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Responsible investments in the Government Pension Fund Global and Norfund

An empirical study of a simple neoclassical production model and the subsequent Lucas Paradox

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Abstract

The Government Pension Fund Global and its investment strategy is widely discussed and criticised by many. Financial institutions solely investing in development projects, like Norfund, have in some studies been identified to outperform traditional profit maximizing investment strategies, like the Government Pension Fund Global.

In this thesis, the return of capital for the Government Pension Fund Global and Norfund are predicted from a simple neoclassical production model and the subsequent Lucas Paradox, and compared to the funds' actual historical returns. The research does however not provide any significant evidence supporting the funds' mean of returns to be unequal. Acknowledging the two funds' return on capital to be statistically equivalent implies that neither the prediction from the simple neoclassical model nor the Lucas Paradox can be observed in the sampled data. Accordingly, the provided empirical analysis does not support the above statement of Norfund outperforming the Government Pension Fund Global.

The further discussion points out limitations regarding human capital, technology and infrastructure and institutions as possible explanations for the differences between the neoclassical predictions and the observed returns.

Preface

This thesis has been written as the final study related to the Master Program at the Norwegian School of Economics, with a major in Financial Economics. Not only have the process been a fantastic academic learning experience in financial economics, but it has also felt rewarding from a personal perspective, being able to apply text book knowledge to a in depth chosen real life case.

The chosen topic has given me the opportunity to further excel my skills in financial economics in a more global perspective. Norway's unique economic position and the current debate of the asset management in the Government Pension Fund Global are topics that I mean should attract extensively attention from the Norwegian citizens, interpreted as the informal owners of the national fortune. An in depth analysis of the national oil wealth allowed me to develop my interest for the asset management of the Government Pension Fund Global, considering the potential of additional focus on responsible investments and implications of such a strategy.

In many ways I consider this final thesis as my last achievement after five years of hard, but valuable studies, equipping me with knowledge and experiences in which I am humble and grateful for.

I wish to thank my family and friends for supporting me through this process. A special thank goes to Ingrid Helen Kronborg and Mia Askevold for spell checking and questioning my results. At last, but not least, I am grateful for my supervisor Ingvild Almås's valuable insights and feedback during the study. She showed great flexibility and shared her thoughts and ideas, and I am very thankful for her guidance during the process of writing this master thesis.

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1. Introduction

Discovering oil on the Norwegian continental shelf has unquestionably had a huge impact on the Norwegian wealth. To limit the effect of the temporary gift on the Norwegian economy, the Norwegian Government Pension Fund Global (GPFG) was established. The so called fiscal rule involves a 4% pay-out ratio for the fund, included in the Norway's national budget. The fiscal rule is supposed to reflect the long term real expected return of the GPFG. The fund is meant to increase future Norwegians purchasing power; which also is the meaning of the term "pension fund" in its name. The fund's name and main objective causes the citizens of Norway to be interpreted as the owners of the fund, even if the Ministry of Finance is the formal owner. The management and the size of the fund attract domestic and international attention, which requires great transparency and consistency of its management.

Even though the GPFG critics are numerous, the chosen focus of this thesis is to what extent the portfolio is tilted towards developed economies. The fund is often accused to avoid contributing in developing countries. One side of the debate includes political and spillover effects, implying whether or not the capital should be invested as a political tool or in the purpose of generating spillover effects[1] increasing development in challenged economies. The other side of the debate addresses how to maximize the portfolio return. The Ministry of Finance is constantly stating that the overall objective for the fund is to maximize its profits, hence simple returns[2] are also the focus of this thesis. Politics and spillover effects is therefore not quantified and incorporated in the sampled data. Other effects than short term revenues for investing in developing countries will to some extent be discussed in chapter 7.

To study the topic of responsible investments in the GPFG the fund has been compared to Norfund, which objective is to ensure capital flows to sustainable companies in developing countries. Norfund is part of a sister organization called Developing Financial Institution (DFI), which by some are claimed to deliver higher rates of returns simultaneously as the funds contribute to improvement in challenged regions in the global economy. An example

[1] Spillover effects do here includes decreased unemployment, access to critical goods, increased taxable revenues, enhanced basic services, reduced poverty in general (International Financial Corporation, 2011).

[2] Simple returns are here interpreted as an investment's profit before tax and interest hence the actual capital gain.

of such studies is Sony Kapoor's "*Investing in the future*" commissioned by the Norwegian Church Aid. In Kapoor's report Norfund is claimed to outperform the GPFG, and therefore Kapoor recommends the GPFG's mandate to incorporate a similar investment strategy (Kapoor, 2013).

Kapoor's findings were somehow surprising, as fundamentals of finance entails rather conservative expectations for excess returns. However, different angles of the comparison could cause different conclusions. It was therefore interesting to test if the funds' officially reported return, excluding all kinds of spillover effects, would confirm Kapoor's findings. The simple neoclassical production model and the Lucas Paradox were applied to investigate the returns of the two funds. In this way this thesis tests Norfund's ability to outperform the GPFG, and if so, to what extent this is predicted by economic theories.

After a thorough brainstorming process the thesis is spun out of a genuine interest for the Norwegian oil wealth and the asset management of the GPFG. The curiosity for understanding how alternative investment approaches could increase the value of the portfolio has resulted to the following key question:

How do a simple neoclassical model and the subsequent Lucas Paradox predictions correspond to the historical returns of the Government Pension Fund Global and Norfund?

The key question is gradually answered through the eight chapters firming this thesis. In chapter 2 relevant background information for the analysis is provided. Chapter 3 describes the theoretical framework and its predication regarding the GPFG and Norfund. The obtained data and its challenges for comparability will be clarified in chapter 4. In chapter 5 the empirical analysis and the findings will be revealed. The following chapter 6 will discuss possible explanation of the findings in the empirical analysis. Chapter 7 is a further discussion addressing the on-going debate regarding responsible investments in the GPFG. Summary remarks are stated in chapter 8.

2. Background

In the following chapter the history and the current situation of the GPFG and Norfund will be presented. The management and the strategy of the GPFG are largely discussed, and compared to funds with different investment approaches. In this study the GPFG was assessed along with Norfund, which is also involved with the Norwegian Government. The characteristics of the two funds will be addressed, especially in regards to the variation of the mandates that the funds are given. The addressed dissimilarities will be subject to the further empirical analysis and discussion.

2.1 Discovering oil and counterforcing the Dutch Disease

The Norwegian oil adventure has had a tremendous effect on the Norwegian economy since the Ekofisk reservoir was confirmed in December 1969 (Norsk Olje og Gass, 2010). After a period of investing in facilities for the new industry, production became profitable. In the wake of the oil discovery the consumptions growth rates increased. A situation that can be interpreted as increased living standards due to borrowing the expected petroleum resource rents (Holmøy & Heide, 2005). To counter this challenge it was suggested in 1983 to establish a fund of the savings of the temporary large revenues from the petroleum sector. The intention was to limit the consumptions of the revenues to the real return on accumulated financial assets, forming the fiscal rule. In this way, the Norwegian Government tries to avoid the so-called Dutch Disease[3].

The dreaded disease has been observed in countries where a temporary increased income entails a de-industrialisation in the economy, causing unsustainable expansion in public services and social welfare. The situation becomes damaging for a nation's economy when its increased revenue and its reduced manufacturing sector create a shift in the demand of goods causing the domestic prices to rise. The country's demand for goods exceeds its production, triggering the nation's currency to appreciate compared to other countries. In that case the nation's export becomes relatively expensive compared to other countries, and the imports become cheaper. The manufacturing sector can be described to be less

[3] The Dutch Disease is a phenomenon named by the challenging economic situation in the Netherlands that followed the nation's discovery of gas in 1959.

competitive, possibly making the economy to suffer from trade deficit (Holmøy & Heide, 2005; Norman & Orvedal, 2010). When such a challenging economic situation is reversed, it may be further exacerbated by increased unemployment in the country. However, Norman & Ovredal (2010) argues that the Norwegian economy never will be threatened by these issues due to the establishment of the GPFG and the fiscal rule. The fiscal rule is claimed to reflect a sustainable equilibrium of demand and production.

2.2 The GPFG and its challenges

From the fund's inception in 1996 its investment strategy and size has been continually enhanced. The GPFG is today the world largest sovereign wealth fund, holding approximately 1.25% of the world's stocks (Kapoor, 2013). Figure 1 illustrates the historical development of the market value of the portfolio and further prediction until 2020. The graph indicates a tremendous growth of the invested portfolio, and last year the value of the portfolio exceeded one million kroner per capita.

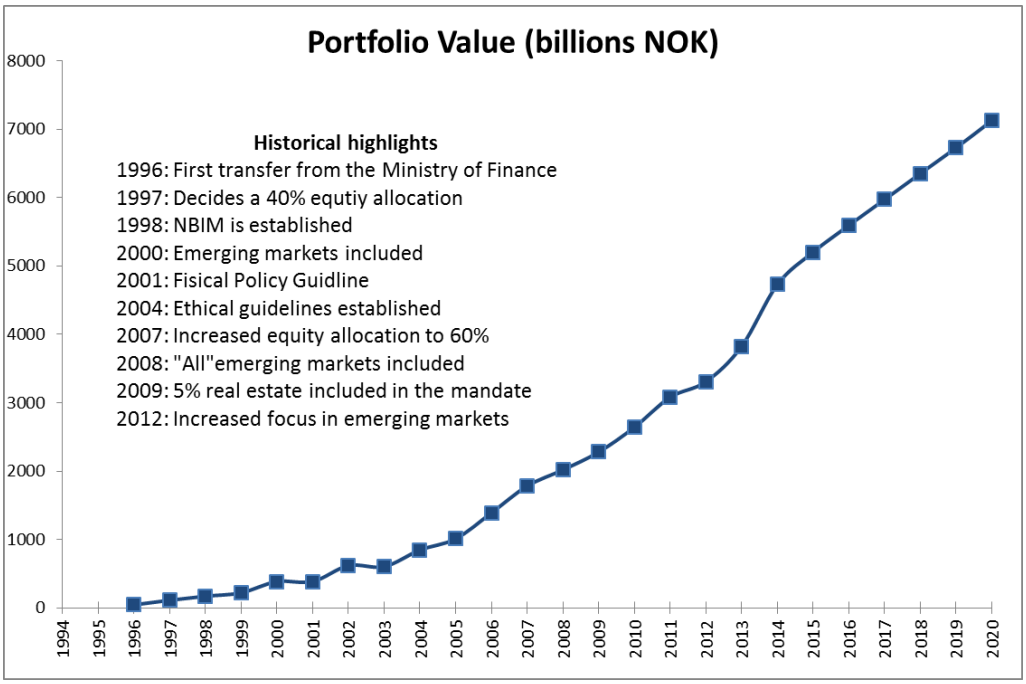

Figure 1) The GPFG's accumulated portfolio value[4] (billion NOK) (Finansdepartementet, 2013; NBIM, 2014e; Regjeringen, 2014)

[4] 4% real return are deducted from the historical and predicted values, in accordance with the established fiscal rule.

