolio will on average lead to expected return of 0,74% in the portfolio of excluded companies. Estimated beta makes more sense when we look at the portfolios high correlation with the benchmark, which is 0,84 (Appendix 8), and R^2 measure of 0,76. The R^2 measure implies that 76% of movements of the portfolio can be explained by the benchmark index (Brooks, 2014)

The regression shows that an increase in returns on GPFG equity portfolio, will on average increase portfolio of exclusions by 0,73%. Beta coefficient in both regressions are closely related as the All-Cap benchmark portfolio is highly correlated with the equity fund.

The table 6 displays the risk components of the portfolio of excluded companies.

	SD of return	Beta	SD of systematic component	SD of residual	Correlation with the benchmark
Constructed all-cap country benchmark	0,1704	1,00	0,1704	0,00	1,00
Portfolio of excluded companies	0,1743	0,74	0,1260	0,0856	0,84

Table 6: Risk components of the portfolio of excluded companies (annualized)

The annualized systematic risk is derived by multiplying the beta of 0,74 with the annualized standard deviation of the benchmark. The annualized standard deviation of the portfolio's residual is derived by multiplying the standard error of the regression with square root of 12. (Bodie et al., 2014)

The standard deviation of the unexplained portion of the portfolio return, that is the portion of risk unrelated to the market index, is 0,0856 annually. The portion of risk related to the market, the systematic risk, is 0,1260 annually. We notice that our portfolios specific risk is less than its systematic risk.

We get similar results when we decompose the risk related to GPFG equity portfolio. Systematic- and nonsystematic risk component of 0,01271 and 0,0834 respectively.

7.1.4 Rolling average

Figure 3 and 4illustrates rolling averages in standard deviations and returns on the three portfolios:

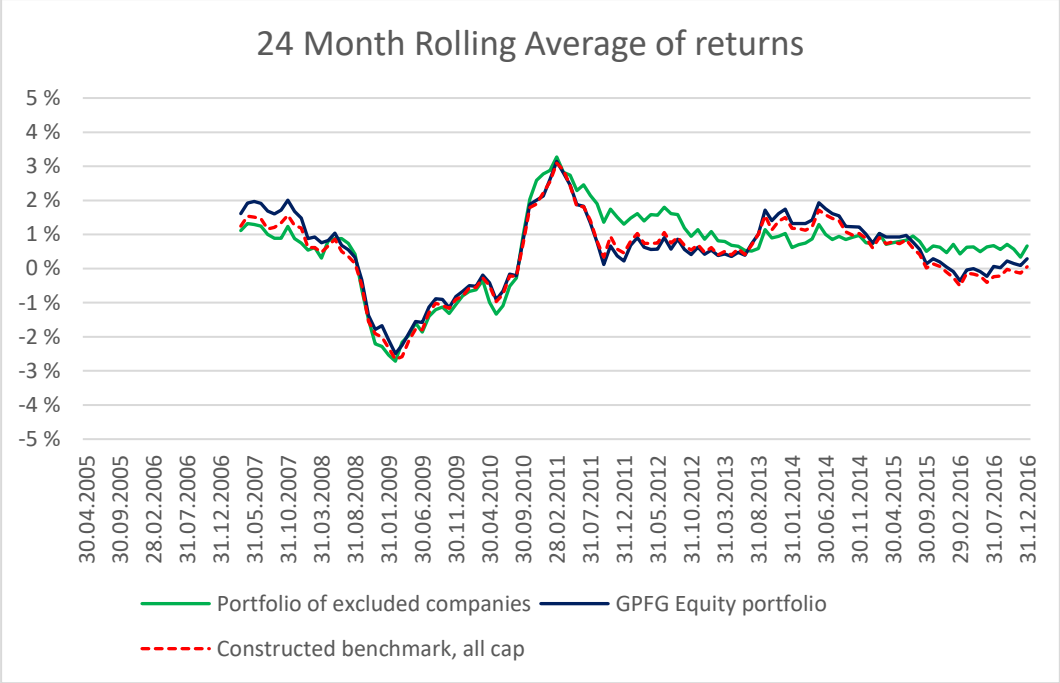

Figure 3: Rolling average of returns

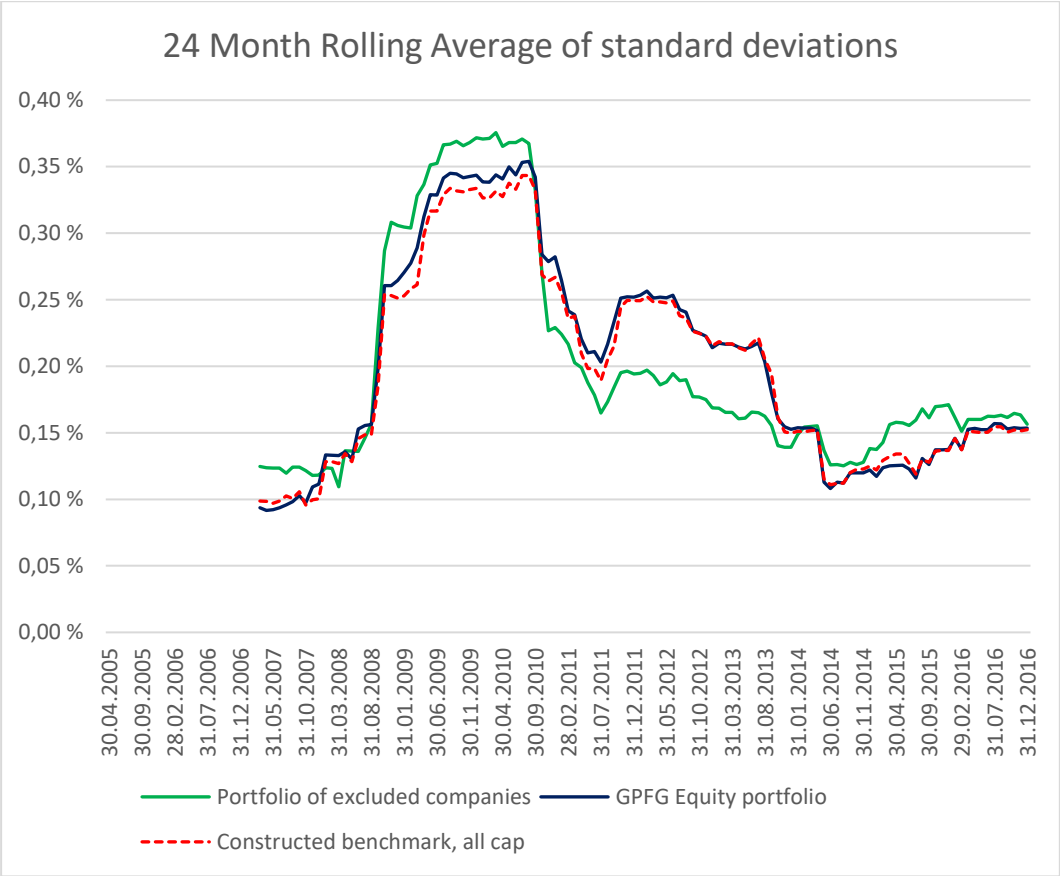

Figure 4: Rolling average of standard deviation

As we can see from the figure 3, our portfolio closely tracks the movements of the benchmark until 2011, where it starts to generate higher return on average than the benchmark. However, we also observe slightly lower average return between mid-2013 and mid-2015. From figure 4, we observe that the rolling average of standard deviation of the portfolio follows a similar trend as its average returns. Between end-2010 and first quarter of 2014, our portfolio has less volatility on average than the benchmark and GPFG equity portfolio, yet it has greater returns most of the period.

