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Pragmatic Review of the Globe's Largest Sovereign Wealth Fund Management Prudence

Empirical analysis of Norway's the Government Pension Fund Global ("the Oil Fund") management

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Abstract*

There exists a possibility that the management of Norway's the Government Pension Fund Global ("the Oil Fund") is not doing its job well due to the fund's large size and a number of other challenges. The fund's historic data were tested for opportunistic conduct and examined for the diligence of execution of the strategy assigned by the fund's investment mandate. Firstly, the performance results disclosed for 2001-2012 were tested for excessively high returns around reporting dates. Then, the data were tested for probability of buying stocks due to stocks' earlier performance, characteristics of size, investment style, sector, economy of origin, and previous decision to buy. The dynamics of odds for buying and selling stocks were also compared over time. No evidence for the fund's management window-dressing the results of their performance or deviating from the investment mandate was found.

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Dedicated to my Father, the most prudent economist ever met.

Contents

1. Introduction

The rise of sovereign wealth funds (SWF) has been spectacular for the last two decades. This has attracted much of attention from public, academia and media for the recent years. The funds are there to secure well-being of entire nations and they have become serious players on the international markets arena.

However, managing an SWF is an enormously challenging mission. Not only the management is responsible for financial future of a country, being a relatively recent phenomenon, the funds also pose a challenge for the managers who mostly come from commercial investment funds industry due to their dissimilarities with the commercial counterparts. The managers implement approaches that they got used to during their years in a mutual or hedge fund, although, hardly all of the methods from the industry are truly appropriate for an SWF. Each SWF is also an exceptionally individual phenomenon.

The Government Pension Fund Global of Norway (the Fund) is currently the largest investor in the world owned by one nation. Norway's wealth generated by surpluses from oil-based revenues is transferred to an SWF that invests worldwide. The Fund is notable for its independence from the country's ministry of finance and is run by Norges Bank that has created a separate similar to a commercial fund entity for managing the Fund. The Fund's management has so far demonstrated performance which is acceptable along the guidelines prescribed by the nation's parliament.

But has the Fund's management been really prudent in their work? Given its remarkable importance for the country's leaders and the entire nation of Norway, the question is central to this research.

In order to formulate a meaningful answer, the matter is approached from two directions.

Firstly, the managers' prudence is queried for opportunistic conduct. If managers act irresponsibly with a motive of benefitting from such actions, i.e. act opportunistically, they clearly do not do their job well. To examine the management actions, historic data of the Fund's positions in equity securities are tested for presence of signs of window dressing of the performance results reported by the management. Given the managers get compensated for demonstrating superior performance, apparently, such devious actions can potentially occur.

Next, the diligence of execution of the Fund's strategy along the prescribed investment mandate is reviewed. The intuition here is somewhat different from that of the previous approach which implies acquisition of some personal gain that motivates a manager to act dishonestly. Apart from being misleading on purpose, a manager can simply not cope with the duties as the result of incompetence or even negligence. In order to address the central problem of the quality of the Fund's management work from this perspective, the decisions to buy and sell stocks – actions that can directly be attributed to the fund's managers – are empirically reviewed along the guidelines set forward by the fund's objectives.

Apart from Introduction, the research consists of the following parts. First part provides an overview of SWFs along their essentials and compares the funds to their commercial counterparts. Second part reviews the Fund's organization, characteristics as an SWF, and its recent performance.

Third part establishes theoretical background for further analyses along the discussion of relevant theories. The discussion starts with an outline of major finance theories that describe the financial markets environment and explain formation of abnormal returns for a fund. The theoretical review continues with a revision of fund management theory and, eventually, a summary of evidence from academic literature that imprudent management conduct poses a realistic threat for SWFs.

Fourth part is dedicated to empirical examination of the Fund's management work along the two perspectives outlined previously. Firstly, a hypothesis for significant difference of abnormal returns around the Fund's reporting date weeks and, then, a hypothesis for systematic abnormal returns patterns for other weeks are tested. After that, six tests for relation between the Fund's management decisions to buy and sell stocks and a number of other explanatory factors are performed and reviewed along the Fund's investment mandate.

The results of entire research are summarized and appropriate conclusions are made in Conclusions. Data and methodology are covered in details along the text, and theories outlined in earlier sections are implemented in latter empirical part. In addition to English language sources, materials that have Norwegian as their original language are used.

2. Overview of sovereign wealth funds

The mere fundamentals of state power are based, primarily, on institutional securitization of essential needs of a society. In The Republic, written by Plato back in the 4th century BC, Socrates in book VI points out that the virtue for philosophers is to create harmonious cooperation within the ideal city. And, according to book IV, the city's guardians are there to securitize this environment where each citizen engages in the occupation that suits this person best to make sure everyone is merry.

Taking this intuition of the ancient thinker to the modern day realities, the government's primary task is to take certain actions in order to make its citizens feel safe, so that they could contribute to everyone's benefit with the fruit of their work. The feeling of safety is also the second-order base level of the infamous Abraham Maslow's hierarchy of needs, preceded only by physiological needs like breathing. Although, an average grown up individual, under normal conditions, has a fairly relatively strong control over her present, she is hardly in charge of her feeling of insecurity regarding her future. Combining the idea of the government's responsibility to gratify its people confidence in the everyday life activities and the source of timidity due to the future's uncertainty, a state-controlled pension system seems to be a rather natural social phenomenon.

A pension fund is any plan, fund, or scheme which provides retirement income. This is a simple but rather well-specified definition provided by Wikipedia, a universal source of information that fashions a widely accepted understanding of the concept by the global public today. And, although, there exists a large number of various private financial products created with the aim to address the client's need to feel safe about her future, it is the ultimate responsibility of the government of a given country to guarantee this safety by the available means, like legislation, control, and law enforcement. Eventually, a state-owned and controlled pension fund should offer supreme insurance for the retirement income, given the government officials' incentives are in the right place and the expertise of those in charge is, at least, not inferior to that of the commercial managers.

From the entire selection of the state-owned pension solutions, perhaps, none has had more attention than the recent rise of the sovereign wealth funds (SWFs). The total value for the assets under control of SWFs, as of April 2014, is estimated by SWF Institute to be over $6.3 trillion. Moreover, for the period of only twelve years, starting from 2000, governments

around the globe acquired around $969 billion worth of stocks, whereas, sold only $765 billion through direct sales or privatization (Borisova, Fotak, Holland, & Megginson, 2012). Additionally, the tendency in growth of SWFs is significantly higher than that of other types of investment funds. The total SWFs assets under management have been growing at the pace of 24% per year and have increased ten times for the period of only three years, from 2009 to 2012 (Bernstein, Lerner, & Schoar, 2013).

A sole definition of an SWF is also not entirely agreed upon. International Monetary Fund (IMF) defines SWFs as special investment funds created or owned by government to hold foreign assets for long term purposes (2007). The Organization for Economic Cooperation and Development (OECD) has a more specified explanation for what it sees an SWF to be, "SWFs are pools of assets owned and managed directly or indirectly by governments to achieve national objectives" (2008). McKinsey Global Institute (2008) regards an SWF as a fund that has diversified portfolios that range across equity, fixed income, real estate, bank deposits, and alternative investments, such as hedge funds and private equity. Truman's vision for an SWF (Truman, 2007) is that it is a collection of government-owned or government-controlled assets, from a broad perspective. His narrower definitions may, however, exclude government financial or nonfinancial corporations, purely domestic assets, foreign exchange reserves, assets owned or controlled by subnational governmental units, or some or all government pension funds. Finally, Balding (2008) states that an SWF is a pool of capital controlled by a government, or government related entity, that invests in assets seeking returns above the risk-free rate of return.