Even though the fund in many ways is interpreted as successful, it has been widely discussed and also criticised by many. The reported average real return, deducted for management cost and inflation, is 3.6%, i.e. lower than the fiscal rule of 4.0%. Hence the fund is underperforming its long-term target return, which is problematic. It can be argued that the fund's restrictions inhibit potential increased returns, for example alternative investments like private equity. Another example of restriction is how annualized standard deviation for the relative return between portfolio and its benchmark, the tracking error, shall not exceed 1.0% (NBIM, 2014c). This restriction can be said to limit the GFPG possibility to act like an actual active investor, gaining excess return from stock picking.

Another debated issue is the GPFG's ability to adapt to new markets and perform a responsible investment strategy. As a result the Strategy Council was asked to examine the fund's responsible investment strategy in 2013. The assessed report of the Strategy Council does among other things acknowledging the complexity and challenges regarding efficiently organisation and management of the fund. The complexity of the organisational structure can easily be misinterpreted. Especially can exclusions of companies or markets unfortunately be interpreted as political actions by the Norwegian Government.

The Ministry of Finance has the formal responsibility of the Fund, while the operational responsibility has been delegated to the Norwegian Central Bank and the subdivision Norges Bank Investment Management (NBIM). NBIM's task is to ensure the fund's return for the fixed mandate (NBIM, 2014b). In addition, the Council of Ethics provides recommendations on exclusions to the Ministry of Finance. Figure 2 below describes the structure of the communication flow of instructions and the reporting of responsible investments in the GPFG. The wide arrows with text illustrate the downward communication in the hierarchy, while the narrow arrows indicate the upward communication in the structure of organizations (Dimson, Kreutzer, Lake, Sjo, & Starks, 2013).

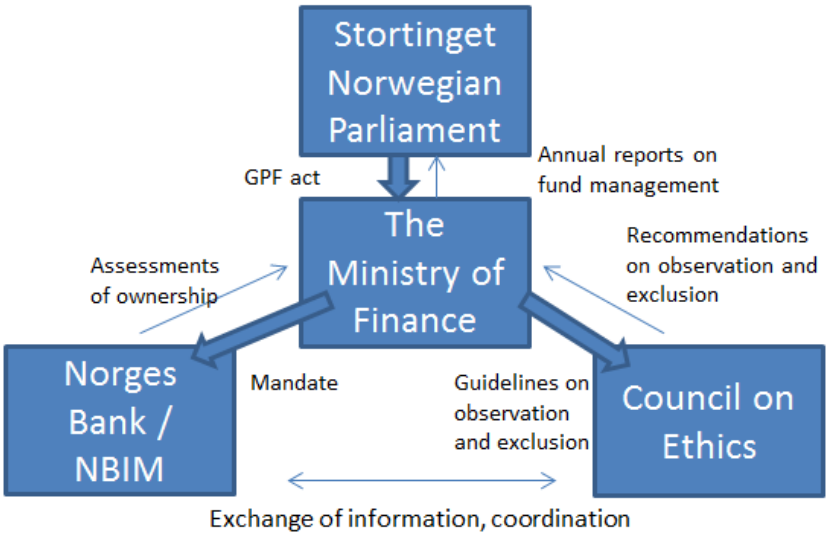

Figure 2) Structure of tasks regarding responsible investments in GPFG (Dimson et al., 2013)

2.3 Disparities between the GPFG and Norfund

Kapoor (2013) argues in his study that the returns of a DFI can outperform the GPFG's current returns, using Norfund as an example. Norfund's investment strategy differs from the GPFG as it is not profit maximizing, but established to contribute capital for development of sustainable commercial activities in emerging markets (Norfund, 2013). In this way Norfund helps companies which otherwise struggle with funding due to high risk or lack of capital. The organization claims that their ability to be exposed to higher risk is due to its hybrid state-owned structure, directly related to the Ministry of Foreign Affairs, through the Norwegian development assistance budget (Norfund, 2013).

Both Norfund and the GPFG argue to behave as active investors. The distinction is however that Norfund gives actual business development support. Norfund argues that this form of active ownership will contribute to better investments and gives the opportunity to focus on the project that gives strong development effects, hence amplifying these effects.

In the GPFG's overall portfolio, the equity portfolio corresponds to 60% of the strategic benchmark, while the bond portfolio constitutes 40% of the index, less the share of real estate investments. The benchmark portfolios are mainly provided by world market indexes, tilted towards developed countries (NBIM, 2014c). Norfund's strategy classifies the fund's operations in three different sectors: renewable energy financial services and agriculture (Norfund, 2013). The selected sectors are found to be particularly important for development

effects when they are well run. Functioning banking systems and accessibility to electricity is identified to be critical infrastructure for development (The World Bank Group, 2008). Both banking and renewable energy is also industries where Norway access expertise that can be utilised across borders (Alfaro, Kalemli-Ozcan, & Volosovych, 2008).

The last important distinction from the GPFG is that Norfund not operate with a specified target return. The argumentation for this is that target returns potentially prevent high-risk investment. A given target for the portfolio may have caused shifts in the initial mandate, away from difficult regions, to projects with lower risk and higher overall profitability. Norfund argues that this strategy helps the fund maximizing development effects (Norfund, 2013). This is identified as one of the current problems regarding the responsible investment strategy in the GPFG (Dimson et al., 2013).

Figure 3 sums up the some highlighted facts for the two funds, to easier get an impression of the funds' size, geographical presence, main objectives and important characteristics of the holdings.

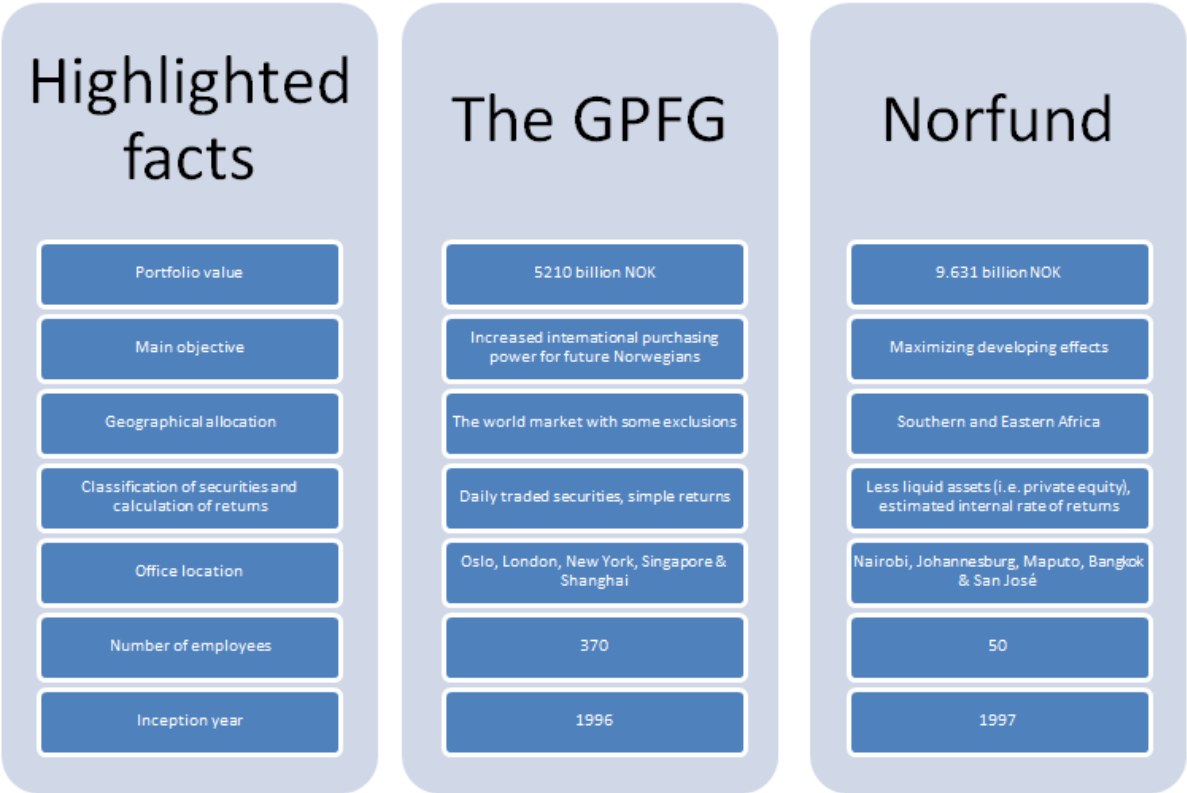

Figure 3) Highlighted facts for the GPFG and Norfund

2.3.1 Geographical allocation

The equity portfolio stands for the majority of the GPFG total holdings. A simplification in the following analysis is therefore that the geographical allocation of the equity portfolio represents the fund's total portfolio. The actual geographical allocation of the equity portfolio is visualized in Figure 4. The pie diagrams illustrate how the portfolio is tilted towards developed countries, and only 9.0% of the total equity portfolio is invested in emerging markets. The five countries which hold the biggest part of the GPFG's portfolio will therefore represent the GPFG, namely the United States, United Kingdom, France, Germany and Japan. The corresponding GDPs per capita are summed up in Table 1.

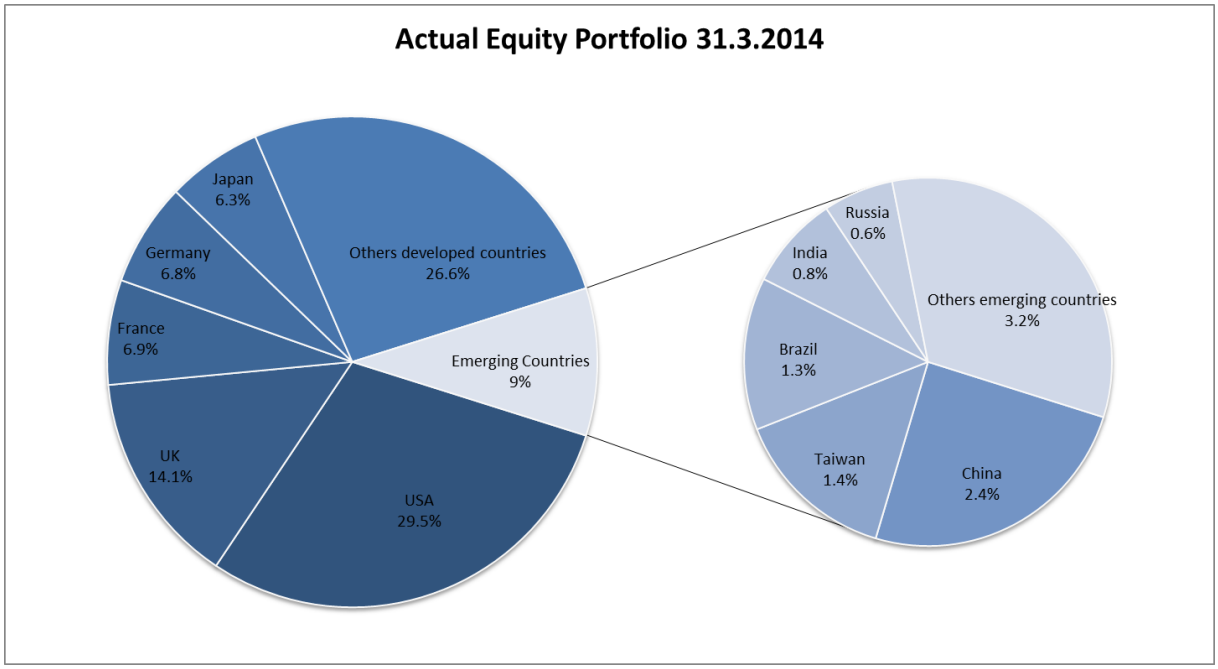

Figure 4) The GPFG's actual geographical allocation for the equity portfolio per 31.3.2014 (NBIM, 2014a)

GDP per capita (current US$)	2012
United States	51749
Japan	46731
United Kingdom	38920
France	39746
Germany	42597
Average	**43949**

Table 1) GDP per capita (US $) representing the GPFG[5] (The World Bank Group, 2014)

This allocation is vital to be able to obtain appropriate data to test the predictions of the simple neoclassical production model.