We also notice that the increased portfolio performance coincides with the inclusion of tobacco companies in our portfolio of excluded companies. At the end of the sample period, 17 of 48 excluded companies in the portfolio from tobacco industry, and 13 of them are included in the portfolio at the end of September 2009. The tobacco industry represents a significant part of our portfolio from 2009, and thus have a large impact on the performance. Hong & Kacperczyk (2009) found that the tobacco companies outperformed their comparables in their study. From figure 3, we see that the portfolio yields higher

return on average than benchmark from 2009. We suspect that the tobacco industry might have a large impact on the positive performance. Thus, we want to further investigate this issue in the next section.

7.2 Exclusion (Tobacco)

7.2.1 Total portfolio value

In this section, we present the total value of portfolio without tobacco companies and with only tobacco companies relative to the re-constructed all-cap benchmark portfolios. Total value of the portfolios is shown in table 7. Figure 5 illustrates the total value of the portfolios and figure 6 shows the differences in total value.

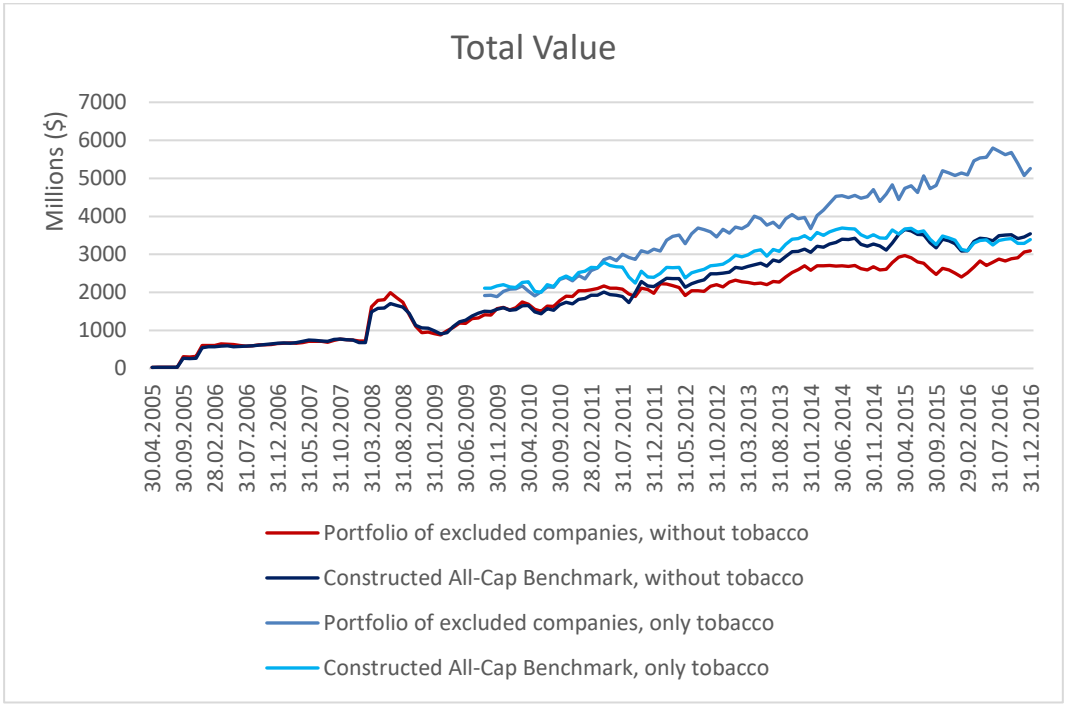

Figure 5: Total value of portfolios

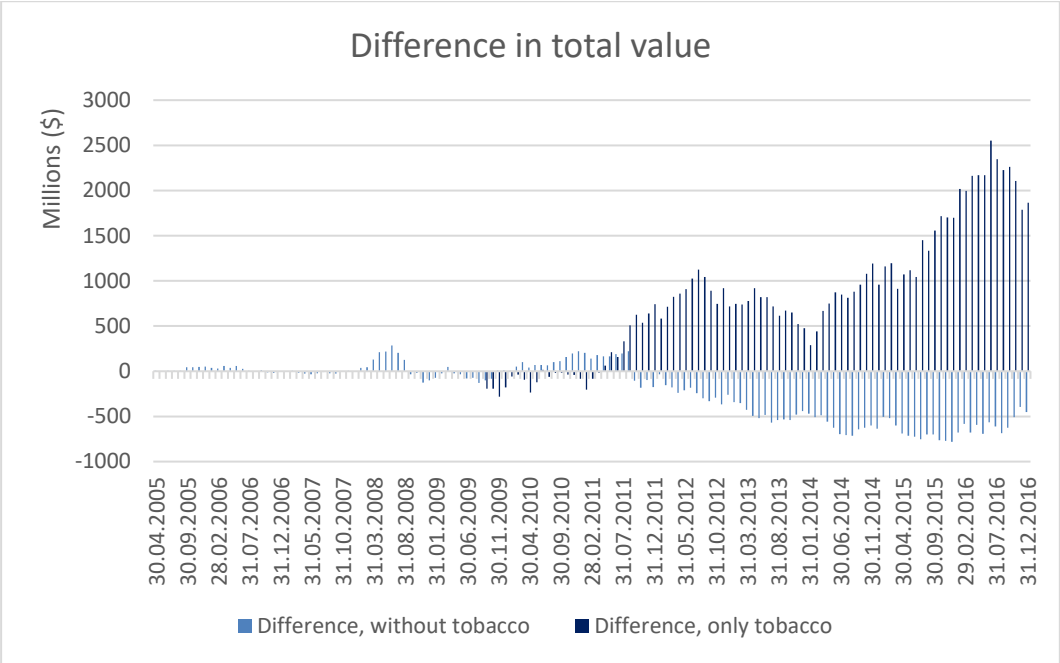

Figure 6. Differences in total value between portfolio of excluded companies and benchmarks.

Portfolio	Total value 31.12.2016
Without tobacco companies	$3 093 778 654,61
All-Cap benchmark	$3 544 505 375,86
Difference	-$450 726 721,25
Only tobacco companies	$5 255 636 577,37
All-Cap benchmark	$3 390 260 954,37
Difference	$1 865 375 623,01

Table 7: Total values without- and with only tobacco companies

The total value for the portfolio without the tobacco companies decreased significantly from the total value for portfolio of all exclusions. We find that the portfolio value is lower than its benchmark in this case. As shown in table 6, the total value of portfolio of excluded companies and benchmark portfolio at 31 December 2016 are $3 093 778 654 and $3 544 505 375 respectively. The difference of - $450 726 721 shows that we lost money with the new portfolio. This value show that the GPFG benefitted from excluding the companies that are not from the tobacco industry. The portfolio of tobacco companies has a total value of $5 255 636 577 while total value of its benchmark portfolio is $3 390 260 954, resulting in a difference of $1 865 375 623. Thus, excluding tobacco has cost the GPFG. We get different results when we separate the portfolio into one without tobacco companies and one with on tobacco companies. We find that the GPFG lost money by excluding tobacco companies, but benefitted from excluding the other companies.