Perhaps, a decent summary for the SWF definition would be "a financial entity owned by a government for receiving economic benefits from investing in various assets".

2.1 Sovereign wealth funds essentials

2.1.1 Objectives

OECD believes that there is a number of potential objectives of SWFs which are not always easy to attribute to a particular fund, and some funds may have more than one of the distinguishable objectives. Some of these are to diversify assets, to get a better return on reserves, to provide for pensions in the future, to provide for future generations when natural

resources run out, to stabilize prices, to promote industrialization, and to promote strategic and political objectives.

The first four of the listed objectives, due to being better specified, can be summarized in two broader categories.

First, governments run SWFs with the purpose of earning return on its monetary holdings such as foreign exchange deposits or fiscal surpluses. The return on an SWF that such a government seeks should be higher than the return it could receive from low-risk investing in money market with, for example, a large international bank. In other words, as Balding points out, the capital pooled in an SWF should yield a return which is higher than the current risk-free rate.

Second, SWFs are regarded as means for diversification of a country's economy. The SWFs capital can be invested either in local, regional economy or can be used for hedging purposes, like that of diversifying away from commodity-dependent domestic economy (Truman, 2007). However, it should be noted that the decision to invest in a local or structurally different economy can also be driven by reasons like better expertise or a feel of comfort due to familiarity with a regional economy, or just simply other than long-term investment needs.

2.1.2 Capital

According to OECD, SWFs may be funded by foreign exchange reserves, sales of scarce resources such as oil, or from taxes and other revenues.

Most SWFs derive their capital from government revenues due to commodities sales. Norway is a classic example of the case when royalties collected in form of special taxes from oil and gas sales are transferred into an SWF. Other countries, like Kuwait, Saudi Arabia, and UAE have similar policies.

However, as mentioned, although commodity driven economies are first line candidates for establishing an SWF, natural resources are not the only source for the SWFs capital. The examples of countries that established non-commodity based SWFs include China and Singapore who built their SWFs on the basis of continuous fiscal surpluses and accumulation of foreign reserves. Most of other European SWFs, like that of Italy or France, are also non-commodity based.

Having discussed the sources for the input capital for an SWF, the rules for withdrawal of capital from a fund can hardly be easily summarized.

Perhaps, the best way to demonstrate how different country governments are in their approach to setting the policies for capital withdrawals the examples of Norway and Russia should be outlined. Norway has a simple stringent policy of using for fiscal purposes for the period of one fiscal year no more than 4% of its SWF's capital invested outside of Norway, known as "handlingsregelen" (Finansdepartement, 2000-2001). Russia, on the other end of the systematic stringency paradigm, established its Stabilization Fund in the end of the 1990s with the oil prices around $30 per barrel with strict limits, but, after the price sky rocketed to $100, implemented rather loose adjustments to capital withdrawal policies (Balding, 2012).

2.1.3 Transparency and international cooperation

Each SWF also has rather individual profile of transparency. This is often attributed to the fact that SWFs are regulated by their home government. Being the primary (and the only) owner of the fund in charge of its own regulation, it comes naturally that each domestic government is prone to be quite liberal in its approaches to defining a governing legal base for a fund it owns. The degree of transparency, in this situation, could be regarded as solely a voluntary decision, rather than a necessity. Keeping in mind that poor performance of an SWF can become a widely used evidence for the incompetence of the ruling government, transparency is something the reigning cabinet could be reluctant to augment.

To compare funds on the basis of transparency, SWF Institute in 2008 developed their own transparency measure, referred by them as the Linaburg-Maduell Transparency Index. The index has ten major principles along which an SWF accumulates total points, one point for each principle. Perhaps, the most important principles that should be outlined are provision of up-to-date independently audited annual reports, percentage of company holdings and their geographical locations, total portfolio market value, returns, and management compensation (Sovereign Wealth Fund Institute, 2008).

An important milestone in setting internationally recognized rules for the SWFs gameplay was the achievement of consensus on the Generally Accepted Principles and Practices, or so-called Santiago Principles, in October 2008. The principles were developed by International Working Group of Sovereign Wealth Funds (IWG) and were backed by World Bank and OECD. An IWG statement said the purpose of the Santiago Principles was to establish a

transparent and sound governance structure that provides for adequate operational controls, risk management and accountability, ensure compliance with applicable regulatory and disclosure requirements in the countries in which SWFs invest, ensure SWFs invest on the basis of economic and financial risk and return-related considerations, and help maintain a stable global financial system and free flow of capital and investment (International Working Group of Sovereign Wealth Funds, 2008). There are 24 items listed as the Santiago Principles, among which are the principles that are there with the purpose of coordination of situations where the SWF's activities have significant direct domestic macroeconomic implications (those activities should be closely coordinated with the domestic fiscal and monetary authorities so as to ensure consistency with the overall macroeconomic policies), and clear definition of responsibility and accountability for the individuals in charge of the SWF's management.

2.2 Sovereign wealth funds distinctions from commercial funds

Little consensus in today's world about a universally acknowledged one effective model for an SWF exists today. Works of Scherer (2009), Chhaocharia and Laeven (2009), Fernandes (2011), Dyck and Morse (2011), Bodie and Briére (2011), Johan, Knill, and Mauck (2013), and Avendaño and Santiso (2011) are all dedicated to discussion on SWFs designs and portfolio structures. Bortolotti et al. (2013) argue that given the purely financial investment objectives of the SWFs, they are most comparable to privately held institutional investors like mutual funds, hedge funds, and institutional endowments. And, although, an SWF is a fund with a similar purpose of making money for investors, the major traits of such a fund are crucially different from that of the commercial counterparts.

2.2.1 Size

SWFs, as mentioned previously, have considerably outgrown commercial funds in the last fifteen or so years. The size of SWFs makes them significant macroeconomic players on the global arena. The rules of the game set up by regulators in various countries that are there to address fairness and market integrity can, given the size of SWFs, actually, backfire.

The ongoing discussion of the Regulation National Market System which introduced the Trade Through Rule whereby market orders must be matched at the National Best Bid and

Offer (NBBO) system, is a good example of such a situation. With the NBBO at place, SWFs, being large buyers/sellers, have undesired market exposure to the volumes of asset blocks they are about to buy or unload after an order is placed with a broker. By simple rules of supply and demand, given substantial size of orders even taking into account that the entire order is broken into smaller blocks, this can have an impact on the market price for the asset. The NBBO, in this case, creates market information asymmetry, as those who have access to the system, like licensed brokers, can exploit this for their own benefit. And although front-running is recognized to be an illegal practice by many regulators worldwide, given technological advances of so called "high frequency trades", front running can actually take place without particular individuals being taken accountable. An extensive discussion of the effect of high frequency trading and NBBO is presented in NBIM's Discussion Note 1 (Norges Bank, 2013).

2.2.2 Liquidity

Liquidity constraints of SWFs are also considerably different from that of commercial funds. Having sources of capital controlled by country governments, which have authoritative power over the country's economic agents, like households and businesses, SWFs are regarded to have much deeper pockets than that of commercial funds. And, although, practically, all market participants are exposed to market instabilities and crashes, having liquidity coming from, say, tax-payers, SWFs have a much more superior position when it comes to going back in game after a substantial market dip.

Additionally, not having a need to keep a fraction of SWF capital as cash reserves for clients who are about to claim their capital after a lock-up period (given, such a lock-up period exists; otherwise, cash reserves should be kept by a commercial fund at all time), SWFs are better off when it comes to harvesting liquidity premiums. Furthermore, the investment horizon of SWFs is usually longer than that of the commercial funds. A simple reason for this is that commercial funds serving private clients can hardly have an investment horizon longer than a life-time of an individual. This also has a substantial positive effect on the liquidity standing for an SWF relatively to other market participants.