To ensure the required expertise and knowledge in the organization, Norfund has concentrated the fund's investment to a limited number of countries (Norfund, 2013). Africa is the dominating region, with over 50% of the fund's holdings. Sufficient addition expertise is also provided through certain key partners in the regions. The geographical allocation of Norfund's portfolio is roughly described in the preliminary financial report published on the fund's web site. Figure 5 is based on the key figures presented in the preliminary report of 2013.

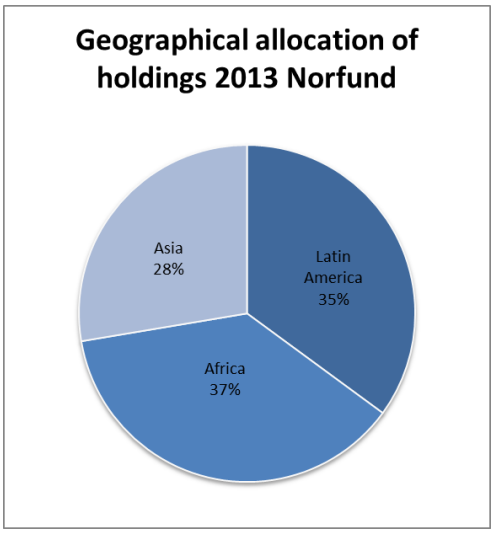

Figure 5) Geographical allocation of Norfund's holdings 2013 (Norfund, 2014b)

[5] The World Bank Group's calculations for the GDP is done by summarizing each the countries' gross value added by all producers in the economy and any product taxes, and by deducting any subsidies not included in the value of the products. Depreciation of fabricated assets, degradation and depletion of natural resources are not deduced. The presented GDP per capita is the described GDP over each county's midyear population (The World Bank Group, 2014a).

According to Figure 5 and statements in Norfund's latest reports, Southern and East Africa are indicated to be the fund's focus, hence it is reasonable to obtain data for further calculation from these regions. Accompanied by UNICEF's definition of Southern and East Africa, Table 2 represents the countries with its respective GDPs per capita used for computing an average of the region's average GDP per capita.

GDP per capita (current US$)	
Angola	5482
Botswana	7238
Burundi	251
Comoros	831
Eritrea	504
Kenya	943
Lesotho	1193
Madagascar	447
Malawi	268
Mozambique	565
Namibia	5786
Rwanda	620
Seychelles	12783
South Africa	7352
South Sudan	943
Swaziland	3042
Tanzania	609
Uganda	551
Zambia	1463
Zimbabwe	714
Average	**2579**

Table 2) GDP per capita (US $) representing Norfund (The World Bank Group, 2014a; UNICEF, 2014)

2.4 Political aspects

The objectives for the two funds identify an important difference between the two funds. While the Ministry of Finance constantly states that the overall purpose of the fund is to maximize the nation's future purchasing power, Norfund strive to maximize the development effect of its investments.

In the long run, the GPFG's profit maximizing strategy is depending on sustainable development in economic, environmental and social terms. Increased returns are also

connected to well-functioning, legitimate and effective markets (NBIM, 2014c). However, this is not the overall target for the GPFG as it is for Norfund.

This distinction in the funds' investment strategies is important to acknowledging as it reveals the duplicity in the debate regarding the responsible investment in the GPFG. The critics can be categorized into two sections, political and financial issues.

For the purpose of this thesis, the political aspects have not been included in the empirical analysis, due to its time limitation and complexity of quantifying spillover effects of investing in emerging markets. Political considerations will however be discussed in some extent in chapter 7. It is also important to notice that the current government has signalized that the fund's investment strategy will remain unchanged, thus focused on increased purchasing power through returns. Assuming no dramatic changes of the fund's mandate in the coming years, the debated political issues of its investments will not be relevant unless it causes the fund's returns to change.

3. Theoretical Framework

In Lucas (1990) the contradiction between the predictions of an international version of a simple neoclassical model of production and the observed capital flows is described (Lucas, 1990; NBIM, 2012). The prediction from the simple neoclassical model is that capital flows should take place from rich to poor[6] countries. However, what we observe is that gross capital flows mainly take place between rich countries. Net flows from rich to poor countries have actually been negative in recent decades (NBIM, 2012).

3.1 A Simple Neoclassical Production Model

In Robert E. Lucas Jr.'s research in 1990 "*Why Doesn't Capital Flow from Rich to Poor Countries?*", he questions and tests the limitations of a neoclassical model regarding trade between rich and poor countries. The research is based on a simple one-periodic neoclassical model and can be derived by the economies of two countries, which produces the same good with the same constant returns to scale production function, *Y*. *Y* is interpreted as a country's gross domestic product, GDP. The production function relates output to homogeneous capital and labour input. Another assumption for the model is that both countries have the same level of technology (Lucas, 1990). Any differences in production per worker are therefore caused by variances in levels of capital per worker for the two countries. The marginal product of capital is higher in the less productive economies, this is called the Law of Diminishing Returns. If the Law of Diminishing Returns holds, trade in capital goods is free and competitive, and new investments will occur in poor economies. This will continue until capital-labour ratios are equalized, affecting the wages and capital return. In the following a simple neoclassical production model will be described to further present and explain Lucas' findings.

[6] Poor countries are interpreted as countries with low GDP per capita, while rich countries have high GDP per capita. Other terms related to this topic is emerging/emerged markets and developing/developed countries. Emerging markets are not distinctly different from other markets in other ways than that the markets are rapidly catching up from a lower base (Khanna & Palepu, 2010). Developing countries concerns countries where the majority lives on far less money, and with far fewer basic public services, than people in industrialized countries (The World Bank, 2012).

A simple version of a neoclassical production function is the so called Cobb-Douglas function:

$$1)\ Y = AL^{1-\beta}K^{\beta},$$

where A is the level of technology, L is the country's aggregated labour and K is the total capital. β is capital share per labour.

Let x be capital per worker and y be income per worker:

$$2) = \frac{K}{L}\ and\ y = \frac{Y}{L},$$

and substitute x into 1):

$$3)\ y = Ax^{\beta} <=> x = \left(\frac{y}{A}\right)^{1/\beta}.$$

The return of capital is denoted r and is given by the marginal product of the capital:

$$4)\ r = \frac{dY}{dK} = AL^{1-\beta}\beta K^{\beta-1} = A\beta x^{\beta-1}.$$

Rewritten with substitution for x, r can be derived as a function of y:

$$5)\ r = A\beta x^{\beta-1} = A\beta\left[\left(\frac{y}{A}\right)^{\frac{1}{\beta}}\right]^{\beta-1} = A\beta\left[\frac{y^{\left(\frac{1}{\beta}\right)*(\beta-1)}}{A^{\left(\frac{1}{\beta}\right)*(\beta-1)}}\right] = A\beta\left[\frac{y^{\left(\frac{\{\beta-1\}}{\beta}\right)}}{A^{\left(\frac{\{\beta-1\}}{\beta}\right)}}\right] =$$

$$A\beta A^{\frac{-\beta+1}{\beta}}y^{\frac{\beta-1}{\beta}} = A^{\frac{\beta-\beta+1}{\beta}}\beta y^{\frac{\beta-1}{\beta}} = A^{\frac{1}{\beta}}\beta y^{\frac{\beta-1}{\beta}}.$$

Hence the marginal capital returns of production (both per worker) is given by the following derivation:

$$6)\ \frac{dr}{dy} = \frac{\beta-1}{\beta}A^{\frac{1}{\beta}}\beta y^{\frac{\beta-1-\beta}{\beta}} = (\beta-1)A^{\frac{1}{\beta}}y^{\frac{-1}{\beta}}.$$

Notice how $\beta < 1 \rightarrow \frac{dr}{dy} < 0$, i.e. the larger y, the lower r. The implication of the above derivation is that the return on capital should be higher in poor relative to rich countries. When perfect international capital mobility is introduced, capital will flow to the countries with highest rates of return. In the model world, the initial poor countries are predicted to obtain the highest rates of return. The capital should flow from wealthy to poor nations, and no investment in rich countries would be expected. This process is predicted to continue

until the rates of capital returns are globally equalized. This result will be limited by the assumptions for the model.

By the construction of the funds' mandates, the GPFG's equity portfolio is tilted towards relatively rich and developed nations, while Norfund consequently invests in emerging and poor economies. This identification makes it possible to forecast the expected return on capital for each of the funds, based on the above simple neoclassical theory. If the world markets were somewhere close to efficient like the model assumes, return on capital, *r*, would be predicted to be significantly higher for Norfund than for the GPFG.

3.1.1 The Lucas Paradox

Lucas studied the mismatch between actual capital flows and predicted capital flows from neoclassical theories. Lucas computed a very simple evidence of the inappropriate assumptions for the neoclassical model, based on the two countries USA and India. Using the differences in production per worker, the American production was fifteen times what it was in India. The technology, A, is assumed to be constant and a given capital share[7] of $\beta = 0{,}4$. With these simplifications Lucas argued that the marginal product in India should be $15^{1{,}5} = 58$ times the marginal product of capital in the United States. In that case capital would flow from the United States to India, expecting no other investment to wealthy countries. As we do not observe such large flows of capital, Lucas studied possible explanations for this.

There are some difficulties with the assumptions for the neoclassical model, which Lucas (1990) discussed. The Lucas Paradox points out three considerable limitations of the neoclassical theory: Differences in Human Capital, External Benefits of Human Capital and Capital Market Imperfection (Lucas, 1990).

1. **Differences in Human Capital**

Standard neoclassical theories do not take into account the possible differences in efficiency for labour input. This limitation in the regular models will ignore the variety in labour quality, called human capital per worker.

[7] $\beta = 0{,}4$ is the average capital share of USA and India in Lucas (1990).