7.2.2 Performance metrics

	Portfolio of excluded co.	All-cap Benchmark	GPFG Equity
All exclusions			
Arithmetic average	7,89 %	5,68 %	7,46 %
Geometric mean	6,51 %	4,28 %	6,07 %
Time weighted return	109,77 %	63,66 %	99,82 %
Without tobacco			
Arithmetic average	5,62 %	5,79 %	7,46 %
Geometric mean	3,85 %	4,40 %	6,07 %
Time weighted return	55,89 %	65,77 %	99,82 %
Only tobacco			
Arithmetic average	14,82 %	7,33 %	8,21 %
Geometric mean	14,13 %	6,36 %	7,29 %
Time weighted return	157,80 %	56,38 %	66,59 %

Table 8: Arithmetic and geometric averages

We experience some significant changes in the performance measures when we remove the tobacco companies from the portfolio. We find that the average return has decreased, and the portfolio without tobacco is not able to beat its benchmark. The time-weighted return on the portfolio without tobacco is 56,02 %, which is lower than the benchmark's 65,87 %. An investment in the portfolio results in 53,88 % lower cumulated return than the portfolio of all exclusions. The portfolio of all exclusions experience a significant decrease in return when we remove the tobacco companies. The portfolio of tobacco companies has the highest average return and lowest volatility. Despite its shorter sample period, it has also the highest time-weighted return. The risk-adjusted return measures show similar results.

	Portfolio of excluded co.	All-cap Benchmark	GPFG Equity
All exclusions			
Excess return	6,72 %	4,51 %	6,29 %
Std. Dev.	17,37 %	17,04 %	17,41 %
Sharpe ratio	0,39	0,26	0,36
Without tobacco			
Excess return	4,45 %	4,61 %	6,29 %
Std. Dev.	18,86 %	17,02 %	17,41 %
Sharpe ratio	0,23	0,27	0,36
Only tobacco			
Excess return	14,72 %	7,22 %	8,10 %
Std. Dev.	15,64 %	15,13 %	15,15 %
Sharpe ratio	0,94	0,48	0,53

Table 9: Performance metrics without- and only tobacco companies

Portfolio without tobacco has lower excess return and higher volatility than portfolio of all exclusions (table 9). The Sharpe ratio falls from 0,39 % to 0,23 %. The portfolio achieves less return per unit of total risk when we remove the tobacco companies. Portfolio of tobacco companies has a relatively high Sharpe ratio of 0,91, which is the highest of all portfolios.

Portfolio without tobacco to GPFG equity		*Portfolio without tobacco to all-cap benchmark*	
	Weights		*Weights*
Portfolio	90 %	Portfolio	88 %
Fixed income	10 %	Fixed income	12 %
	Return		*Return*
Adjusted portfolio	5,40 %	Adjusted portfolio	5,31 %
Equity	7,46 %	Benchmark	5,79 %
M2	**-2,06 %**	***M2***	**-0,47 %**

Table 10: M^2 measure without tobacco companies

We calculate the M^2value for both portfolios. Both GPFG Equity and the benchmark have lower standard deviation than portfolio without tobacco. The appropriate weights of GPFG fixed income and portfolio without tobacco on the adjuster portfolio is presented on table 10. The M^2 value is -2,06 % and -0,47 % for the adjusted portfolio on GPFG Equity and benchmark. The removal of tobacco companies had a large impact on the portfolios risk-adjusted returns.

Portfolio, only tobacco to GPFG equity		*Portfolio, only tobacco to all-cap benchmark*	
	Weights		*Weights*
Portfolio	96 %	Portfolio	96 %
Fixed income	4 %	Fixed income	4 %
	Return		*Return*
Adjusted portfolio	14,30 %	Adjusted portfolio	14,30 %
Equity	8,21 %	Benchmark	7,33 %
M2	**6,10 %**	***M2***	**6,98 %**

Table 11: M^2 measurements, only tobacco companies

The GPFG Equity and the constructed benchmark for portfolio of tobacco have the same standard deviation of 4,37 % during this specific sample period. Portfolio of tobacco has only 0,14% higher standard deviation than the benchmark and GPFG, resulting in smaller weight allocated to the GPFG Fixed Income. The portfolio of tobacco companies yield 6,10% and 6,98 % higher return than the GPFG Equity and benchmark respectively, for the same unit of total risk.

Examining the impact of tobacco companies on our portfolio of excluded companies presents some contrasting findings compared to the evidence from section 7.1. Portfolio without tobacco companies has lower risk-adjusted return than its benchmark. The risk-adjusted measures and time-weighted return show that GPFG benefits from excluding the companies in portfolio without tobacco, but lose money by excluding the tobacco companies. We calculate Jensen's alpha to confirm this. Estimation of Jensen's alpha without- and only tobacco companies are displayed in the tables below.

Portfolio return	Coef.	Std. Err.	t-value	p-value	R-squared of regression
Beta	0,94	0,0499	18,81	0,0000	0,72
Constant	0,0001	0,0025	0,0390	0,9690	
Annualized Alpha	0,12 %				

Table 12: Jensen's Alpha, without tobacco companies

Portfolio return	Coef.	Std. Err.	t-value	p-value	R-squared of regression
Beta	0,66	0,0861	7,69	0,0000	0,41
Constant	0,0083	0,0038	2,1809	0,0320	
Annualized Alpha	9,94 %				

Table 13: Jensen's Alpha, only tobacco companies

The alpha of portfolio of excluded companies have decreased considerably when tobacco companies have been left out, from 2,86% to 0,12%, but the coefficient is insignificant. The alpha is positive, but we cannot statistically conclude that the portfolio outperformed the benchmark. We have the same problem as mentioned in section 7.1 for the portfolio without tobacco companies. Portfolio with only tobacco companies have a significant alpha of 9,94%. This portfolio had a shorter sample period, and normal distribution in the residuals. We can statistically conclude that the portfolio of tobacco companies outperformed its benchmark, and excluding the tobacco companies has thus cost the GPFG.

7.2.3 Regressions

Regression estimates without and only tobacco companies in the portfolios are shown in the tables below. Both beta coefficients are significant at 1%.

Portfolio return	Coef.	Std. Err.	t-value	p-value	R-squared of regression
Benchmark, all cap	0,84	0,0517	16,25	0,0000	0,75
Constant	0,002	0,0023	0,96	0,3378	
Dummy	-0,077	0,0176	-4,40	0,0000	

Table 14: Regression of portfolio on all cap benchmark, without tobacco companies

Portfolio return	Coef.	Std. Err.	t-value	p-value	R-squared of regression
Benchmark, all cap	0,66	0,0861	7,69	0,0000	0,41
Constant	0,0083	0,0038	2,1886	0,0314	

Table 15: Regression of portfolio on all cap benchmark, only tobacco companies (Nov. 2009 – Dec. 2016)

The beta estimate when tobacco companies are removed from the portfolio is higher than when they are included. Beta increases to 0,84. The increase in beta implies that without tobacco companies, our portfolio is more related to the market movements. This is further supported by the beta estimate of 0,66 for the

portfolio with *only* tobacco companies, implying that tobacco companies have lower sensitivity to the market movements.

Risk component of the two portfolios, without tobacco- and only tobacco companies, are displayed in the tables below.