2.2.3 Risk profile

Risk profile of SFWs is also different from most of commercial funds. Given responsible and, at a time, rather ambitious objectives set forward by political leaders of a country for a

state owned fund, an SWF can hardly get involved in overly risky strategies. Low risk profiles for SWFs also make sense if approaching to creation of an SWF as a better alternative to investing in assets that yield the risk-free rate (Balding, 2008). Moreover, an evidently bold gambling strategy, if traced back to an SWF, can have a negative impact on political standing of a country's government, as it can be interpreted as irresponsible attitude to the country's future.

2.2.4 Performance

Procedures used for performance evaluation of an SWF are also different from those of commercial funds. Initially, it is a country's legislative body that drafts and adopts the framework along which the effectiveness of a fund should be measured.

A common practice of adopting an index that should be used to account for the performance of the fund in relation to the appropriate market and/or strategy is also rather challenging. Given the wide variety of commercial funds that compete for clients, most of the benchmarks for commercial funds are readily available from specialized financial information vendors, like MSCI or Standard and Poor's. Since SWFs have rather unique objectives and investment mandates defined by local governments, it is quite challenging to specify a suitable readily available to the public benchmark against which a fund's performance should be compared.

Moreover, considerable heterogeneity of SWFs makes it quite challenging, if not at all impossible, to compare performance of one SWF to that of another. Furthermore, differences in structures of SWFs and their dissimilarity to the structures of commercial funds prescribe personally tailored practices for performance evaluation of each individual fund.

2.2.5 Organization

Organizational structures of SWFs are also different from that of the commercial funds and vary significantly from country to country. As Truman (2008) points out in his discussion for the SWFs structures, the structures seem to be rather flexible and many of the funds had their initial designs altered over the years of their existence or shut down completely due to rigidity with a subsequent start of a new entity taking the objectives of the earlier SWF.

Another important aspect about the organizational built of SWFs is the distance that a fund keeps between itself and the governmental body in charge of the country's fiscal and monetary policy, like a ministry of finance. Some funds, like that of Russia's Stabilization Fund, are directly controlled by the country's ministry of finance, whereas, management of other SWFs, like that of the Norway's Government Pension Fund Global, is entirely outsourced to another organizational unit, which is still subordinated to the ministry of finance, but whose actions in managing the fund are not directly controlled. It's hard to specify which distance is more efficient, as the in-house endorsement of a fund ensures better cooperation for the country's internal fiscal policy fit, and the independency of a fund's management gives more room for maneuvering in the fast changing global financial markets.

2.2.6 Costs

The previous discussions of the SWFs organizational structures and evaluation of performance, logically, take us to the next substantial difference of SWFs from commercial funds, the funds costs structures.

The standard hedge funds management agreement is comprised of a 2% fixed fee with a 20% incentive fee and a high water mark. The manager thus receives 2% fixed fee of net assets per year and 20% of gains in excess of a fixed percentage benchmark or a flexible market rate, like LIBOR. The high water mark provision was designed to incentivize management to recoup the earlier losses before the 20% premium on gains is paid.

Mutual funds costs can be broken into two broader categories. The first category is the current expenses such as administrative costs, management expertise fees, and sometimes even promotion fees (12B-1 fee in the United States, for example).

The costs are usually measured with the help of management expense ratio which is determined through an annual calculation, where a fund's operating expenses are divided by the average dollar value of its assets under management. The second costs category is what a client pays when she buys or sells a mutual fund. These costs are often referred to as "loads". Fund costs substantially lower the net return which a client receives. This is not a surprise, as the commercial funds are out there with the primary objective to make money for their founders.

SWFs, however, are owned by governments and, to large extent, have a vision to serve for their country's public benefit. The expertise that SWFs use for managing their capital, naturally, does not come for free. And, although, managers might be paid rather generously, they don't have transgression over their compensation, as it is the country's government that decides on their fees.

Having such inconsistency in management fees between the commercial funds and SWFs might make one wonder if this is all fair. To shed some light on this seemingly bigoted situation, it can be argued that, with the SWFs, a typical investor who is a citizen of the fund owning country, does not have power to somehow directly express her disagreement with management fees (or any other policy) by simply choosing not to invest in the country's SWF, something she can do with a commercial fund.

2.2.7 Social effects

Eventually, the social effects of SWFs are fundamentally different from those of commercial funds. Firstly, the objectives set forward by the SWF founding governments are aimed at home country citizens' future or present public benefit, whereas, commercial funds are, primarily, out there to promote the welfare of their founders. Secondly, SWFs have strong political liabilities, as there's always a clearly defined government of a particular country that stands behind an SWF. These ties can be used for political reasons, be that on the international or domestic arenas.

Moreover, given the large size of many SWFs, becoming a major shareholder of a firm that operates in a foreign defense sector can trigger extensive political speculations. To address these issues, many SWFs have voluntarily adopted the Santiago Principles discussed earlier. In addition to them, some countries developed guidelines, to which many refer as "responsible investing", on their own.

3. Sovereign wealth fund of Norway (The Government Pension Fund Global)

An SWF, often quoted as a responsible investor, Norway's the Government Pension Fund Global (throughout the rest of the text referred to as the Fund) is the largest SWF with the total asset holdings estimated at the level of $838 billion[1].

The Fund was founded in 1990 by the Parliament (*Stortinget*) as a part of the State Pension Fund (*Statens Pensjonsfond*). State Pension Fund, whose primary objectives are, according to Law on State Pension Fund (*Lov om Statens pensjonsfond*), to save funds for financing of social security payments and accumulation of long-term wealth from the state's oil-related activities intakes, consists of two funds: the Fund (*Statens pensjonsfond utland*) and the Government Pension Fund Norway (*Statens pensjonsfond Norge*).

The Fund is formed from the budget transfers of state revenues received from "oil cooperation" net transaction costs. The state revenues from "oil cooperation" include various taxes levied on companies that perform exploration and extract oil on the Norway's continental and sea territories. The revenues also include indirect taxation of the oil-related activities, such as taxes on CO_2 and NO_x from oil-related activities, dividends from Statoil ASA and proceedings from the state's sales of share stakes in the company, and other revenues from state engagement in oil-related activities. The funds are transferred to an account with Norges Bank who is responsible for further management of the capital (Stortinget, 1990, ed.2005).

3.1 Framework for the Fund's organization and management

Further actions of Norges Bank ("the Bank") regarding the Fund management are governed by Mandate on the Fund Management (Stortinget, 2010), referred to as "the Mandate" throughout the rest of the text. The Bank is granted independency from the Department of Finance in management, in its own name, of the funds received on the Fund account with the objective to deliver as high return on the capital as possible.

[1] As of April 2014 (Sovereign Wealth Fund Institute, 2014).

The Bank is required to develop Strategic plan along the Mandate's guidelines. The Mandate, also, obliges the Bank to act as a responsible investor and cooperate with organizations like OECD and the UN's Global Compact when investing in multinational corporations. In addition to this, the Bank should use the internally developed guidelines for responsible investing, and should actively participate in the international cooperation aimed at research in this field.

A noteworthy feature of regulation aimed at responsible investing is the prescription to invest in environment-related assets with the total market value of the capital allocated for these assets equal to from 20 to 30 billion Norwegian krona (NOK). A generous gesture with hardly a concrete specification for what assets are defined as environmental, and what exactly is regarded as value added to solution of global environmental problems.