By implying estimates for differences in human capital Lucas shows that the predicted *y* does decrease for poor countries. Lucas highlights this finding by replacing unadjusted labour with *effective labour*, resulting differences in return on capital for the two test countries to be smaller. However, the differences were still large enough to lead to expectations of capital flows from rich to poor countries (Lucas, 1990).

Lucas also points out that with constant returns, equal capital returns causes equal wages for equal labour. In that case, there will be no motives for flows of labour as long as there is no economic motive for capital flow. Still, immigration rates from poor to rich countries are at the maximum according to rules of immigration. Lucas argues that the immigration from Mexico to USA is clear evidence that the actual capital flow cannot fully be explained by differences in human capital, excluded by substituting with effective labour rates (Lucas, 1990). The mentioned stream from Mexico to USA still exists, and we have also observed similar streams from Eastern to Western Europe in the last decades. Hence, the Lucas Paradox can be argued to be just as present today considering these examples of cross country human capital flows.

2. External Benefits of Human Capital

In his further analysis Lucas (1990) assumed that an economy's technology level is the average level of its workers' human capital raised to a power, changing the product function. The new function presents the income per effective worker and a new variable for human capital was established. The new variable was interpreted as external effects.

The surprising result of this technique is that taking external effects of human capital into account entirely eliminates the differences in predicted returns between the test countries (Lucas, 1990).

This cross-country comparison is based on an important assumption that external benefits of a country's stock of human capital accrue entirely to producers within the same country, and acknowledging spillovers across countries is non-existing (Lucas, 1990).

If the above limitation is ignored, Lucas' research suggests that when human capital differentials are corrected the predicted difference in returns between rich and poor nations is dramatically reduced, and possible fully absent if knowledge spillovers are local enough.

3. **Capital Market Imperfections**

The hitherto used statements represent a mindset that treats flows as borrowing contracts across borders. Poor countries acquire capital from wealthy nations today, and in return they have a promising future with good flows to the rich countries in the days to come. If such an arrangement should be attainable, and in order to create a competitive equilibrium, there must be an effective mechanism ensuring international borrowing agreements. Lacking effective mechanisms like these are referred to as market imperfections, and are often included in the term "political risk". The most serious difficulty with political risk is that some of the explanation of the cash flow inadequacy lies in the novelty of the current political arrangement between rich and poor countries. Regarding market imperfections, Lucas' study concludes that restrictions on capital flows from the borrowing country can be explained by mistrust of foreigners or a reluctance to let development proceed too fast (Lucas, 1990).

The Lucas' report concludes that the effects of Human Capital successfully can be incorporated in the simple neoclassical model. Therefore the human capital issue cannot be interpreted to comprehensive explain the unexpected, negative capital flow between poor and rich countries. The political risk and market imperfections, on the other hand, are seen as important factors in the limitations of capital flows.

To conclude, Norfund's mandate to entirely invest in developing and emerging markets results in the fund's portfolio being particularly vulnerable to political risks. According to the Lucas Paradox, political risk is a decisive consideration of why capital flows to such regions are negative. A further prediction is that the Lucas Paradox may cause Norfund's return on capital to decrease.

3.1.2 The neoclassical prediction for the GPFG and Norfund

Recalling the representative geographical allocation for the two funds in section 2.3.1, a simplified average of GDP per capita for the relevant countries was computed.

Fund	Average GDP per capita
The Government Pension Fund Global	43 949 USD
Norfund	2 579 USD

Table 3) Average GDP per capita in invested regions (The World Bank Group, 2014a)

Table 3 sums up the average GDP per capita for the relevant regions. Let the average GDP for the countries heavily represented in the GPFG portfolio be denoted y_{GPFG} and correspondingly $y_{Norfund}$ for Norfund. The ratio of GDPs for the regions can be computed:

$$\frac{y_{GPFG}}{y_{Norfund}} = \frac{43\ 949\ USD}{2\ 579\ USD} \approx 17$$

Hence it can be argued that the countries represented in the GPFG have a production per person about seventeen times the investment region in Norfund's portfolio.

When applying the same argumentation[8] as Lucas (1990) did when the Lucas Paradox was established, the differences in production per person in the two identified regions would cause Norfund's marginal product of capital to be $17^{1,5} \approx 70$ the marginal product of capital in the investment regions of GPFG[9]. This represents a great difference in expected returns for the two funds.

[8] Constant level of technology, A, and a given capital share of $\beta = 0{,}4$.

[9] According the simple neoclassical model: $r_{GPFG} = \left(K17y_{Norfund}\right)^{-1,5} \rightarrow 17^{1,5}r_{GPFG} = Ky_{Norfund}{}^{-1,5}$

4. Data

Holding mainly publically traded securities is reflected by the GPFG's annual reports, providing a range of key figures. The GPFG's returns were therefore straightforwardly retrieved from the fund's latest produced reports at the Ministry of Finance's web page.

The presented returns for the Norfund is based on the organization's official reports on operation from 2008 – 2012, retrieved from the fund's web site. After conversations with Norfund, there has also been possible to obtain calculations of returns for the years 2002-2007 and 2013. There was no realization of Norfund's holdings from the fund's inception in 1997 until 2002; hence including this period in the sample population is not considered to be appropriate.

Due to the limited amount of available data for Norfund and both funds' relatively short existence, only twelve years of data was successfully obtained for the empirical analysis. The implications of the limited sampled data will be discussed in section 5.2 Requirements for the t-test.

4.1 Comparability

To be able to conduct the empirical analysis in chapter 5, it was necessary to clarify some challenges in the sampled data. Identification of these challenges and the provided enhancements are meant to prepare the comparability of the data samples. Firstly, issues regarding the two funds initial reported returns are discussed. In section 4.1.2 impacts of management costs are incorporated for the further analysis.

4.1.1 Return calculations

The GPFG's presented annual returns are based on time-weighted monthly rate of returns, using the geometric average of the assets trading prices. Fair value of the assets is determined on the day the external cash flow, generating geometric interim returns. Fair value is the predicted realizable value of an asset or the assumed cost of settling a liability between willing and informed partners (NBIM, 2014d).

Norfund does on the other hand use the internal rate of return (IRR) as an estimate for the actual return of its investments. The IRR is based on estimations of the future cash flows for

the investments, and valuations of the projects at the end of each year (Norfund, 2013). The actual fair value of a project will not be known until the investment is realized in the market. Not being able to obtain current market prices of the investments creates uncertainty in evaluating the fund's value and rate of returns.

In regards of the mentioned observations, it is important to recognize the impact of such differences of the reported numbers for GPFG and Norfund, and try to reduce these effects as much as possible. The following discussion emphasis the assumptions and simplification done to dispute these issues, and therefore incorporated for the further analysis.

Currency fluctuations

To exclude effects of fluctuations in currencies, the returns used for further calculations are returns based on the local currency of the actual investment. For both the GPFG and Norfund it is important to stress that it is the return in international currency that are relevant to measure international purchasing power.

Inflation

For simplicity, the inflation effects for both funds are ignored. If this effect should have been included, the inflation must have been corresponding to the chosen currency. In this report the returns are processed in their local currency, hence the inflation issue must also been weighted for the same currency and country.

Geometric averages

The geometric return represents the average weighted return over time, while the arithmetic return is a simple average of the return for a given period. As the compounding effect generated by the geometric average causes differences in the two types of returns, it is appropriate to arrange the geometric returns for funds like the GPFG and Norfund (Bodie, Kane, & Marcus, 2011; Finansdepartementet, 2012). The computation of geometric average return for Norfund was therefore essential for the comparably of data. The computation and its effects on Norfund's returns are shown in Appendix 1.

4.1.2 Management costs

The management cost for a fund is crucial in evaluating the funds' performance. A big fund is likely to develop economies of scale due to its size and ability to utilize internal expertize in the asset management. Economies of scale for a fund can be visible in low management

cost. Due to monitoring cost of the portfolio, actively managed fund is expected to cause higher managerial costs than passively managed funds. However studies have also proven that sovereign wealth funds performing an active monitoring of its holdings are associated with abnormal returns for the firm acquired, while the holdings of passive funds underperforms (Bortolotti, Fotak, & Megginson, 2013).

The Government Pension Fund Global

Management costs for GPFG is defined by NBIM to represent all operating cost directly related to the asset management of the fund's portfolio (NBIM, 2014a). Figure 6 describes the reported allocation of management cost for the fiscal year of 2013. In 2013 the total management costs for the fund was 0.066% of the fund's value, 0.016% of these were performance-based fees to external asset managers.

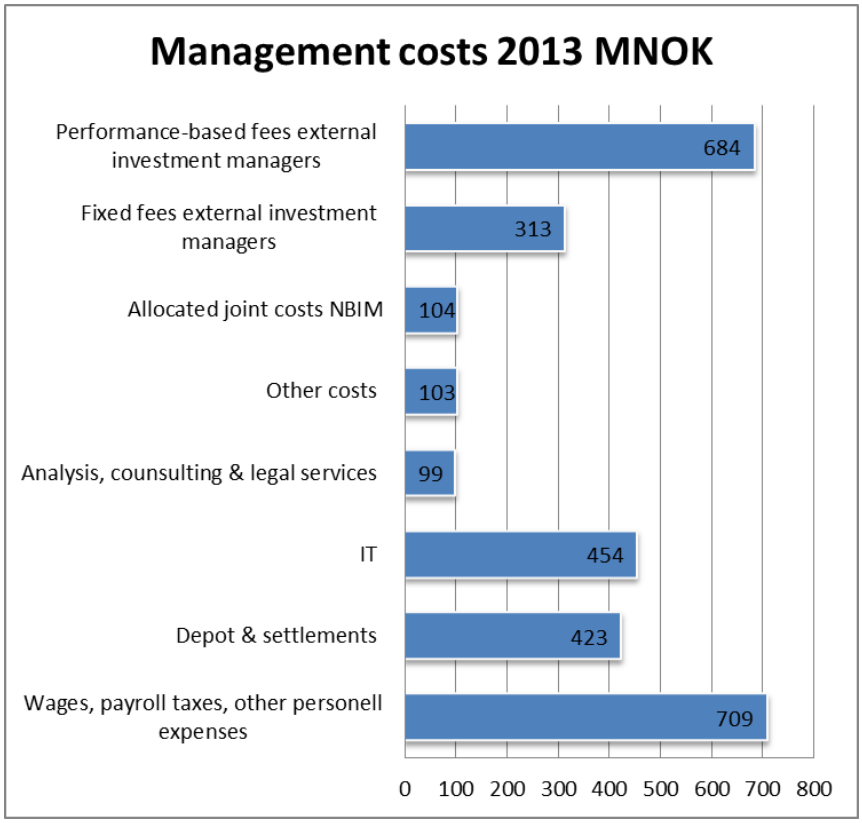

Figure 6) Allocation management costs for the GPFG 2013 (NBIM, 2014a)

Management costs of 2014 are estimated to be 0.075%, whereas the upper limit determined by the Ministry of Finance is 0.090%. NBIM's ability to outperform the Ministry of Finance's restrictions indicates the organization's focus on cost reduction and effectiveness.