	SD of return	Beta	SD of systematic component	SD of residual	Correlation with the benchmark
Constructed all cap country benchmark	0,1702	1,00	0,1702	0,00	1,00
Portfolio of excluded companies	0,1886	0,84	0,1429	0,0947	0,85

Table 16: Risk decomposition, without tobacco companies

	SD of return	Beta	SD of systematic component	SD of residual	Correlation with the benchmark
Constructed all cap country benchmark	0,1513	1,00	0,1513	0,00	1,00
Portfolio of excluded companies	0,1564	0,66	0,0998	0,1215	0,64

Table 17: Risk decomposition, with only tobacco companies

Nonsystematic- and systematic risk component of the portfolio without tobacco companies are higher than the risk components of the total portfolio. Systematic risk component is still higher than the unsystematic risk component. For the portfolio of only tobacco companies, the nonsystematic risk component is larger than the systematic component. This is consistent with the lower beta, the market sensitivity, and lower correlation with the benchmark.

7.2.4 Rolling average

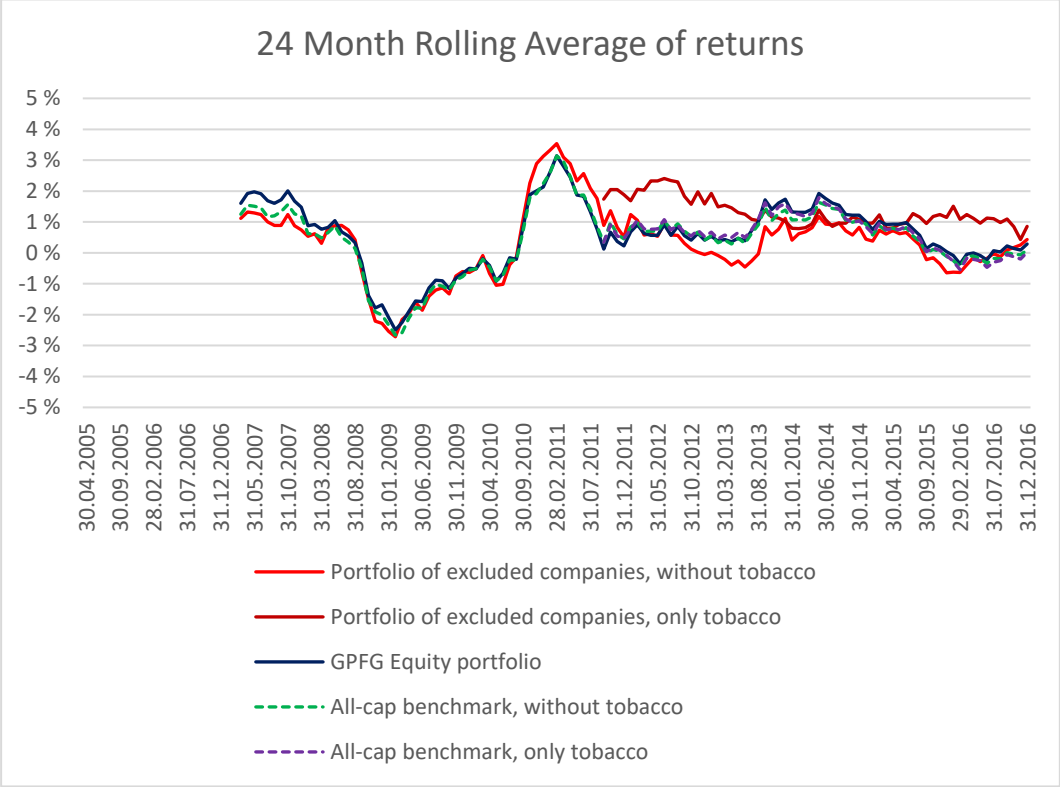

Figure 7: Rolling averages of returns on portfolios, categorized in without- and only tobacco companies.

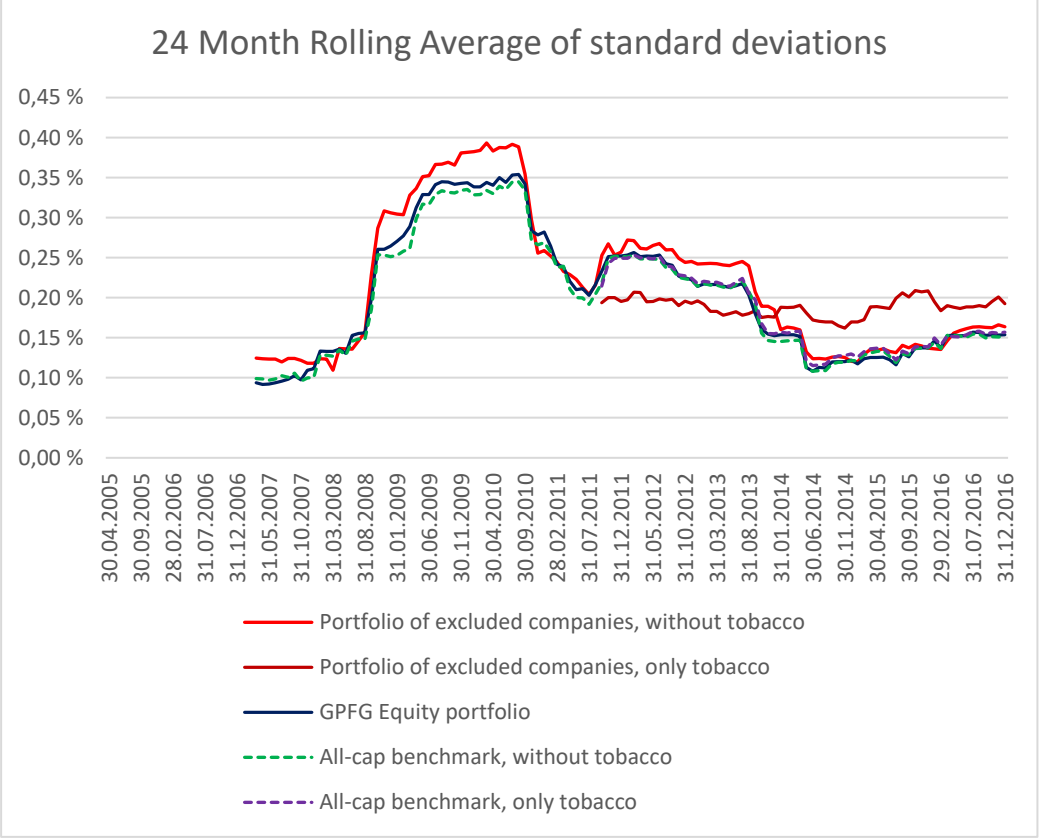

Figure 8: Rolling averages of standard deviations, categorized in without- and only tobacco companies

Figure 8 shows that the portfolio of tobacco has higher returns on average than portfolio without tobacco since inclusion. The movements of average returns and standard deviations are relatively stable, but we find a slightly decreasing trend on average return for the portfolio of tobacco companies. We see that it less sensitive to market cycles, given its lower beta from the regression analysis. The portfolio without tobacco shows similar movements as its benchmark. The rolling average shows that the average return on portfolio is much closer to its benchmark when we remove the tobacco companies.

7.3 Robustness check

We have compared the portfolio of excluded companies to a benchmark portfolio with FTSE All-Cap country indices. The excluded companies in our sample are public companies with large market capitalization. So as a robustness check, we use the FTSE Large-Cap indices for the benchmark portfolios, and repeat the steps from 7.1 and 7.2. The robustness check is used to find any changes in results when we switch the benchmark indices from FTSE All-Cap to Large-Cap.