General investment policy

The Bank is prescribed to invest in three classes of assets. The first class is equities that should constitute 60% of the entire portfolio value, adjusted for the real estate. The Bank is required to invest in stocks of companies listed on recognized and well regulated exchanges. In addition to investing in shares of such firms, the Bank is allowed to invest in equivalents of listed shares and depository receipts for this type of equity securities, and the equity securities of companies that seek listing.

The other classes of assets are fixed income securities with low risk profiles (should comprise 40% of non-real estate portfolio) such as bonds, and real estate. There is an exception for investing in basic infrastructure related real estate like railways, roads or airports, in addition to more detailed guidelines.

The Bank is not permitted to invest in derivative financial instruments, unless they are directly related to investing in the three main asset classes. The value of the Fund's assets is calculated in Norwegian krona by the end of each month net of the costs encountered by the Bank and adjusted for the actual currency conversion rate. The actual weights for allocations in the main asset classes are compared to those defined previously on the last trading day of a month. If the actual weight of equity securities on this day differs by over 4%, the Bank is required to rebalance by the final trade day of the next month. The Bank is also not permitted to invest in Norway.

Reference benchmarks

Equity securities

The reference index for the equity class securities is FTSE Global All Cap Index (GACI). It is a market-capitalization weighted index representing performance of large, mid and small-cap stocks globally. The index is an aggregate of around 7,400 stocks that covers Developed and Emerging markets and is suitable as the basis for investment products, such as funds, derivatives and exchange-traded funds (FTSE Group, 2014). The index was launched in 2003 with the base date of December 31, 2002.

The FTSE GACI returns for the period of existence are almost perfectly correlated (coefficient of 0.9994, with p-value of 0.000) with MSCI All Country World Index (ACWI), comprised of only 2,434 constituents from 44 countries based in Developed and Emerging markets, but the historic data for which are available from 1990 (MSCI Inc., 2014), a significantly longer timespan.

The securities weights that FTSE GACI is comprised of are adjusted with coefficients of 2.5 for European Developed markets (excluding Norway), 1 for the US and Canada, and 1.5 for other Developed markets and Emerging markets, following the definitions for Developed and Emerging markets of FTSE used for the index formation. The coefficients are multiplied by the market capitalization for each index constituent and divided by the total sum of the products (Stortinget, 2010).

The portfolio is also adjusted for the stocks of companies that are not allowed for investing according to responsible investing guidelines of the Bank. Moreover, the Fund is not allowed to accumulate more than 10% of voting rights of a company. Short-selling is allowed but only under condition of the Bank's access to securities through an established loan scheme.

Fixed income securities and real estate

The allocation of fixed income securities prescribed by the Mandate is 30% of corporate and 70% of sovereign debt securities. The Bank is allowed to invest in government debt securities included in Barclays Global Inflation-Linked Index (Series-L), Barclays Global Treasury GDP Weighted by Country Index, and all securities placed in the subsection for international bonds of Barclays Global Aggregate Index. The weights for government debt securities are adjusted according to the Mandate with factor coefficients in regard to geographical location and the country's GDP growth. Corporate fixed income securities

allowed for the Fund's portfolio are those included in Barclays Global Aggregate Index, but limited to the following currencies: USD, CAD, EUR, GBP, SEK, DKK, and CHF.

For real estate, the Bank is expected to deliver, at minimum, the return of Investment Property Databank (IPDs) Global Property Benchmark, adjusted for the exclusion of Norway, the effects of debt financing and incurred management costs. The upper limit for the capital allocation in real estate assets is 5% of the portfolio.

Risk profiling and performance evaluation

In addition to expected volatility, the Bank is supposed to place stringent limits on risks attributed to credit risk, both at issuer level and overall investment portfolio, liquidity risk, counterparty exposure, risks due to debt financing, reinvestment of cash collateral received and short selling. The Bank is also responsible for managing overall risk profile of the portfolio taking into account qualitative differences in risk profiles for the equity and fixed income portfolios and their effect on the total portfolio risk profile. There are also additional guidelines for the Banks responsibility regarding the risk management for the real estate portfolio along the portfolio's exposure to countries, sectors, emerging markets, condition, designated use, and financing for the real estate assets.

The Fund's performance is evaluated against the discussed reference indexes, with the adjustments for costs related to operations, transactions, administration and taxes. The Bank is also required to report along the Global Investment Performance Standards (GIPS), a framework for the industry performance reporting endorsed and actively promoted by CFA Institute. The bank publishes quarter and annual reports audited by a recognized external auditing firm that become available to public within some time.

Management organization

Since Norges Bank has its primary role as the Norway's central bank, it was decided to create a separate in-house entity responsible for managing the Fund named Norges Bank Investment Management (NBIM). The reason for this was to organize the Banks investment management activities to reflect the recognized standards for the division of responsibilities among the board, the executive officers and administration (Norges Banks Executive Board, 2011).

The main principles along which NBIM is envisioned to function are as following. NBIM should be organized in a way that ensures that the organization fulfills its mission to

safeguard and build wealth for future generations within the framework of the Mandate, and NBIM should be organized to ensure an appropriate management structure, including adequate risk and control systems and procedures, appropriate for the funds and portfolios under management. The organizational structure of NBIM is meant to be based on proper segregation of duties, delegated authority and defined areas of responsibility.

3.2 The Fund's character as a sovereign wealth fund

Along the earlier discussion of SWFs, the character of the Fund can be summarized as the following. The Fund has long-term investment horizon with the principal objective to further increase the national wealth generated by the state revenues coming from the country's natural resources – namely, oil – extraction. High oil prices for the recent two decades together with an efficient fiscal structure that secures the collection of revenues through appropriate taxation and surplus from state-participated oil extraction and exploration activities ensure the Fund's current rather solid liquidity position. The Fund invests along the prescribed by the Norway's Parliament low-risk profile.

The management of the Fund has a high degree of independence from the country's department of finance with a right to come up with proposals regarding improvements for the Fund's investment strategy and organizational structure that should be attended to by the higher level institutions. The latter can be regarded as a prerequisite for the Fund's sizable flexibility.

The costs structure of the Fund is rather stringent, and the costs should be reported directly to the country's department of finance. The NBIM's employees' compensation has low and high limit caps in form of a base fixed annual salary and limits to performance pays (Norges Banks Executive Board, 2011). The Fund pursues a public image of a responsible investor with a relatively high degree of transparency, it has the Linaburg-Maduell Transparency Index of 10 (Sovereign Wealth Fund Institute, 2014), the highest value the index has.

The Fund is also required to file its reports in accordance with the GIPS, a framework developed as the commercial industry's performance reporting standard. In addition, the Fund cooperates with major organizations when it comes to investing in multinational corporations regarding possible illegal activities of the latter, actively participates in research for responsible investing, and pays particular attention to the matters of environment. The

procedures designed for performance evaluation of the Fund are based on comprehensive similar to the commercial funds standards and involve application of benchmarks based on popular indexes provided by mainstream vendors, like FTSE and Barclays.