GPFG	2013	Last 3 years	Last 5 years	Last 10 years	1998-2013
Management cost	0.07	0.07	0.09	0.1	0.09

Table 4) Historical Management Cost in percent reported for the GPFG (Finansdepartementet, 2014a)

The GPFG's historical management costs are presented in Table 4 above. The total average of 0.09% is incorporated in the empirical analysis. Historical cost below 0.10% is regarded as low, compared to other actively managed portfolios (see argumentation for Norfund). Hence, the GPFG can be interpreted as a low cost fund, compared to other actively managed portfolios. This interpretation is also supported by the public discussion for the fund. For example does Scott (2014) discuss how the GPFG can be deemed as an active owner, performing a passive investment strategy in Financial Times 6th of April 2014. Scott argues that a fund can be perceived as an active owner, for example by exclusion of corporations with undesirable characteristics, and at the same time conduct a passive investment approach. Exclusion of enterprises with unwanted behaviour is currently an essential sanction for the GPFG, which are predicted to be even more important as the fund continues to grow (Dimson et al., 2013).

Norfund

Historical management cost for Norfund has been estimated from annual reports published from 2008-2013. According to Norfund's financial reports and notes, "total operating expenses" contains wages, salaries, other payroll expenses and other operating expenses (Norfund, 2013). Hence, the post corresponds to GPFG's post of management cost related to the portfolio management. To make the management costs for the two funds comparable, it is reasonable to compute Norfund's ratio for management cost based on the fund's total operating expenses over total invested portfolio.

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	***Average***
Total operating costs	74	79	78	114	106	127	*96.33*
Total invested portfolio	4798	5264	5844	7580	8295	9631	*6902*
Management cost ratio	1.54	1.50	1.33	1.50	1.28	1.32	*1.41*

Table 5) Historical management cost ratios Norfund in percent, cost in millions NOK (Norfund, 2009, 2010, 2011, 2012, 2013, 2014a)

Table 5 indicates the development in Norfund's operating costs. The growth of the portfolio will increase the operational expenses, but we observe a slight decline in computed ratio for management costs. This can be interpreted as an effect due to economics of scale, the size of

the fund increases the effectiveness of the asset management. The observed decline is a positive trend regarding future predication of the fund's profits. The computed rates in Table 5 will be applied for the further analysis of returns deducted for management costs. It has not been possible to obtain information on the operational cost for the period 2002-2008. Therefore the rate of 2008, 1.54%, will be applied as an estimate for this period.

From researching other similar funds investing in emerging markets and private equity, management costs and fees has ranged from 2-3%[10] (DnB, 2014; Odin Forvaltning, 2014; Skagenfondene, 2012). Even though some of these peers are in greater extent commercialized, it still gives an indication of the level of actively management costs in the investment banking sector. Hence, the initial thought for this report was that Norfund's management costs must at least exceed 2%, bearing in mind the risk profile and active management of the portfolio. However, internal sources have confirmed that the above calculations of management cost ratios do correspond with the fund's estimates of management costs.

4.2 Credibility of the sampled data

Credibility is associated to the evaluation of the obtained data for the analysis. The term can be divided into two sections: Reliability and Validity (Saunders, Thornhill, & Lewis, 2009). Each of the terms will be defined with examples from the acquired data sample in the following paragraphs.

4.2.1 Reliability

Reliability describes to what extent the analysed data will result in consistent findings when applied in other studies (Saunders et al., 2009). In regards of both of the funds, especially Norfund, there is reasons to believe that the economies of scale will be further enhanced causing the portfolio management to be more efficient. When cost structure and returns for

[10] DnB Global Emerging Markets 1.80%

ODIN Emerging Markets 2.00%

Skagen Kon-Tiki 2.93%

the funds has the ability to change in later periods, it is not possible to generalize the sampled data for related studies in the years to come. In addition, other studies could also be based on data where inflation and currency fluctuation where incorporated. In this report, the data has been processed in accordance with the funds stated objectives and guidelines.

Norfund's risk profile and mandate cause the fund's returns to fluctuate over years, and this variation is also expected in the future. The country risk for the fund is assumed to be higher than for other traditional investors, as the investments are done in some of the poorest countries in the world. Norfund calculates with especially high risks for project in fragile states like Myanmar and South Sudan. Possible losses of such investing activities define the fund's risk profile. This characteristic of Norfund impedes to generalize the findings to other funds for developing countries, for example if other funds' holdings are diversified over different geographical regions.

4.2.2 Validity

The term "Validity" refers to how well a test measures what it is claimed to measure (Saunders et al., 2009). An example of validity affection on the sampled data is the financial crisis. By the construction of the GPFG's benchmark portfolio, the fund's returns must inevitably reflect the development in the world economy. This can be seen in GPFG's graphed returns in Figure 7 (see Descriptive statistics) where the graph has a sharp drop around year of 2007-2008. The world economy was without doubt affected by recession in this period, where the Financial Crisis hit the financial markets the autumn of 2007. However, NBIM ability to reposition the portfolio by acquiring even more securities rather than panic selling was a successful strategy through the period. Acting like a stable countercyclical investor, exploiting its long-term characteristics, helped the GPFG to quickly recover from the Financial Crisis.

Norfund's returns do on the other hand not reflect the same trends as the GPFG. Note that the substitution of publically traded simple returns and IRR may affect this result. Annually calculation of unlisted investments' IRR is not optimal for comparing Norfund with funds that holds public traded assets, as it not necessarily reflect the actual market price. Ideally the returns for Norfund should be based on market price of each company and investment at any time. Due to the illiquidity issues with private equity and other non-public traded assets, the IRR is probably the best estimate for the comparison.

In regards of the provided example, there are some concerns about the validity of the sampled data. The issue of comparing returns of public traded assets with IRR is particularly problematic. However, in regards to the Norfund's characteristics and internal framework of evaluating the fund's performance, this is deemed to be the best estimate for comparison.

5. Empirical Analysis

In this chapter the predictions from the simple neoclassical production model will be examined through empirical analysis. The first thing that needs to be analysed is the historical rates of returns for the two funds. This is done by first looking at the descriptive statistics and then by conducting a two-sample t-test allowing unequal variances. The t-test is designed to evaluate the differences in the funds' means. Two t-tests are conducted, excluding and including management cost.

5.1 Descriptive statistics

Table 6 shows that the historical returns from 2002-2013 are somewhat higher for Norfund than GPFG. Norfund's historical mean, exclusive costs, for the period was 7.86% while GPFG's corresponding returns was 6.57%. The variance for Norfund's sample was approximately 0.77% and for GPFG the variance was rounded to 1.53%. From Figure 7, the observed historical variance for the GPFG can be caused by the dramatic drop in returns prior to the financial crisis from 2007-2009, which cannot be observed for Norfund due to the valuation of its non-tradable assets, as discussed earlier.

	Government Pension Fund Global			**Norfund**		
Year	Returns ex. cost	Man. cost	Returns inc. cost	Returns ex. cost	Man. cost	Returns inc. cost
2002	-0.04740	0.00090	-0.04830	-0.04387	0.01540	-0.05927
2003	0.12590	0.00090	0.12500	0.06613	0.01540	0.05073
2004	0.08940	0.00090	0.08850	-0.01387	0.01540	-0.02927
2005	0.11090	0.00090	0.11000	0.03613	0.01540	0.02073
2006	0.07920	0.00090	0.07830	0.23613	0.01540	0.22073
2007	0.04260	0.00090	0.04170	0.16613	0.01540	0.15073
2008	-0.23310	0.00090	-0.23400	0.20613	0.01540	0.19073
2009	0.25620	0.00090	0.25530	0.03613	0.01500	0.02113
2010	0.09620	0.00090	0.09530	0.09613	0.01330	0.08283
2011	-0.02540	0.00090	-0.02630	0.07613	0.01500	0.06113
2012	0.13420	0.00090	0.13330	0.09613	0.01280	0.08333
2013	0.15950	0.00090	0.15860	-0.01387	0.01320	-0.02707
Mean	*0.06568*	*0.00090*	*0.06478*	*0.07863*	*0.01476*	*0.06387*
Variance	*0.01528*	*0.00000*	*0.01528*	*0.00775*	*0.00000*	*0.00772*

Table 6) Historical returns for the GPFG and Norfund, including means and variances (Finansdepartementet, 2014; NBIM, 2014a; Norfund, 2009, 2010, 2011, 2012, 2013, 2014b)

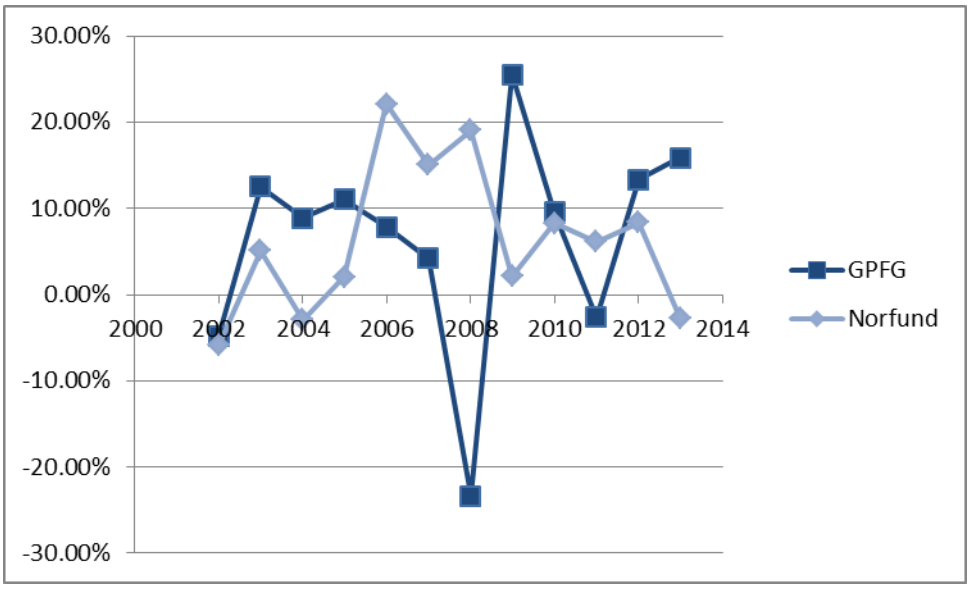

Figure 7) Rates of returns, management costs included (Finansdepartementet, 2014; NBIM, 2014a; Norfund, 2009, 2010, 2011, 2012, 2013, 2014b)

Table 6 also present the funds' returns deducted for computed historical management cost. When introducing management costs, the difference between the funds decreases. Deducted for costs, the mean rate of returns for Norfund was 6.48%, slightly higher than GPFG's 6.39%. Due to the assumptions of the management cost being relatively constant for the period, there are no remarkable changes in the funds' variances after deduction of costs.

The requirements for the t-test, construction and the result are described in the following sections.