Total value of the portfolio and the large-cap constructed benchmark at the end of sample period are displayed in the table below. We add All-Cap benchmark portfolio value from section 7.1 and 7.2 to see if there are any significant changes when we use the Large-Cap indices. The portfolio of all exclusions and only tobacco have larger difference in total value when we use Large Cap, while the portfolio without tobacco has smaller difference.

Portfolio	All exclusions	Without tobacco	Only tobacco
Portfolio of excluded companies	$8 349 415 231,00	$3 093 778 654,61	$5 255 636 577,37
All-Cap benchmark	$6 934 766 330,00	$3 544 505 375,86	$3 390 260 954,00
Difference	**$1 414 648 901,00**	**-$450 726 721,25**	**$1 865 375 623,37**
Large-Cap benchmark	$6 561 136 394,00	$3 454 150 759,00	$3 106 985 636,00
Difference	**$1 788 278 837,00**	**-$360 372 104,39**	**$2 148 650 941,37**

Table 18: Total value of the portfolios

The regression analysis show similar results as 7.1 and 7.2. Beta of the portfolio of excluded companies to the large-cap benchmark is 0,75 which is slightly higher than it is with the all-cap benchmark, and it is significant at 5% level. We also get a higher R-squared measure of 0,77. Systematic and non-systematic risk components are 0,1248 and 0,0839 annually, which are similar to the risk components related to all-cap benchmark. We get alpha of 3,31% annually but it is insignificant at 5% level. Portfolio without tobacco beta to large-cap benchmark is 0,85 and the annualized alpha of 0,04% is insignificant. Systematic- and non-systematic risk components are 0,1408 0,0952 respectively. Portfolio with only tobacco beta to large-cap benchmark is 0,69. Annualized alpha 10,36% and significant at 5%. Systematic- and non-systematic risk components are 0,1021 and 0,1188 respectively.

The performance metrics of the portfolios are displayed in table 19.

	All exclusions	Without tobacco	Only tobacco
Portfolio of excluded companies			
Excess return	6,72 %	4,45 %	14,72 %
Std. Dev	17,37 %	18,86 %	15,64 %
Sharpe ratio	0,39	0,24	0,94
Arithmetic average	7,89 %	5,62 %	14,82 %
Geometric mean	6,51 %	3,85 %	13,29 %
Time weighted return	109,77 %	55,88 %	157,80 %
All-Cap Benchmark			
Excess return	4,51 %	4,61 %	7,22 %
Std. Dev	17,04 %	17,02 %	15,13 %
Sharpe ratio	0,26	0,27	0,47
Arithmetic average	5,68 %	5,79 %	7,33 %
Geometric mean	4,28 %	4,40 %	6,18 %
Time weighted return	63,66 %	65,77 %	56,38 %
Large-Cap Benchmark			
Excess return	3,88 %	4,11 %	6,33 %
Std. Dev.	16,63 %	16,57 %	15,02 %
Sharpe ratio	0,23	0,24	0,42
Arithmetic average	5,05 %	5,28 %	6,43 %
Geometric mean	3,71 %	3,96 %	5,31 %
Time weighted return	53,39 %	57,79 %	46,79 %

Table 19: Performance metrics of the portfolios

The performance metrics show the Large-Cap benchmark has lower cumulative return and risk-adjusted performance measure than the All-Cap benchmark. Thus, the portfolios perform better in comparison to the Large-Cap benchmarks than the All-Cap benchmarks. The M^2 show similar results

Portfolio without tobacco to all-cap benchmark		*Portfolio, only tobacco to all-cap benchmark*	
	Weights		*Weights*
Portfolio	88 %	Portfolio	96 %
Fixed income	12 %	Fixed income	4 %
	Return		*Return*
Adjusted portfolio	5,31 %	Adjusted portfolio	14,30 %
Benchmark	5,79 %	Benchmark	7,33 %
M2	**-0,47 %**	***M2***	**6,98 %**
Portfolio without tobacco to large-cap benchmark		*Portfolio, only tobacco to large-cap benchmark*	
	Weights		*Weights*
Portfolio	88 %	Portfolio	95 %
Fixed income	12 %	Fixed income	5 %
	Return		*Return*
Adjusted portfolio		Adjusted portfolio	
Benchmark		Benchmark	
M2	**-0,45 %**	***M2***	**7,76 %**

Table 20: M^2 measure, all-cap and large-cap

Overall, we can conclude that there are no dramatic changes in the results when we switch the benchmark from All-Cap to Large-Cap.

8.0 Conclusion

Our thesis contributes to the literature on SRI by investigating the financial impact of ethical exclusion for the GPFG. We want to investigate whether ethical exclusion has cost the GPFG higher returns on its investment. We attempt to measure the financial impact by creating a portfolio of excluded companies, and measure it against a constructed benchmark. Our research provides some interesting results.

We find that the portfolio of exclusion has a cumulative return of 109,77 % by the end of the sample period, while the benchmark has 63,66 %. The portfolio has earned $ 1 414 648 901 more than the benchmark. We find the GPFG has lost money by ethical exclusion. The risk-adjusted performance measures show similar results, with higher Sharpe ratio and M^2 value for the portfolio. However, we found a positive, but insignificant alpha for the portfolio. The alpha we have estimated has been drawn from non-normal distributed returns which translates into non-normal distributed residuals. Therefore, we cannot make statistical inferences about the alpha. By using the rolling average analysis to track the portfolio movements throughout sample period, we found an improvement in performance after the inclusion of tobacco companies. By splitting the portfolio, we found that the portfolio without tobacco achieves a cumulative return of 55,89 %, which is lower than its benchmark's return of 65,77 %. The total portfolio value of portfolio without tobacco is lower by $450 726 721 compared to the benchmark, while the portfolio of tobacco companies has a total value of $1 865 375 623 higher than its benchmark. We find that the higher performance of the portfolio of exclusion is primarily due to the tobacco companies. The regression analysis shows that the systematic risk of the portfolio of exclusions has higher systematic risk after the exclusion of tobacco companies. The non-systematic risk component is also higher for the portfolio consisting of only tobacco companies, which explains how it is able to achieve higher return than market. The alpha calculation show positive insignificant alpha of 0,12 % for the portfolio without tobacco, and 9,94 % alpha for the portfolio of tobacco companies with 5 % significance level.

The results leave us with a two-parted conclusion. Based on our research, we find that the portfolio of exclusions outperforms its benchmark in terms of dollar value

and risk-adjusted performance measure. The results show that ethical exclusion has cost the GPFG higher returns on its investment. We find economically significant evidence in support of our alternative hypothesis, but we cannot statistically reject the null hypothesis. When we separate the portfolio into one without tobacco companies and one with tobacco companies, we find that the tobacco companies had a significant influence on the performance of the portfolio of all exclusions. Thus, the other part of our conclusion is that the GPFG has lost money by excluding tobacco companies. The portfolio of tobacco companies has the highest cumulative return and risk-adjusted performance measures, and have a significant alpha of 9,91 %.

The financial cost of ethical exclusion for the GPFG will be borne by the Norwegian people. The petroleum revenue stems from the Norway's natural resources. Thus, the wealth extracted from the natural resources belong to the country, and its people. This goes back to the fiduciary duty mentioned in the introduction. With the declining profitability of the oil industry, the long-term wealth for the Norwegian people are dependent on the financial performance of the GPFG. The cost of ethical exclusion can be illustrated with the following example. SSB reports on its website that the current population in Norway is 5 277 762. If we divide the dollar value lost on the population, we find that ethical exclusion has cost each norwegian 268 $.