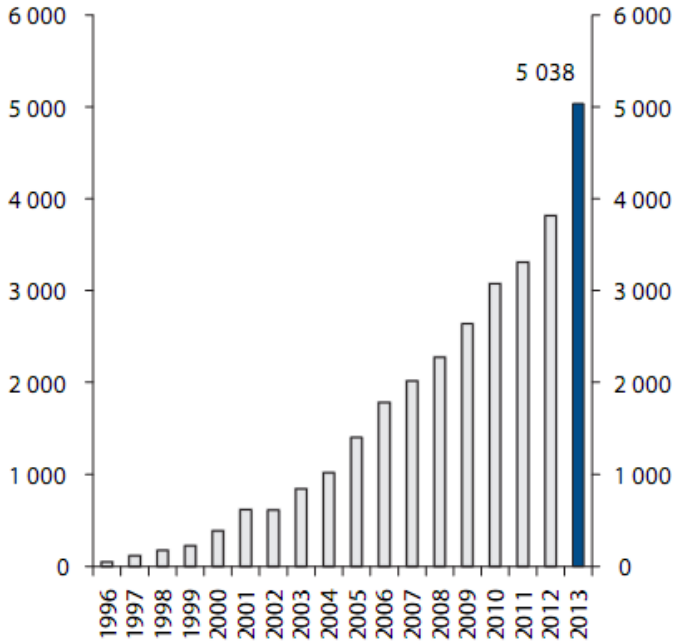
The overall investment policy for the Fund set forward by the Mandate can be summarized as fairly conservative. Again, given the long-term character of the investment horizon, the Fund's management is hardly expected to engage in various types of activities that would be based on a short-term gain intuition, like short-momentum speculation, or investing in temporarily well performing risky assets, like buying micro-cap technology stocks after a minor breakthrough in communications. The management is also expected to avoid all type of "overheated" well-performing issues that tend to be heavily overpriced due to attracting too much of investors' and media attention. In other words, the Fund's management is expected to beware any sort of market-herd behavior, sidestep risky investments, and, surely, make a decision to invest only in securities with which they are reasonably familiar in order to be able to add value in the long perspective.

3.3 The Fund's recent performance

Advancing the discussion in the direction of the Fund's performance, to begin, the Fund ended up the reporting period of 2013 with the total market value of assets equal to 5,038 billion NOK[2], with the actual allocation of 3,107 billion NOK in equities, 1,879 billion NOK in fixed income securities, and 52 billion NOK in real estate (Finansdepartement, 2013-2014). The Fund's market value (Figure 1) grew by 1,222 billion NOK over the period of 2013.

[2] For the discussion of the Fund's performance, the Norwegian krona (NOK) is mostly used, since the Fund reports in NOK according to the Mandate. The values are not converted in the USD to avoid inconsistency.

Figure 1. The Fund's market value growth (billion NOK)

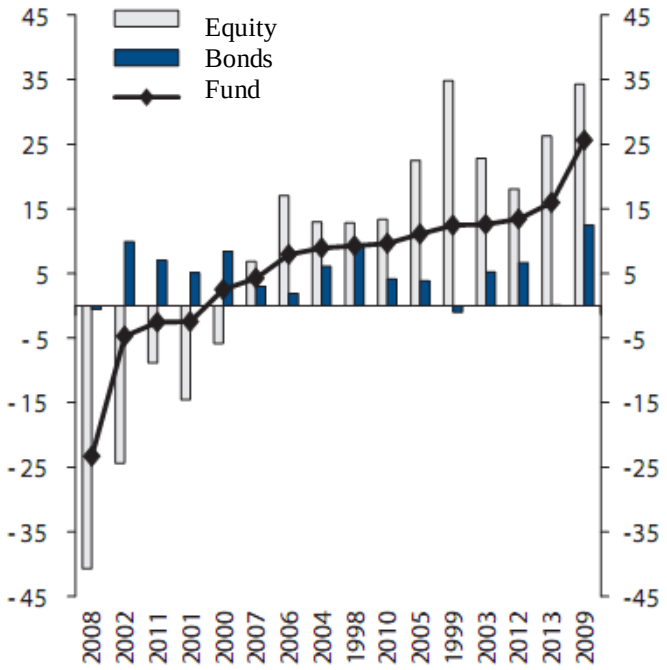


Source: Norges Bank

3.3.1 Return

The total return for the year 2013 was 15.9%, before adjusting for the management costs, and 14.3%, adjusted for inflation and management cost. The dynamics for the Fund's annual nominal return are presented in Figure 2. Table 1 summarizes the Fund's returns for the last period, last 5 years, 10 years and the period of 1998-2013.

Figure 2. Annual nominal return, before costs



Source: Norges Bank

Table 1. Annual returns for the Fund for various periods, geometric average, in percent

	Last year	Last 3 years	Last 5 years	Last 10 years	1998-2013
Fund, incl. real estate					
Realized return	15.95	8.62	12.03	6.30	5.70
Inflation	1.39	2.07	2.00	2.14	1.89
Costs	0.07	0.07	0.09	0.10	0.09
Net return	14.29	6.35	9.74	3.98	3.65
Fund, excl. real estate					
Realized return	15.97	8.64	12.04	6.31	5.70
Benchmark return	14.98	8.31	10.88	6.07	5.39
Excess return	0.99	0.33	1.16	0.24	0.31
Equity portfolio					
Realized return	26.28	10.77	15.64	7.81	5.66
Benchmark return	24.99	10.42	14.96	7.33	5.13
Excess return	1.28	0.34	0.69	0.49	0.53
Fixed income portfolio					
Realized return	0.10	4.55	6.01	4.41	5.03
Benchmark return	-0.15	4.39	4.17	4.20	4.82
Excess return	0.25	0.16	1.83	0.21	0.21

Real estate portfolio		
Realized return	11.79	4.57[3]

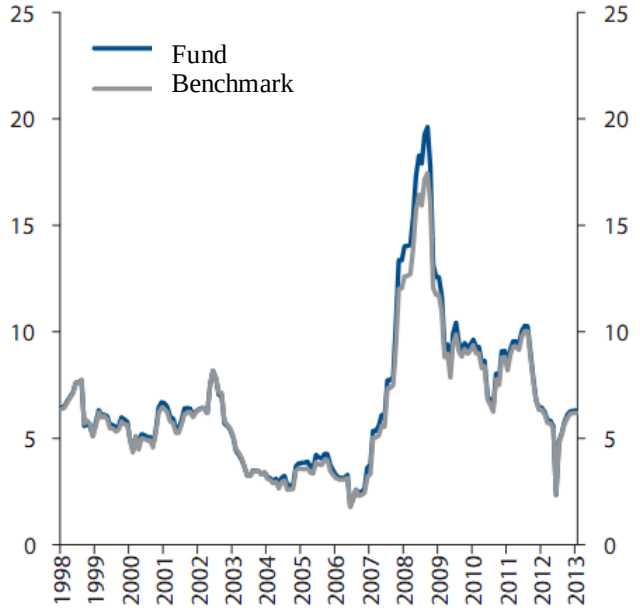
Source: Norges Bank

The excess return from Table 1, calculated as the difference between the benchmark and the realized return, that the Fund reached by the end of 2013, excluding real estate, is 0.99%. For the period of 1998-2013, the annualized excess return equals to 0.31%. For the equity portfolio, the excess return in 2013 constitutes 1.28% and 0.53% for the period of 1998-2013. The fixed income portfolio yielded a less generous excess return of 0.25% in 2013 and 0.21% for 1998-2013.

3.3.2 Risk

The standard deviation, a simple measure used by the Norway's Department of Finance to describe volatility, of the Fund's return in 2013 was 9.3%, which is equal to 470 billion NOK in terms of the total market value of the Fund. Figure 3 plots the total Fund's and reference index's volatilities for dynamic comparison over the period from 1998 to 2013.

Figure 3. Combined 12-month rolling window standard deviation for the Fund and benchmarks



Source: Norges Bank

[3] From April 1, 2011

The diagram shows that the Fund's standard deviation dynamics has been mostly in line with the dynamics of the standard deviation for the benchmark. In addition, the Fund's equity and bonds portfolio mostly demonstrated slightly lower riskiness than the riskiness of the benchmark for the period of 16 years.