5.2 Requirements for the t-test

In order to compare returns and performance of the GPFG and Norfund, a two-sample t-test assuming unequal variances was defined. A t-test is a statistic used for investigating if the characteristics of two samples are significantly different from each other. The t-statistic is distributed in what is called a t-distribution, which is closely related to the standard normal distribution (Ubøe, 2008). The t-statistic is t-distributed if the population from which we have sampled is normal (Keller & Warrack, 2003). In other words, the distribution of the continuously returns for the funds, if it was possible to obtain. According to well-known financial fundament stock returns are assumed to be approximately normally distributed.

However for small samples, the normality requirement is loose in the sense that the t-test performs well as long as there are no outliers and departures from normality are not too extreme (Triola, 2011). To test this requirement, histograms were drawn to illustrate the frequencies of events in the samples, determining whether it is far from bell shape caused by normality.

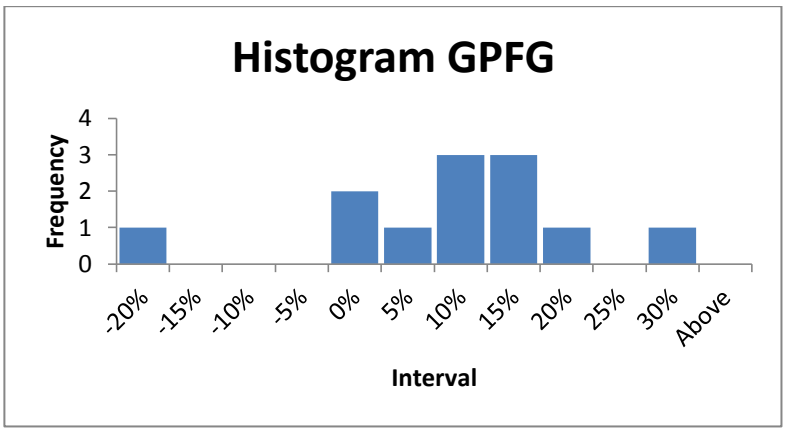

Figure 8) Frequency distribution of returns the GPFG

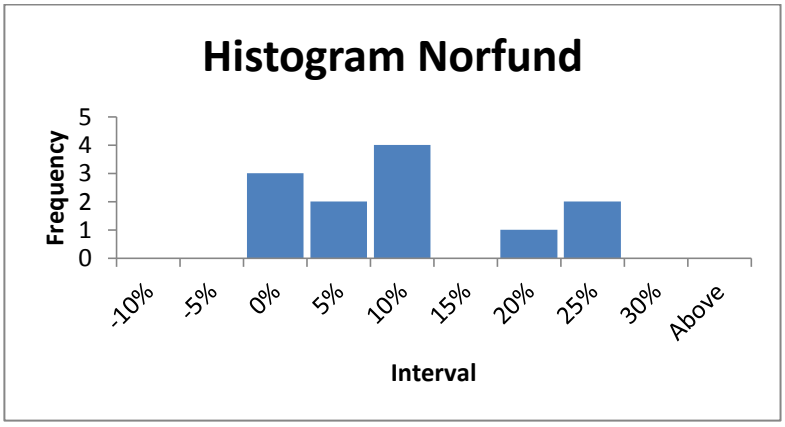

Figure 9) Frequency distribution of returns Norfund

Figure 8 and Figure 9 cannot be interpreted as perfectly bell shaped, the funds' returns are rather positively skewed to the right. Nonetheless, the figures cannot be understood as *too extreme* departures from normality. Hence the requirements for the t-test are fulfilled, and there is no reason to discredit the robustness of the t-test.

Although the requirements for the model are met, it is important to notice the implication of having a limited sample. In this case, the small amount of data will require high variation in the tested data sets or big differences in the sample means, to trigger a rejection of the null hypothesis. As an example, Norfund's maximum constant management cost rate not to

change the results was identified to be approximately 11% for the sampled data. When testing for excess return needed for Norfund to change the test results, a rate of approximately 8% was observed. The unequal decisive rates are perceived to be caused by a slightly, not significant, higher initial mean of returns for Norfund. In a financial perspective, such differences in returns are interpreted as extreme. On the other hand, according to the predictions of the simple neoclassical model, such extreme differences are expected. Recall how the neoclassical prediction estimated the Norfund portfolio to deliver a 70 times higher capital return over the GPFG.

This result gives an indication of how great the differences in the two funds' returns must have been to be able to change the result, assuming the approximately same variance in the previous samples.

5.3 Two-sample t-test assuming unequal variances

The assessed two-sample t-test assuming unequal variances reveals if the observed differences in the means of the data are reliable. The test compares the variance within one group with the variance between the groups. When there is a big variance between two groups relative to the variance within the groups, the means of the two groups will be unequal (Midtbø, 2012). Hence, a big t-value is caused by the groups to be different, while a small t-value indicates the two groups to be similar.

The test statistic for a two-sample t-test for unequal variances is given by equation 7):

$$7)\ t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{s_1^2/n_1 + s_2^2/n_2}},$$

where $(\bar{X}_1 - \bar{X}_2)$ is the difference of means in the sampled data, and $(\mu_1 - \mu_2)$ is the difference in hypothesis means. For this particular test, $(\mu_1 - \mu_2) = 0$, as it will examine whether or not the means are equal. s_1^2 and s_2^2 are the sampled variances and n_1 and n_2 is the sample sizes.

The t-test is performed by analysing a null hypothesis against an alternative; matching the test statistic and a critical value. The choices for the statistic and critical value are based on convenience and the desire to maximize power given a significance level for the test. For

example, larger samples yield more information by producing more power to the test and narrow confidence interval estimator[11], v.

For a given test statistic, a rejection rule is defined to decide when H_0 is rejected in favor of H_1. The rejection rule is based on comparing the resulted t-value with a critical value. To be able to determine the critical value[12], a significance level for the test must be decided. For a given significance level, denoted α, the critical value associated with this level is determined by the distribution of T, assuming $H_0$is true (Wooldridge, 2006). The significance level for the conducted t-test is 5%. The significance level represents the probability for rejecting a correct null hypothesis (Ubøe, 2008)

A commonly used null hypothesis for such tests is that the mean in two distributions are equal. The null hypothesis for testing if the mean of returns for the GPFG and Norfund are equal, is stated:

$$8)\ H_0: \mu_{Norfund} = \mu_{GPFG}\ ,$$

where μ denotes the mean. The corresponding alternative hypothesis is:

$$9)\ H_1: \mu_{Norfund} \neq \mu_{GPFG}\ .$$

The alternative hypothesis H_1 defines our test to be two-sided. A two sided test is suitable when any departures from the null hypothesis are relevant. For the two funds' returns, the test must include all deviations from H_0.

5.4 Findings

In the following the result of the conducted t-test of the sampled data will be presented. In the first test the computed management costs are excluded from the returns, to get the best possible view of the actual financial performance of the funds before any costs deducted.

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[11] The confidence interval estimator is given: $v = \frac{\left(s_1^2/n_1 + s_2^2/n_2\right)^2}{\left(\frac{\left(s_1^2/n_1\right)^2}{n_1-1} + \frac{\left(s_2^2/n_2\right)^2}{n_2-1}\right)}$

[12] The critical value is given: $(\bar{X}_1 - \bar{X}_2) \pm t_{\alpha/2}\sqrt{(s_1^2/n_1 + s_2^2/n_2)}$

Then the calculated management costs were deducted in the second t-test, to assess whether the differences in the funds' management cost possibly could modify the results of the first t-test.

5.4.1 T-test excluding management costs

t-Test: Two-Sample Assuming Unequal Variances		
	GPFG	*Norfund*
Mean	0.06568	0.07863
Variance	0.01528	0.00775
Observations	12	12
Hypothesized Mean Difference	0	
df	20	
t-Stat	0.29549	
P(T<=t) two-tail	0.77067	
t Critical two-tail	2.08596	

Table 7) t-Test returns exclusive management costs, α = 5%

Table 7 presents the results for the two-tailed t-test at a 5% significance level, with a t-static rounded to 0.296. From the table above, the observed t-value is:

$$-\textit{critical value} < t < \textit{critical value},$$

thus the two-tailed t-statistic do not exceed the absolute critical value, and there is no reason to reject the null hypothesis, H_0: $\mu_{Norfund} = \mu_{GPFG}$.

Table 7 also provides the test's p-value. P-value is the probability that the pattern of data in the sample could be produced by random data. From Table 7 the p-value for the t-test is 0.77, implying there is a 77% chance there is no real differences in the returns in the sample. The p-value can also be interpreted as the largest significance level to carry the test without rejecting the null hypothesis (Wooldridge, 2006). A p-value of 5% is usually regarded to reflect statistically significant differences in the average returns. Hence is also the p-value expression that there is no reason to discard the given null hypothesis for the test.

The conclusion for the two-tailed t-test at a 5% significance level is to keep the initial null hypothesis. There is no significant statistic prove that the funds' returns are different from each other.

5.4.2 T-test including management costs

t-Test: Two Sample Assuming Unequal Variances		
	GPFG	*Norfund*
Mean	0.06478	0.06387
Variance	0.01528	0.00772
Observations	12	12
Hypothesized Mean Difference	0	
df	20	
t-Stat	0.02091	
P(T<=t) two-tail	0.98352	
t Critical two-tail	2.08596	

Table 8) t-Test returns inclusive management costs, α = 5%

Table 8 presents the results for the two sample t-test assuming unequal variances, including management cost, with a 5% significance level. As already mention in the section 6.1 Descriptive statistics, the differences in mean returns for the two funds tend to diminished when deducting the management costs. In other words, Norfund's relatively higher ratio of management costs entails the fund to be less attractive than first assumed by its initial calculations of returns.

This results also implies that the t-statistic is decreased compared to the t-test excluding management costs. Recall how a small t-value representing similar groups.

The conclusion to this t-test is similarly as the previous test:

$$-\,critical\ value < t < critical\ value,$$

and in addition, the p-value is observed to be 98.35%. The p-value states that there is a 98.35% chance there is no real differences in the returns in the sample. Both the t-statistic and the p-value do clearly indicate that there is no reason to reject the null hypothesis.

There is no statistical evidence for claiming any inequalities in the two funds' returns. The summery of the provided hypothesis tests is that the difference in rate of returns is not significant. The null hypothesis remains valid, $H_0: \mu_{Norfund} = \mu_{GPFG}$. This result does however not coincide with the predicted results from the simple neoclassical model, which states that return on capital for Norfund should be significantly higher than for GPFG.

6. Why cannot the neoclassical predictions be observed?

As stated from the provided empirical analysis, the results do not coincide with the predictions from the neoclassical theory. There is no statistically evidence for Norfund's return to outperform the GPFG. Actually the sampled data does not indicate any significant differences in the returns of the assessed funds. Thus one cannot argue the predictions of the simple neoclassical production model nor the Lucas Paradox to be present in the sampled data. An evaluation of the differences between the neoclassical predictions and actual returns is nevertheless valuable to identify possible explanations for the observed mismatch. The discussion will incorporate arguments from Lucas (1990) and additional studies regarding the observed mismatch.