As earlier mentioned, our analysis focus solely on the financial performance. Any social or other non-financial value added is not considered in our thesis. Although our sample period cover11 years, the long-term value of socially responsible investment might change with a longer time horizon. Hong & Kacperczyk (2009) argued that the sin stocks are largely shunned by institutional investors due to their potential litigation risk. The latest exclusion wave from the GPFG includes a large number of firms excluded for environmental damage. This industry is very exposed to regulations and litigation risk. There are also significant negative returns associated with environmental crisis (Klassen & McLaughin, 1997). Thus, a longer study period might be necessary to truly capture the potential benefit of socially responsible investment. Our suggestion for further research include longer time-horizon to better capture the long-term benefits of SRI.

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Appendices

Appendix 1

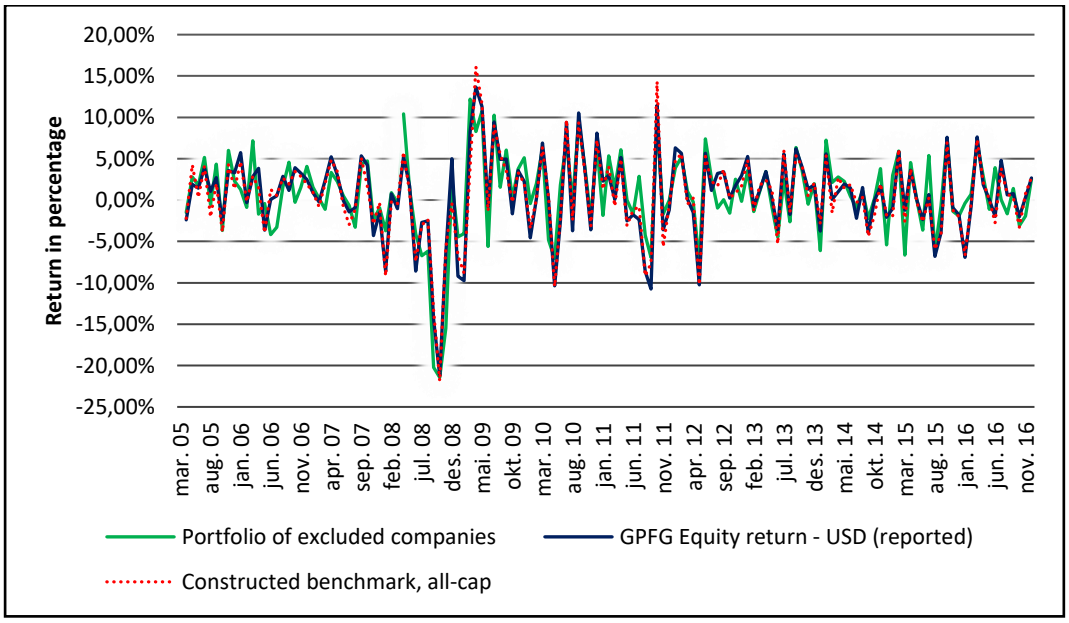
Excluded companies in our sample

Company name	Exclusion announcement	Reason of exclusion from the fund
General Dynamics Corporation	31.08.2005	Production of cluster munitions
Northrop Grumman Corp	31.12.2005	Production of nuclear weapons
Honeywell International Inc.	31.12.2005	Production of nuclear weapons
Airbus Group N.V	31.12.2005	Production of nuclear weapons
Boeing Co.	31.12.2005	Production of nuclear weapons
Wal-Mart Stores Inc.	31.05.2006	Violations of human rights
Wal-Mart de Mexico SA de CV	31.05.2006	Violations of human rights
Freeport McMoRan Copper & Gold Inc.	31.05.2006	Environmental damage
Vedanta Resources Plc.	31.10.2007	Environmental damage
Hanwha Corporation	31.12.2007	Production of cluster munitions
Serco Group Plc.	31.12.2007	Production of nuclear weapons
Rio Tinto Plc.	30.06.2008	Environmental damage
Rio Tinto Ltd.	30.06.2008	Environmental damage
Barric Gold Corp	30.11.2008	Environmental damage
Textron Inc.	31.12.2008	Production of cluster munitions
Elbit Systems Ltd.	31.08.2009	Violations of fundamental ethical norms
Norilsk Nickel	31.10.2009	Environmental damage
Alliance One International Inc.	31.12.2009	Production of tobacco
Altria Group Inc.	31.12.2009	Production of tobacco
British American Tobacco BHD	31.12.2009	Production of tobacco
British American Tobacco Plc.	31.12.2009	Production of tobacco
ITC Ltd.	31.12.2009	Production of tobacco
Japan Tobacco Inc.	31.12.2009	Production of tobacco
KT&G Corp	31.12.2009	Production of tobacco
Reynolds American Inc.	31.12.2009	Production of tobacco
Swedish Match AB	31.12.2009	Production of tobacco
Universal Corp VA	31.12.2009	Production of tobacco
Vector Group Ltd.	31.12.2009	Production of tobacco
Imperial tobacco (Imperial brands)	31.12.2009	Production of tobacco
Philip Morris Cr AS	31.12.2009	Production of tobacco
Shanghai Industrial Holdings Ltd.	15.03.2011	Production of tobacco
Grupo Carso SAB de CV	24.08.2011	Production of tobacco
Potash Corporation of Saskatchewan	06.12.2011	Violations of fundamental ethical norms
Shikun & Binui Ltd.	31.05.2012	Violations of individuals rights
BWX Technologies Inc	11.01.2013	Production of nuclear weapons
Jacobs Engineering Group Inc.	11.01.2013	Production of nuclear weapons
Schweitzer-Mauduit International Inc.	08.05.2013	Production of tobacco
Huabao International Holdings Limited	08.05.2013	Production of tobacco
Orbital ATK Inc	21.08.2013	Production of nuclear weapons
Lockheed Martin Corp	21.08.2013	Production of nuclear weapons
Ta Ann Holdings Berhad	14.10.2013	Environmental damage

Zuari Agro Chemicals Lyd.	14.10.2013	Violations of human rights
WTK Holdings Berhad	14.10.2013	Environmental damage
Volcan Comapna Minera	14.10.2013	Environmental damage
Africa Israel Investment	30.01.2014	Violations of individuals rights
IJM Corp Bhd	17.08.2015	Environmental damage
Genting Bhd.	17.08.2015	Environmental damage
Posco	17.08.2015	Environmental damage

Appendix 2

Total return of the main portfolios during the sample period



Appendix 3

Equity indices used in construction the benchmarks

Country	All-Cap index	Large-Cap Index
Australia	FTSE Australia All-Cap	FTSE Australia Large-Cap
Canada	FTSE Canada All-Cap	FTSE Canada Large-Cap
Czech Rep.	FTSE Czech R. All-Cap	N/A
France	FTSE France All-Cap	FTSE France Large-Cap
Hong Kong	FTSE Hong Kong All-Cap	FTSE Hong Kong Large-Cap
India	FTSE India All-Cap	N/A
Indonesia	FTSE Indonesia All-Cap	N/A
Israel	FTSE Israel All-Cap	FTSE Israel Large-Cap
Japan	FTSE Japan All-Cap	FTSE Japan Large-Cap
Malaysia	FTSE Malaysia All-Cap	N/A
Mexico	FTSE Mexico All-Cap	FTSE Mexico Large-Cap
Peru	FTSE Peru All-Cap	N/A
Russia	FTSE Russia All-Cap	FTSE Russia Large-Cap