Table 2 summarizes the risk measures for the Fund. The table also presents third and fourth moments of distribution, skewness and kurtosis, in addition to standard deviation. According to the latter two, the Fund's returns do not fit the normal distribution. For each period, the returns were negatively skewed, which means that negative returns were more frequent than the positive. The distribution of returns is leptokurtic (> 3) for all periods of equity portfolio, and for most periods of other portfolios. This means that extreme positive or negative outcomes for returns were more probable than for those of the normal distribution. The Fund has demonstrated positive excess volatility for each period.

Table 2. Absolute and excess to benchmarks risk measures for the Fund, monthly observations

	Last year	Last 3 years	Last 5 years	Last 10 years	1998-2013
Fund, excl. real estate					
Absolute volatility (%)	6.31	7.27	9.01	8.54	7.67
Excess volatility (%)	0.38	0.37	0.68	0.90	0.75
Skewness	-1.08	-0.60	-0.20	-1.08	-0.96
Kurtosis	4.04	3.11	2.83	6.85	6.77
Information ratio	2.62	0.90	1.70	0.27	0.42
Equity portfolio					
Absolute volatility (%)	8.76	12.39	15.05	14.81	15.63
Excess volatility (%)	0.35	0.43	0.41	0.80	0.85
Skewness	-0.98	-0.70	-0.22	-0.97	-0.80
Kurtosis	3.92	3.91	3.22	5.57	4.32
Information ratio	3.71	0.81	1.68	0.61	0.62
Fixed income portfolio					
Absolute volatility (%)	2.95	2.67	3.42	3.55	3.48
Excess volatility (%)	0.61	0.45	1.36	1.42	1.13
Skewness	-0.31	-0.33	-0.08	-0.46	-0.41
Kurtosis	1.91	2.71	3.21	4.57	4.11
Information ratio	0.41	0.37	1.35	0.15	0.19

Source: Norges Bank

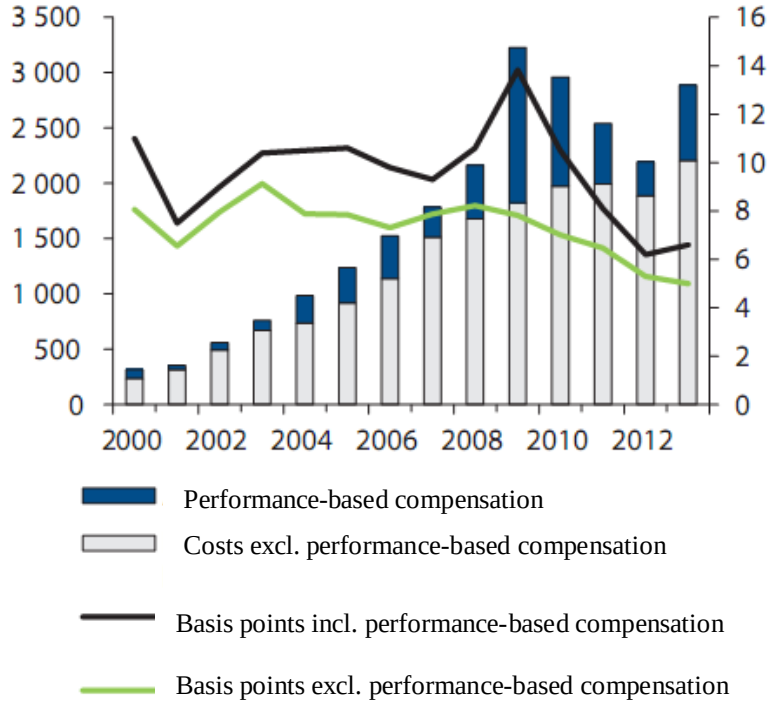
The Information Ratio (IR) is a measure of risk-adjusted return comprised of the expected active return divided by the tracking error, or the active return's standard deviation, or as in

this case, the excess volatility. IR, unlike the excess volatility is a more meaningful measure, as it can be interpreted as the amount of newly taken risk for each unit of excess return. The IR for the Fund's total portfolio for the period of 1998-2013 was close to 0.4, with the IR for equities and fixed income portfolios equal to 0.6 and 0.2, respectively.

3.3.3 Costs

Management costs, other than performance-based compensation for external managers, totaled to 2.2 billion NOK in 2013, which corresponds to 0.05% of the Fund's average market value over the year. The overall management costs, including the performance-based compensation for managers, was 2.9 billion NOK, which, adjusted for currency rates differences, equals 0.066% of the Fund's average market value over the year. Figure 4 plots the costs encountered by the Fund from 2000 to 2013 in NOK (to the left) and percent basis points (1 basis point = 0.01%) with and without performance-based compensation.

Figure 4. Dynamics for the Fund's costs, NOK (left), basis points (right axis)



Source: Norges Bank

From the diagram, it comes clear that the management costs do have an effect on the Fund's performance figures, cutting the Fund's performance by, roughly, 2-3 basis points each year.

The fixed costs have been rather steadily growing for the entire period. Starting from 2009, the performance based compensation has become a substantial part of the management costs, and has demonstrated more volatile dynamics than that of the fixed costs. This, perhaps, can be explained by the fixed costs being dictated by, primarily, the Fund's growing size and overall market conditions, like, for example inflation. The performance based compensation, on the other hand, is at the discretion of the NBIM's executive board. Observing a strong correlation between the Fund's performance before the compensation costs related to performance are excluded, it is possible to conclude that the managers are strongly motivated to demonstrate superior performance, although, the performance of the Fund suggests, that such a performance comes at a cost.

Taking into consideration both the dynamics demonstrated by performance, with excess returns being only slightly over the benchmark for equity and fixed income portfolios, but, nevertheless, steady and, on average, positive over the years, and the evidence that the Fund's management compensation is substantially influenced by superior performance, the question on the true quality of the management's work is hardly not of the primary importance to the NBIM's executive board and the Norway's ministry of finance.

4. Discussion of relative theoretical background

Although, the Fund has managed to deliver positive returns over the most of the periods, the excess returns demonstrated against the predefined benchmarks are hardly impressive. Given, although, mostly, positive, but rather insignificant result that can be attributed to the actively involved management, a crucial question of how hard it could be for a manager to beat the benchmark and deliver positive excess return arises. In addition, the observation of the abnormal return for all periods makes one wonder if it is all possible for a large investment fund that keeps growing to deliver positive excess returns consistently over time.

To answer these two fundamental questions, it is essential to begin with a general review of the relevant financial theories that attempt to answer what accounts for an investment manager's performance. The overview starts with the Efficient Markets Hypothesis, and goes on with coverage of other relative influential milestones in academia like Arbitrage Pricing Theory, Capital Asset Pricing Model, and Multi-factor model. The outline of the financial theories also sets up a strong theoretical context for further empirical tests.

The focus of the theoretical discussion is smoothly shifted from financial models to issues that accompany management of an investment fund. Beginning with general coverage of methods for evaluation of the management's performance, the discussion is taken further, through various alternatives for fund management strategies, fund management incentives, and evidence and rationalization behind imprudent conduct, to concluding that hazards for inappropriate managers' actions due to opportunistic motives or incompetence potentially exist for SWFs. Given such exposure, the Fund's management actions are tested for evidence of misdemeanor with the help of the Fund's and equity markets' historical data in the section that follows.

4.1 Finance theory

4.1.1 Efficient Markets Hypothesis

Perhaps, one of the most fundamental theories that were developed by the academic world during the last century and that became a foundation for further advances of the economic theory regarding investing practices is the Efficient Markets Hypothesis (EMH).