The limitations for the simple production neoclassical model of production are accused to not reflect a real world situation, causing the model's predictions to be less accurate. In that case, the simplifications of the model can be evaluated in order to explain the differences between the neoclassical predictions and the provided empirical findings. Challenging assumptions for the simple neoclassical model have been identified, interpreted to affect the observed return on capital of the funds' investments. The simplifications identified to cause the difference between predictions and empirical findings are sectioned into topics of, Human Capital, Technology and Infrastructure & Institutions. The mentioned topics of explanations will be discussed in the following.

6.1 Human Capital

The possibility of differences in human capital is not taken into account in the simple neoclassical model. Differences in efficiency for labour input, often referred to as human capital per worker, will therefore not be reflected in the model's predictions. When Lucas (1990) incorporated estimates for labour quality to the initial neoclassical model, the predicted capital return was reduced for poor countries. According to Lucas' finding, differences in human capital can be a possible explanation for the mismatch between the neoclassical predictions and the empirical findings of the sampled data.

Figure 10 displays plots of tertiary education enrolment rates for the countries representing the GPFG's and Norfund's invested portfolios. The plots expressed a percentage of the total population, regardless of age, of the five-year age group following on from secondary school leaving. The data is the most recent available from the Word Databank, see Appendix. 2 The dark blue plots in the figure represent countries in the GPFG portfolio, while the light blue plots illustrates countries representative for Norfund's investments. The figure illustrate a division between the two funds, as the countries representing the investment universe of the GPFG have a much higher gross tertiary enrolment ratio. If the tertiary enrolment ratio is defined as a measure of human capital, the plots expresses a clear evidence of differences in human capital for the two investment universes. The variety in the funds' human capital can therefore explain the mismatch of the neoclassical prediction and the empirical findings.

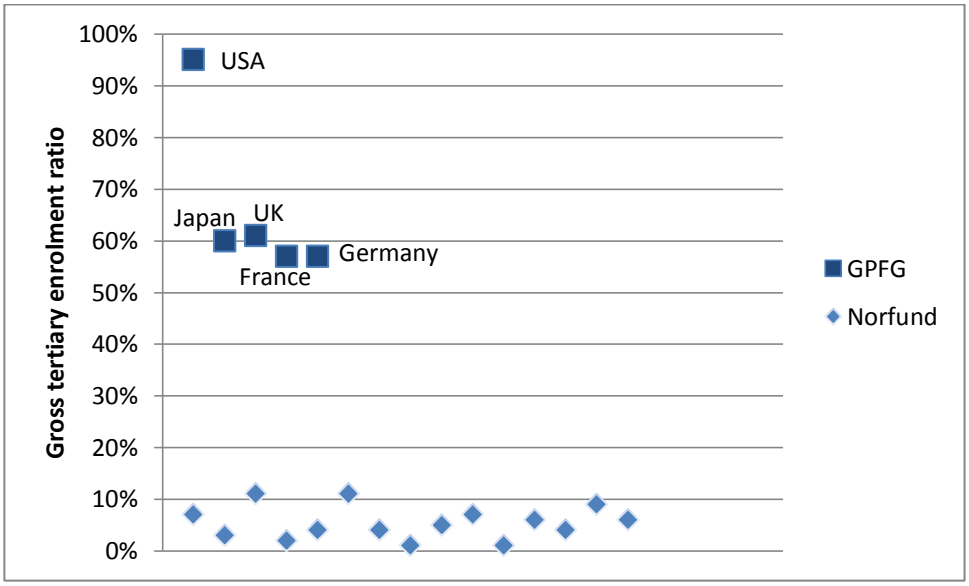

Figure 10) Gross tertiary enrolment ratio of the GPFG and Norfund (The World Bank Group, 2014c)

6.2 Technology

The simple neoclassical production function assumes constant level of technology, denoted *A*. In Lucas (1990) the average technology level was incorporated, changing the initial Cobb-Douglas function. By including countries assumed level of technology, Lucas developed an alternative production function, involving the external effects of technology to the human capital. The new production function was shown to entirely eliminate the differences in predicted returns for the test countries in Lucas' study.

The total factor productivity (TFP) is often used as a measure of technology of production, and its growth rate as an indication of technical progress (The World Bank Group, 2008). Figure 11 presents TFPs for regions representing the GPFG and Norfund. Even though the data is limited to Poncet's (2006) studied countries (see Appendix 2), it still gives an indication of differences in technology for the two funds' investment universes. Low values for the light blue plots illustrates countries of weak total factor productivity, while the dark blue plots illustrate that the GPFG have high values of TFP, hence level of technology.

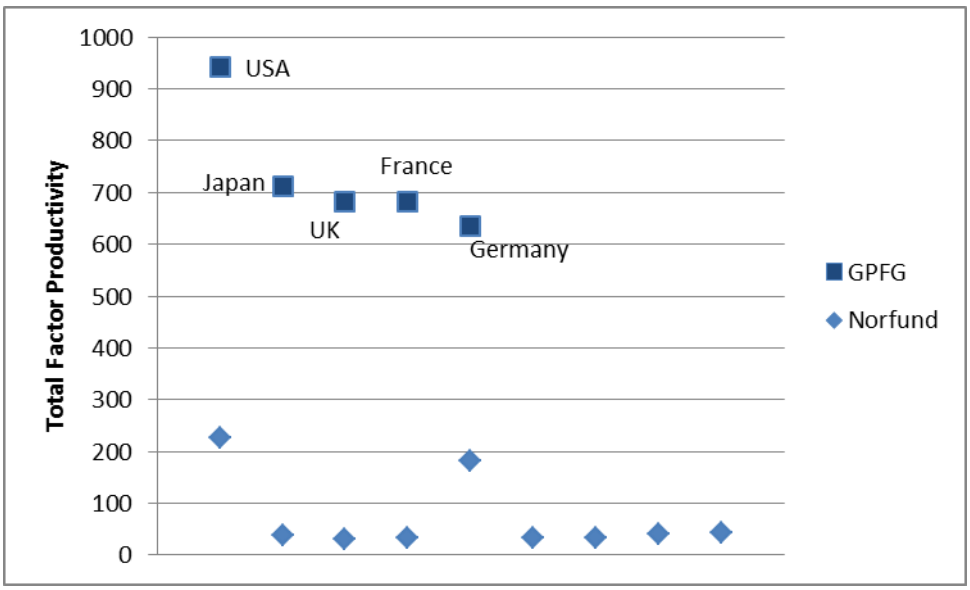

Figure 11) TFP for the GPFG and Norfund (Poncet, 2006)

However, the simplest form of the neoclassical model which is used for the predictions in this thesis does not reflect the countries different levels of technology. Assuming equal technology in rich and poor countries is not considered appropriate. The observed technology gap is problematic as it is shown to exacerbate the capability of international business for example in areas like Sub Saharan Africa (Elmawazini & Nwankwo, 2012). Sub-Saharan Africa is identified as a region where Norfund is heavily involved (Library of Congress, 2010; Norfund, 2014c).

The observed differences in TFP, hence technology, of the two funds' investment portfolios can therefore be interpreted as a possible explanation of the mismatch between the neoclassical prediction and the empirical analysis.

6.3 Infrastructure and institutions

Institutions can be defined as rules of play in a society and is given by both informal rules like traditions and culture, and formal rules like laws and constitutions. The shape of an economy is based on its institutions, interpreted as interactions between political, economic and social structures (Alfaro et al., 2008). The simple neoclassical model does not include institutional difference. Not incorporating this aspect can be interpreted to be rather unrealistic, as developing countries often are suffering by poor infrastructure and institutions.

A thorough empirical analysis of the Lucas Paradox was conducted by Alfaro, Kalemli-Ozcan and Volosovych in 2008. The study addressed institutional quality to be the leading causal variable explanation for the paradox, hence shaping international cash flows. The study claims poor institutions to entail uncertainty in returns or lack of productivity, causing investors to exclude these regions from their investments portfolio (Alfaro et al., 2008). Nations included in Norfund's investment universe can be characterized to have weak forms of institutions and policies, which according to Alfaro et al. (2008) can cause a wedge between expected and actual returns.

The Ease of Doing Business Rank (EDBR) is a system that ranks economies on their ease of doing business, in the range of 1-189. A high ranking indicates the country's regulatory environment is conductive for operating and start-ups of local firms. The index is based on multiple indicators[13], involving the quality of the nation's infrastructure and institutions (The World Bank Group, 2014b). Therefore the index is assumed to be an appropriate measurement of institutional and infrastructural quality. In Figure 12 the EDBR of countries representing the investment universe of the GPFG and Norfund are plotted to illustrate the actual institutional and infrastructural situation for the portfolios (see Appendix 2). The plots of high values in the figure indicated countries which have been categorized with low ratings. For example has South Sudan obtained a rank of 186, hence the country has the forth worst institutional quality of the World Bank sample. The USA does on the other hand represent an institutional quality rank of 4, representing the fourth best country in the World Bank sample. The plot in Figure 12 does clearly indicate a difference in institutional quality

[13] Starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency.

in the representing countries for the two funds. The investment universe of the GPFG, shown by the dark blue plot, is allocated close to the origin in the figure illustrating high ranking of institutional quality. The light blue plots representing Norfund in the figure is on the other hand located far out in the figure, indicating weak intuitions and infrastructure.

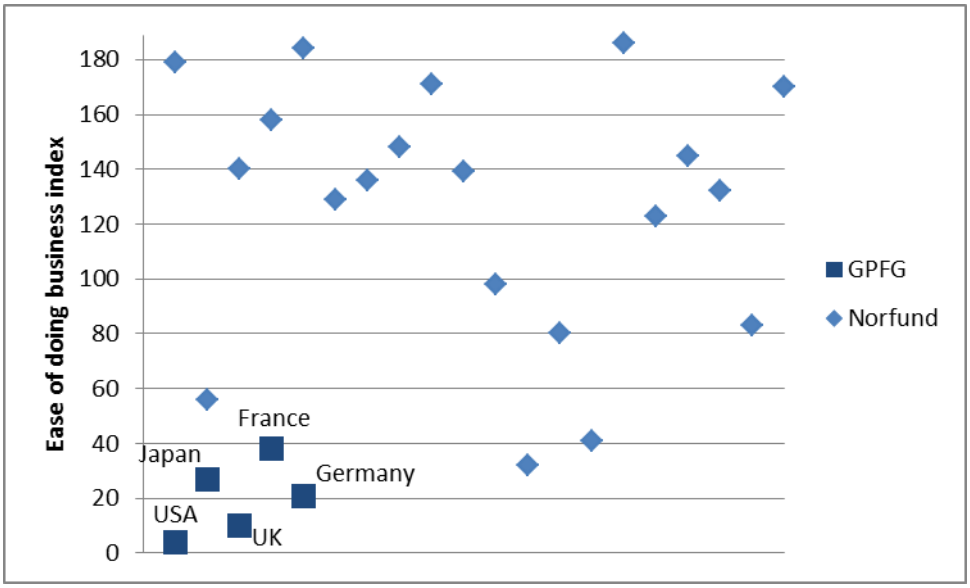

Figure 12) The Ease of Doing Business Ranking of the GPFG and Norfund (The World Bank Group, 2014b)

Figure 12 can therefore be interpreted to confirm the initial idea of the funds' investment universe to differ in terms of institutional quality. Thus the institutional differences for the portfolios identified as possible explanation for the difference between the neoclassical prediction and the empirical findings for the GPFG and Norfund.