South Korea	FTSE South Korea All-Cap	FTSE South Korea Large-Cap
Sweden	FTSE Sweden All-Cap	FTSE Sweden Large-Cap
UK	FTSE UK All-Cap	FTSE UK Large-Cap
USA	FTSE US All-Cap	FTSE US Large-Cap

Country weights

Country	Number of companies excluded	Weight in portfolio, 31 December 2016
Australia	1	2 %
Canada	2	4 %
Czech Republic	1	2 %
France	1	2 %
Hong Kong	2	4 %
India	2	4 %
Israel	3	6 %
Japan	1	2 %
Malaysia	5	10 %
Mexico	2	4 %
Peru	1	2 %
Russia	1	2 %
South Korea	3	6 %
Sweden	1	2 %
UK	5	10 %
USA	17	35 %
Total	**48**	**100,00 %**

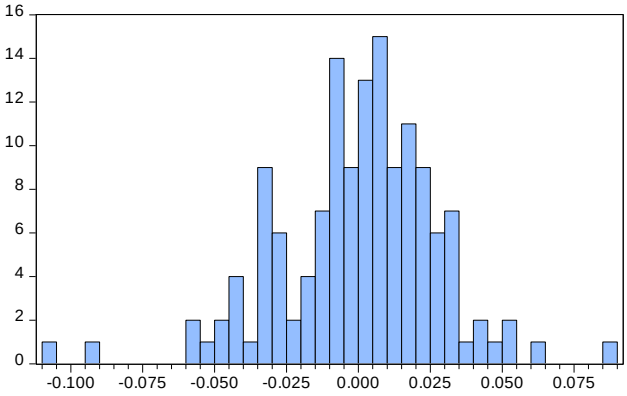
Appendix 4

Regression outputs of portfolio returns on all-cap benchmark, without control variable

Source	SS	df	MS	Number of obs	=	141
				F(1, 139)	=	325.91
Model	.248642274	1	.248642274	Prob > F	=	0.0000
Residual	.106044055	139	.000762907	R-squared	=	0.7010
				Adj R-squared	=	0.6989
Total	.354686329	140	.002533474	Root MSE	=	.02762

portfolio	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
benchmark_A	.8538929	.047299	18.05	0.000	.7603744	.9474114
_cons	.0025312	.0023368	1.08	0.281	-.0020892	.0071515

Test for normality



Test for heteroscedasticity

Heteroskedasticity Test: White

F-statistic	4.631277	Prob. F(1,139)	0.0331
Obs*R-squared	4.546433	Prob. Chi-Square(1)	0.0330
Scaled explained SS	8.410063	Prob. Chi-Square(1)	0.0037

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/30/17 Time: 23:24
Sample: 2005M04 2016M12
Included observations: 141

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000633	0.000134	4.713523	0.0000
BENCHMARK_A^2	0.048716	0.022637	2.152040	0.0331

R-squared	0.032244	Mean dependent var	0.000752
Adjusted R-squared	0.025282	S.D. dependent var	0.001473
S.E. of regression	0.001454	Akaike info criterion	-10.21505
Sum squared resid	0.000294	Schwarz criterion	-10.17322
Log likelihood	722.1607	Hannan-Quinn criter.	-10.19805
F-statistic	4.631277	Durbin-Watson stat	2.133924
Prob(F-statistic)	0.033122		

Test on autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.549904	Prob. F(12,127)	0.1149
Obs*R-squared	18.01139	Prob. Chi-Square(12)	0.1153

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/30/17 Time: 23:24
Sample: 2005M04 2016M12
Included observations: 141
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.51E-05	0.002288	0.024065	0.9808
BENCHMARK_A	-0.016140	0.050691	-0.318405	0.7507
RESID(-1)	0.008671	0.089238	0.097172	0.9227
RESID(-2)	0.114186	0.089476	1.276172	0.2042
RESID(-3)	0.034433	0.089027	0.386777	0.6996
RESID(-4)	-0.105975	0.087001	-1.218089	0.2254
RESID(-5)	-0.064688	0.088191	-0.733495	0.4646
RESID(-6)	-0.015444	0.087508	-0.176491	0.8602
RESID(-7)	-0.155023	0.089214	-1.737661	0.0847
RESID(-8)	-0.016767	0.090614	-0.185034	0.8535
RESID(-9)	0.193506	0.090398	2.140601	0.0342
RESID(-10)	-0.075880	0.091521	-0.829099	0.4086
RESID(-11)	0.102908	0.091131	1.129237	0.2609
RESID(-12)	-0.142571	0.093079	-1.531723	0.1281

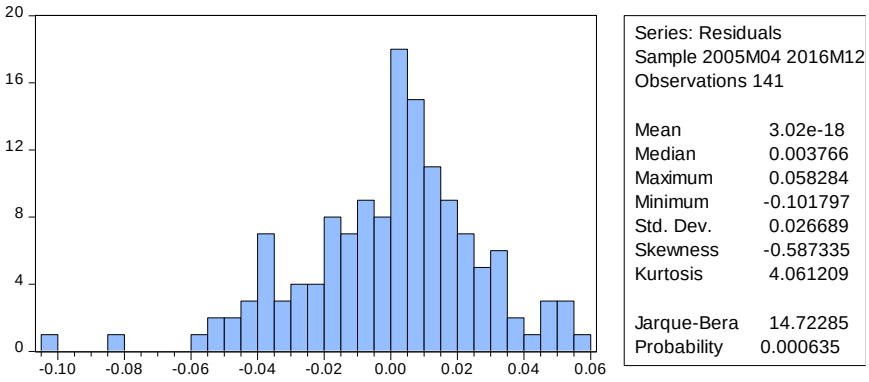
R-squared	0.127740	Mean dependent var	4.30E-18
Adjusted R-squared	0.038454	S.D. dependent var	0.027522
S.E. of regression	0.026988	Akaike info criterion	-4.292870
Sum squared resid	0.092498	Schwarz criterion	-4.000085
Log likelihood	316.6473	Hannan-Quinn criter.	-4.173893
F-statistic	1.430681	Durbin-Watson stat	2.039790
Prob(F-statistic)	0.154025		

Regression of portfolio returns on GPFG equity returns, without control variable

Source	SS	df	MS	Number of obs	=	141
				F(1, 139)	=	355.40
Model	.254966954	1	.254966954	Prob > F	=	0.0000
Residual	.099719375	139	.000717406	R-squared	=	0.7189
				Adj R-squared	=	0.7168
Total	.354686329	140	.002533474	Root MSE	=	.02678

portfolio	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gpfg_e	.8460365	.0448776	18.85	0.000	.7573056	.9347675
_cons	.001314	.0022728	0.58	0.564	-.0031799	.0058078

Test for normality



Test on heteroscedasticity

Heteroskedasticity Test: White			
F-statistic	4.817652	Prob. F(1,139)	0.0298
Obs*R-squared	4.723265	Prob. Chi-Square(1)	0.0298
Scaled explained SS	7.025816	Prob. Chi-Square(1)	0.0080

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/30/17 Time: 23:23
Sample: 2005M04 2016M12
Included observations: 141