The origins of EMH can be traced back as far as the year 1863 when Regnault, a French economist and a practicing broker, in his attempt to approach stock market trading scientifically, suggested that the stock prices moved randomly. The idea of the so-called "random walk" of the stock prices was later developed by Bachelier in his work "The Theory of Speculation" (1900), where he modeled the stochastic process of a stock price using Brownian motion. Later, Cowles (1933) suggested that professional forecasters of stock prices were, in fact, useless. He supported his idea by a simple comparison of portfolios modeled according to the forecasters' advice and portfolios set up by a random selection of stocks. This proposition that professional investors could not outperform the market was later formalized by Cowles and Jones (1937).

Starting from the early sixties of the twentieth century, EMH became popularized by Paul Samuelson and Eugene Fama. Samuelson (1965) argued that the future contracts are priced by rational investors who expect the same spot price outcome in the future. This implied that the expected reward for engaging in a transaction of purchasing a contract with the purpose of reselling the underlying, or speculative activity, should be equal to zero, or, at most, to normal risk premium recognized by the market. Fama (1965) based his work for description of stock market prices behavior on the Mandelbrot's (1963) mathematical framework for proving that price changes should be unpredictable. By the time Fama formalized EMH in 1970, it became a dominant academic framework for further development of asset pricing theory, primarily, due to EMH's main assumption that market agents are, on average, rational in their expectations when they price an asset and incorporate the information available to market in the asset prices.

According to Fama (1970), EMH can be stated in three common forms: weak form efficiency, semi-strong efficiency, and strong efficiency.

Weak form efficiency suggests that the present prices incorporate all historic market information. This means that the future prices cannot be predicted by analyzing the stock's past. This, also, makes it impossible to earn abnormal returns for those managers who use technical analysis in their stock price forecasts, as the technical analysis is based purely on analyzing historical patterns of data for the stock's prices and trading volumes. However, under the EMH weak form, there is still room for "beating the market" by those managers who use other than readily observable information for their pricing models. Diligent

fundamental analysis of the company's financial, organizational, and strategic planning information can give a manager superior knowledge on the future price for a stock.

This, however, is not possible under semi-strong form of efficiency of markets, where prices for stocks constantly adjust to newly available public information in a timely and unbiased manner. This means that it is not possible to earn abnormal returns by trading on this information, making both technical and fundamental analyses inefficient.

The third form, which is strong efficiency, in addition to the semi-strong form, suggests that the market prices incorporate not only the publicly available information, but also the private information of those directly involved with the companies' management. This implies that, under strong market efficiency form, even insiders can't make excess returns by trading on specific information that could, otherwise, be available only to them.

In addition to this, an important remark should be made here. Although, according to EMH, it is believed that the market is always correct in pricing assets, for this, all participating individuals should not necessarily be ideally rational. The deviations from the market price, however, are assumed to be random, since this ensures that speculators cannot systematically exploit the mispricing.

Generally speaking, under condition of EMH semi-strong and strong forms of efficiency, a fund manager can hardly add meaningful value. However, there is still evidence of talented managers with outstanding records of delivering positive excess returns to funds for a decent period. This could be interpreted in the manner that, although, the market is always right, according to EMH, there's still room for "star" managers who have a decent record of systematically beating the market. This is possible due to a truly large number of managers competing worldwide, which means that the existence of a few impressively brilliant in the extreme right tail of the normal distribution can be, simply, explained by chance.

EMH validity

EMH, as of the state for the early 70-s, although, having the market information as its core component, did not question how this information is originated. In addition, the mechanisms for how the market information is reflected or interpreted are also not taken into account. Under EMH, the information on prices is already present when an agent comes to the market. Simply speaking, the market agents are viewed not as providers but takers of the information.

However, undoubtedly, it is the agents that generate the information. To address this rather unrealistic inconsistency, Grossman and Stiglitz (1976) modeled a market where information acquisition comes at a cost. This means that if an investor is there to acquire superior information due to, for example, research, this would come at a cost. Abnormal return which comes as the result of such costs is, therefore, a premium for superior knowledge, which, in its turn is used to cover the incurred costs. This idea suggests that those who run analyses on the true value of assets traded in the market, and, therefore, acquire better understanding of the true value, push the market price to its equilibrium. This suggests that in the economy which is close to being efficient, superior skilled managers can still notice and exploit cases of temporary market mispricing.

EMH validity has been tested with empirical methods numerous times. The majority of tests were looking for systematic, statistically significant deviations of prices for assets from that of the predicted by the market. Such a systematic deviation from the modeled market price was coined as a market anomaly. The largest part of these tests was performed on prices for stocks, due to, mainly, availability of reliable historic data from CSRP, a stocks database hosted by the University of Chicago starting from the 1970s.

Market anomalies

One of the earliest prominent documentations of market anomalies was that the companies that had small capitalization systematically outperformed large firms (Banz, 1981). A few years later, the January effect was documented by Keim (1983) and Reinganum (1983). The January effect stands for significantly higher returns that were systematically observed in the beginning of a year. The book-to-market effect (Stattman, 1980) was observed as the companies that had the value of their equity on their balance sheets higher than the total price for their shares on the market outperformed the firms whose equity was valued by the market higher than the book value.

A number of reversal and momentum effects with different time spans were observed in the 80s and 90s (Rosenberg, Reid, & Lanstein, 1985), (De Bondt & Thaler, 1985), (Jegadeesh & Titman, 1993). A reversal effect stands for the market agents' overreaction to extreme news, and that it takes some time for the market to correct the price. Momentum effect is the evidence that the stocks of those companies that previously outperformed the market have better odds for outperforming the market next year, and vice versa, the previous losers have higher chances for underperforming in the future. Finally, Bernard and Thomas (1989)

demonstrated that buying stocks of the companies that surpassed the expectations for their returns by the market can yield positive abnormal return.

4.1.2 Arbitrage Pricing Theory

Practically, all tests for EMH validity heavily rely on pricing models used to define the correct market prices against which the realized returns are measured to define the excess return. Arbitrage Pricing Theory (APT) was an important milestone in the development of the asset pricing theory.

APT was proposed by Ross (1976) in his attempt to improve the EMH standings when he suggested that arbitrageurs would drive expected return of assets towards the value that is consistent with the market equilibrium. Similarly to Grossman and Stiglitz, he allowed for exploitation of some opportunities that could lead to earning abnormal returns by managers under EMH. Using the arbitrage argument, Ross described the mechanism by which the information on asset prices becomes incorporated in the market. In addition to this, there was made a valuable conclusion that an arbitrageur will consider the tradeoff between the expectation of positive excess return, the risk associated with the position financing, and the risk of being wrong. By the logic of risk and reward tradeoff, APT states that the expected return of an asset can be modeled as a function of a set of macroeconomic variables to which asset's cash flows are exposed. Given the risks from these factors, the cash flows should be discounted by an appropriate discount to obtain a fair price for the asset. This is modeled as the linear function of the asset's change in price over time, i.e. return, and a number of independent factors, sensitivity of the return to which is represented by coefficients:

$$r_j = a_j + b_{j1}F_1 + b_{j2}F_2 + \cdots + b_{jn}F_n + \epsilon_j$$

where r_j is a risky asset j return, a_j is a constant for asset j, F_k is a systematic factor, b_{jk} is the sensitivity coefficient of the asset j to factor k, ϵ_j is an idiosyncratic and independently distributed error term.

The factors can be regarded as sources of systematic risk for which an investor should receive premiums incorporated in the expected return ($E(r_j)$):

$$E(r_j) = r_f + b_{j1}RP_1 + b_{j2}RP_2 + \cdots + b_{jn}RP_n$$

where RP_k is the risk premium of the factor, r_f is the risk-free rate

APT suggests that the price for an asset derived using this model can be compared to the observed market price of the same asset, and if the prices differ, an arbitrageur can exploit this inconsistency, and, this way, adjust the market price to the correct level. APT has become an instrumental basis that set intuition behind such important frameworks as, for example, derivatives pricing models. However, arbitrage has its limits for practical implementation as a principal approach to managing an investment fund. The infamous case of the Long-Term Capital Management collapse in 1998 was an evident demonstration that even if it is possible to define a fair value for an asset before the market truly recognizes this value, it is quite impossible to foresee how long it will take for the market to converge.