7. The debate of responsible investments

Even though the empirical analysis did not provide any statistical evidence of Norfund to outperform the GPFG in term of simple returns, the critiques on the GPFG not to prioritize responsible investments are substantial. This chapter is therefore dedicated to provide some insights to the political debate regarding responsible investing. The insights are discussed in despite of the lack of empirical evidence of excess return compared to traditional profit maximizing asset management.

The debate is especially important as the GPFG is identified as a leading institutional investor for responsible investments. Being a leader in the market entails the possibility to influence in further innovation of responsible investment in the market (KPMG, 2013). Acknowledging the fund's impact and position is therefore a necessity for further adaption of responsible investments in the GPFG (Dimson et al., 2013). An example of this is NBIM's and the Ministry of Finance's ability to clearly communicate the fund's management to international stakeholders.

A common financial assumption is that highly risky assets must reflect a higher expected return compared to asset with lower risk (Bodie et al., 2011). Given from research by Campbell R. Harvey (2012), commissioned by the Ministry of Finance, there are reasons to believe that there are higher expected returns from investing in emerging markets relative to developed countries. Harvey claims the expected returns to reflect higher growth potential in these regions, but he also emphasises the assumed trade-off of risk and return. Emerging markets are argued to represent higher risk, for example regarding illiquidity and sensitivity to market volatility (Harvey, 2012).

However, even if Norfund's assumed higher risk is not seen to be significantly reflected in the returns in the sampled data, other possible trade-off can be discussed in a political perspective. These trade-offs indicate other reasons for responsible investments than increased returns. Examples for this are the trade-off of risk and development and the trade-off of risk and long term returns.

7.1 Development

In section 6.3 Infrastructure and institutions, differences in the quality of infrastructure and institutions was identified for the GPFG and Norfund. Investing in infrastructure and institutions is recognized to contribute in direct development and additionally make the regions more attractive to other international investors. As seen by the identified differences in human capital, technology, infrastructure and institutions in the previous chapter, the poorer regions is evidently in need of assistance to be able to change these differences. Thus can capital inflow contribute to reduce distortions in the world economy. An investor willing to offer long term capital can therefore be interpreted as a contributor of enhanced development growth in the countries. In that case, investments in poor countries can be expressed as a desire of contributing in development in challenged regions and reduce distortion between rich and poor economies.

The private sectors' role has been emphasised as an important stakeholder in economic development. The sector is claimed to contribute with job creation, gives access to critical goods, taxable revenues, enhanced services like health care and education, and make it possible for suffering people to escape poverty (International Financial Corporation, 2011).

The fact that the GPFG's mandate initially excludes investments in private equity has been heavily debated in media the last months. An overheated discussion played out after a possible huge loss from a private equity investment in the GPFG was detected, the so called Formel 1 investment[14]. The leader of the firm, Bernie Ecclestone, has previously been charged for corruptions, which contradicts with NBIM's given mandate. CEO of NBIM, Yngve Slyngstad, has humbly apologized for the inconvenient, but NBIM nevertheless receives critique for its compliance of policies (NTB, 2014a, 2014b). The lack of transparency regarding the investment was also criticized, and several required the equity to be liquidated, especially as it was associated with illegal tax planning (Skaalmo, 2014; Tax justice network, 2014). Due to this incident the Formel 1 investment can be interpreted as a counterargument for private equity investment by the GPFG. Even though the Formal 1 investment was based on other arguments that development, namely increased profits, the

[14] In May 2012 NBIM purchased stocks for 1.8 billion NOK in Delta Topco, the company owning the rights of Formel 1. Nine days after the investment, the company abandoned the initial plan of going public, which was a prerequisite for NBIM to hold the assets according to its mandate.

example still enlightens some questionable issues of involvement in the private equity market. The current organization does not possess the resources to cope with such challenging markets. However, private equity investment can be adhered feasibly for such big and powerful investor like the GPFG. The relevant question is whether the Norwegians can tolerate the possibility of mistakes like the Formel 1 case, acknowledging that the private equity market is more risky and challenging than the fund's current investment universe.

7.2 Long term returns

Another angle of the on-going discussion is how responsible investments today will entail long term returns. This argument can be based on how structural growth composition has implications for longer-term strategic allocation.

Sony Kapoor did in his report claim that the majority of global growth is expected to be concentrated in developing countries, and therefore implies that the GPFG should reallocate towards these economies (Kapoor, 2013). A similar conclusion is also drawn by Harvey (2012), who suggests an increase in weights to 16%[15]. Kapoor is consequently puzzled by NBIM's rejection of what he interprets as an "intuitive" conclusion. NBIM Discussion Note #5 2012 did however conclude that there is no significant relationship between economic growth and equity returns. The Discussion Note identifies the reason for this to be that there are differences in countries abilities of converting GDP growth into profit growth and that better growth prospects already are reflected in the market prices (NBIM, 2012).

The result of the discussion note regarding growth and equity returns does however coincide with the Strategy Council's report, addressing a lack of empirical confirmation on how a fund's returns will be affected by further tilting the portfolio towards emerging markets (Dimson et al., 2013; NBIM, 2012).

To sum up the above discussion it can be stated that, if the current mandate of the fund was tilted from profit maximization towards development objectives, the GPFG is definitely a perfect provider of the long-term capital which the challenged countries is in need for. However, changing the fund's focus towards development would require great changes in

[15] For the GDPF equity portfolio 9.8% was allocated to emerging markets per 31.3.2014

the organization, due to the fund's size and lack of development expertise. Regardless of the strategy, a clarification of the different roles of the organization will benefit the GPFG from being misunderstand and interpreted as a political instrument in the global economy (Dimson et al., 2013).

8. Summary Remarks

In this thesis the rate of returns for the GPFG and Norfund has been analysed in order to evaluate the GPFG current strategy of responsible investments. A simple neoclassical model was conducted to predict the return on capital to the respective funds, claiming Norfund to outperform the GPFG.

However, after researching the two funds' actual historical rates of returns, the empirical analysis does not coincide with the neoclassical prediction. According to the empirical analysis there is no statistic significant evidence supporting the two funds' mean of returns to be unequal. Acknowledging the two funds' return on capital to be statistically equivalent implies that neither the prediction from the simple neoclassical model nor the Lucas Paradox can be observed in the sampled data. The model's limitation regarding human capital, technology, in infrastructure and institutions was identified as possible explanation for the difference in the neoclassical predictions and the empirical finding.

The discussion in the last chapter enlightens the ongoing debate of responsible investment in the GPFG. A clarification of these concerns is helpful to understand the criticism of the fund's strategy, and the distinction of the development and long term return trade-offs. One noticeable part is the mentioned distinction of political and financial objectives for the asset management, acknowledging the fund's size and impact. The Strategy Council does also states a necessity of further research on the impact on the returns of increased focus on responsible investments.

A proposed further research in the context of this thesis is therefore a in depth assessment on the impact on the GPFG's returns if a given proportion of the fund was liquidated in favour of directly investing in development financial institutions, like Norfund. To the extent of this thesis, such an additional analysis was not possible to obtain, realizing the complexity regarding termination of certain holdings and its effects on the fund's return. The proposed approach was also considered in the initial phase of this thesis, but was not conducted as the main focus was to study whether or not such a strategy would be consistent with the fund's overall profit maximizing objective. If the proposed further analysis is performed, it should be based on an acceptance of no significant evidence of Norfund outperforming the GPFG according to the conducted empirical findings of this report.

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9. APPENDIX

9.1 Appendix 1

For the purpose of this report, Norfund's presented IRR is interpreted as the arithmetic average for each year. Thus, the IRR for each year can be derived to the corresponding geometric average of returns using a simplification, based on an assumption of normally distributed returns[16]:

$$10)\ R_{Geo} = R_{Arit} - \frac{1}{2}\sigma^2,$$

where σ^2 is the variance in the sample of IRR, the fiscal year of 2002-2013. The variance is calculated by the following formula:

$$11)\ \sigma^2 = \frac{1}{n}\sum_{i=1}^{n}(IRR_i - \overline{IRR_n})^2,$$

where *n* is years, and $\overline{IRR_n}$ is the average artimetric IRR for the sample period.

	Norfund arit. IRR	Norfund geo. IRR
2002	-0.04000	-0.0439
2003	0.07000	0.0661
2004	-0.01000	-0.0139
2005	0.04000	0.0361
2006	0.24000	0.2361
2007	0.17000	0.1661
2008	0.21000	0.2061
2009	0.04000	0.0361
2010	0.10000	0.0961
2011	0.08000	0.0761
2012	0.10000	0.0961
2013	-0.01000	-0.0139
Mean	*0.08250*	*0.0786*
Diff mean	*-0.00387*	

Table 9) Artimetric and geometric IRR Norfund, excluding costs

The table above shows the differences in the reported IRR of Norfund, the corresponding derived nominal geometric returns for Norfund. Table 9 confirms that the geometric annual mean for Norfund is 0.0387% less than the initial arithmetic reported return.

[16] Terms for normal distribution is established in section 5.2 Requirements for the t-test

9.2 Appendix 2

The Ease of Doing Business Ranking	
The GPFG	
USA	4
Japan	27
UK	10
France	38
Germany	21
Average	20
Norfund	
Angola	179
Botswana	56
Burundi	140
Comoros	158
Eritrea	184
Kenya	129
Lesotho	136
Madagascar	148
Malawi	171
Mozambique	139
Namibia	98
Rwanda	32
Seychelles	80
South Africa	41
South Sudan	186
Swaziland	123
Tanzania	145
Uganda	132
Zambia	83
Zimbabwe	170
Average	126.5

Gross enrolment ratio. Tertiary	
The GPFG	
USA	0.95
Japan	0.6
UK	0.61
France	0.57
Germany	0.57
Average	**0.66**
Norfund	
Angola	0.07
Burundi	0.03
Comoros	0.11
Eritrea	0.02
Kenya	0.04
Lesotho	0.11
Madagascar	0.04
Malawi	0.01
Mozambique	0.05
Rwanda	0.07
Seychelles	0.01
Swaziland	0.06
Tanzania	0.04
Uganda	0.09
Zimbabwe	0.06
Average	**0.054**

Countries	TFP
GPFG	
USA	943
Japan	712
UK	683
France	683
Germany	634
Average	**731**
Norfund	
Botswana	226
Kenya	38
Madagascar	30
Rwanda	34
South Africa	181
Tanzania	33
Uganda	34
Zambia	41
Zimbabwe	42
Average	**73**