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000593	0.000116	5.133043	0.0000
GPFG_E^2	0.044498	0.020273	2.194915	0.0298

R-squared	0.033498	Mean dependent var	0.000707
Adjusted R-squared	0.026545	S.D. dependent var	0.001242
S.E. of regression	0.001225	Akaike info criterion	-10.55733
Sum squared resid	0.000209	Schwarz criterion	-10.51550
Log likelihood	746.2915	Hannan-Quinn criter.	-10.54033
F-statistic	4.817652	Durbin-Watson stat	2.129616
Prob(F-statistic)	0.029830		

Test on autocorrelation

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.527186	Prob. F(12,127)	0.1226
Obs*R-squared	17.78068	Prob. Chi-Square(12)	0.1225

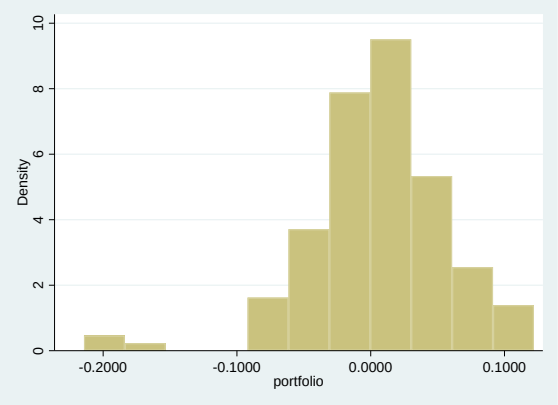
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/30/17 Time: 23:23
Sample: 2005M04 2016M12
Included observations: 141
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000191	0.002229	0.085591	0.9319
GPFG_E	-0.035262	0.047442	-0.743269	0.4587
RESID(-1)	0.069571	0.088160	0.789148	0.4315
RESID(-2)	0.179739	0.089365	2.011295	0.0464
RESID(-3)	0.032243	0.089839	0.358902	0.7203
RESID(-4)	-0.089571	0.087864	-1.019426	0.3099
RESID(-5)	-0.064622	0.088971	-0.726331	0.4690
RESID(-6)	0.012314	0.088050	0.139850	0.8890
RESID(-7)	-0.166542	0.089959	-1.851320	0.0664
RESID(-8)	-0.027775	0.090919	-0.305496	0.7605
RESID(-9)	0.207479	0.091169	2.275763	0.0245
RESID(-10)	-0.047092	0.092938	-0.506710	0.6132
RESID(-11)	0.058890	0.091166	0.645965	0.5195
RESID(-12)	-0.156042	0.093250	-1.673370	0.0967

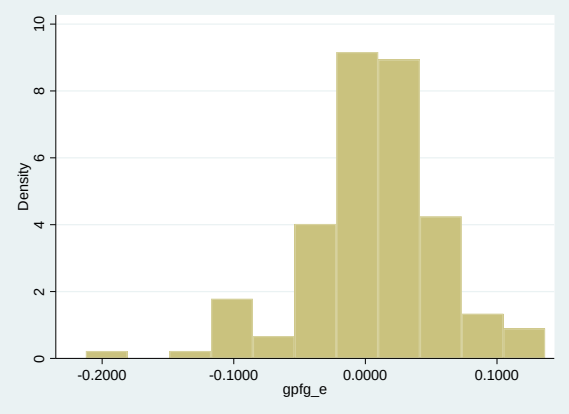
R-squared	0.126104	Mean dependent var	3.02E-18
Adjusted R-squared	0.036650	S.D. dependent var	0.026689
S.E. of regression	0.026195	Akaike info criterion	-4.352491
Sum squared resid	0.087144	Schwarz criterion	-4.059706
Log likelihood	320.8506	Hannan-Quinn criter.	-4.233513
F-statistic	1.409710	Durbin-Watson stat	2.035734
Prob(F-statistic)	0.163499		

Appendix 5

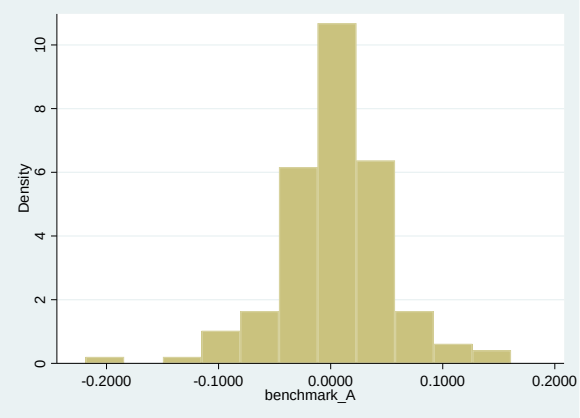
Histogram of portfolio of excluded companies returns



Histogram of GPFG equity portfolio returns

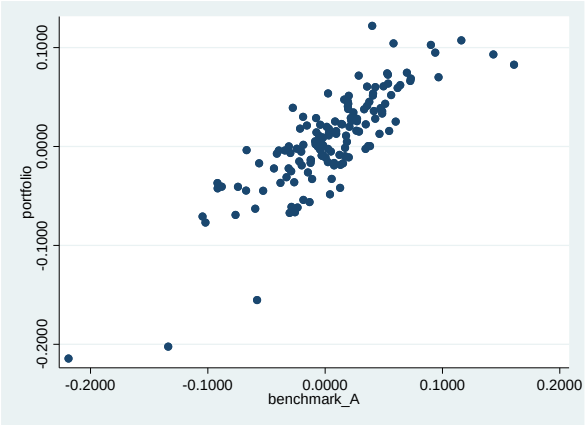


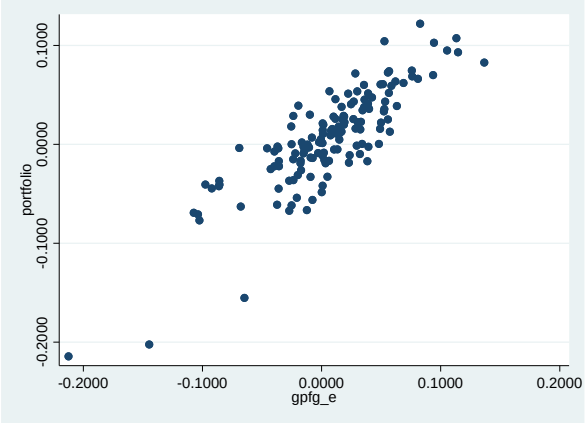
Histogram of all-cap benchmark returns



Appendix 6

Scatter plots of portfolio returns on all-cap benchmark and GPFG equity returns





Appendix 7

Skewness and kurtosis

	Portfolio, excluded companies	GPFG equity	All-cap Benchmark	Large-Cap benchmark
All observations				
Skewness	-1,08	-0,76	-0,56	-0,47
Kurtosis	4,07	2,50	3,34	2,85
Without sept, oct, nov. 2008 obser.				
Skewness	0,20	-0,16	1,31	1,30
Kurtosis	-0,15	0,63	0,19	0,17

Appendix 8

Correlation matrix

Correlation Matrix					
	Portfolio of excluded companies	GPFG Equity	GPFG Fixed	All-Cap Benchmark	Large-Cap Benchmark
Portfolio of excluded companies	-				
GPFG Equity fund	0,85	-			
GPFG Fixed-Income	0,56	0,62	-		
All-Cap Benchmark	0,84	0,97	0,57	-	
Large-Cap Benchmark	0,84	0,97	0,57	1,00	-