4.1.3 Capital Asset Pricing Model

Capital Asset Pricing Model (CAPM), is, perhaps, the most iconic asset pricing model both in academia and financial industry, and, although, being a predecessor to APT, it can be regarded as a special case of APT.

William Sharpe (1964), John Lintner (1965) and Jan Mossin (1966) are all credited for independently introducing CAPM. Their work comes from the earlier works on portfolio formation, known as Modern Portfolio Theory, or MPT (Markowitz, 1952). MPT suggested that rational investors can diversify away a portion of the risk associated with individual securities by including more uncorrelated securities in the portfolio.

Taking this concept one step ahead, CAPM differentiates the total risk of a security into the fraction of risk attributed specifically to a company whose stock is being traded, or idiosyncratic risk, and the part of risk that is common to all securities traded in the market, or systematic risk. Since all of the securities traded in the market have this same, and, therefore, perfectly correlated, portion of systematic risk embedded in them, an investor cannot get rid of this risk through diversification. Hence, an investor should be compensated for taking on this systematic risk, rather than the total risk of a security.

CAPM is a linear equation model used to determine a theoretically valid required rate of return of an asset according to the asset's exposure to the systematic, or market risk. The measure for sensitivity of a security to the market risk is beta (β), which, along with the expected return on the market portfolio (r_m) and the return on the risk-free asset (r_f),

determine the expected return of an asset, and this relation is summarized with the well-known CAPM formula:

$$E(r_i) = r_f + \beta_i(E[r_m] - r_f)$$

To model the return of the market portfolio, which in the ideal CAPM world is comprised of a global portfolio of assets, practitioners use a broad market index, like S&P 500, as a proxy. For the risk-free rate, some riskless, often government-backed fixed income security, like long-term US Treasure Bonds, is used. The $(E[r_m] - r_f)$ part of the formula is also referred to as the market premium (RP_m) over the riskless return, this means that the formula can be restated as:

$$E(r_i) = r_f + \beta_i RP_m$$

The last formula provides a somewhat better intuition for CAPM to be regarded as a single-factor APT model, where the only factor that defines the riskiness of an asset is its exposure to the market. The sensitivity coefficient, beta, is the measure of the asset's covariance with the market relatively to the market's variance, or:

$$\beta_i = \frac{Cov(r_i, r_m)}{Var(r_m)}$$

A more risky stock will have a higher beta, and, therefore, investors will require a higher return for taking on the risk that they cannot diversify away. The market's beta is equal to 1, and if the stock is less risky than the market, its beta will be less than 1, with the same intuition for a more risky stock, whose beta will be more than 1. A stock's beta can be negative as well. In such a case, this would be a sign that the stock moves in the opposite direction of the market's moves. Such stocks are regarded to be valuable for various defensive strategies, as they are considered to provide some hedging to a portfolio against the market's turmoil. A large, well-diversified portfolio, like that of the Fund's, should have riskiness almost identical to the market's (beta of 1). This also implies that the expected return on such a portfolio should be equal to that of the market.

Graphically, CAPM is represented with the Security Market Line (SML) that is plotted along the x-axis of beta and the y-axis of expected return. The correctly priced securities should be placed on SML which represents the tradeoff between the systematic risk (beta) and reward. CAPM is widely applied for comparing the estimated price for a security with that of the

market's. To do this, an investor should derive the beta for the asset using the market single-factor model and implement it in the CAPM formula. This, required by the market, return should be used to discount the expected cash flows of the security to their present value. The resulting sum of the present values of the cash flows should be compared to the observed on the market price, and if the observed price is lower than that of predicted by CAPM, the asset is regarded to be underpriced and presents an investing opportunity for an investor, again, given the assumption that the market will later converge to the theoretically estimated price.

CAPM validity

CAPM assumes that all investors aim to maximize economic utilities, are rational and risk-averse, are broadly diversified across a range of investments, are price takers and cannot influence prices, can lend and borrow unlimited amounts under the risk-free rate of interest, can trade without transaction or taxation costs, deal with securities that are all highly divisible and liquid, have homogeneous expectations, and do not encounter information asymmetries (Arnold, 2005). These assumptions, evidently, relate back to EMH, and CAPM has been tested numerously for empirical evidence for its validity.

However, an ability to test CAPM for validity has also been questioned. A remarkable work by Roll (1977) suggests that it is impossible to test the CAPM validity, under CAPM's original basic assumptions due to inability to observe a global portfolio of assets that should, in addition to financial assets, incorporate all other types of assets, including the works of art and human capital which are not only hard to quantify, but also impossible to realistically correctly price. In addition to this, it has been argued that CAPM could not be supported empirically due to, mostly, invalid applications of the model (Fama & French, 2004).

4.1.4 Multi-factor model

Returning to the discussion of efficient markets anomalies, it is important to mention that most of the tests performed for the empirical evidence for EMH to hold with the discovery of anomalies as the result were performed against the benchmarks designed with CAPM. This spurred further debates regarding the validity of a model that offers only one factor for the risk.

On the verge of APT developed as a systematic approach to solution for this problem, as mentioned earlier, it was suggested that an asset's sensitivity to multiple factors for

systematic risk can be used for deriving the premiums for holding this risk that should be incorporated in the return required by investors. Such factors should be universally recognized by all investors as risky. It was suggested to include inflation shocks, unanticipated shifts in the yield curve, business risk represented by GDP shocks, and changes as risk factors in addition to market risk Chen, Roll and Ross (1986).The securities not influenced by these risk factors should, therefore, yield the risk-free rate of return, and those that are risky should pay premiums appropriate to their exposure.

There has been a massive debate on how to measure the risk factors proposed by Chen et al, as they are quite intuitive from the economic perspective. However, there has been little universal concern on robust measures that could be used for practical implementation of the multi-factor analyses based on these factors. An obvious reason for this is the nature of the listed factors. To be more specific, it is rather challenging to set up appropriate time series that would account for shocks relatively smoothly over time in order to, say, use those data along daily stock returns. Moreover, most of the statistical procedures would not appropriately pick up the effects of those shocks over time due to smoothing and the unpredictable, i.e. random, nature of the shocks.

The observed market anomalies, however, can be viewed as simply premiums for other than market systematic – or not diversifiable – risk factors captured by the setups of the empirical tests. Indeed, if some strategy readily observed in the market yields systematic premiums which have not been immediately corrected for by speculators, this strategy can be interpreted as a strong evidence for systematic risk presence that accounts for the premiums. In such case, it is hardly the manager's skill that should be rewarded, and the exposure to these risk factors, if they are acceptable for the overall vision for the portfolio's strategy, should be incorporated in the benchmark in order to measure the manager's performance diligently.

Fama-French three factor model

Such factors, proven to hold empirically and widely popular today, in addition to market factor proposed by CAPM, are the premium for holding small capitalization companies stocks over large capitalization (small minus big or "SMB") and high book-to-market ratio firms over low book-to-market (high minus low or "HML"), as offered by Eugene Fama and Kenneth French (1993). The latter can also be interpreted as the relation between the price for one stock of a firm offered by the market and the book value of one share.

Perhaps, more intuitive restatement for HML-factor would be with the implementation of price-to-book (P/B) ratio which, in essence, is a reciprocal of the book-to-market. In this case, high P/B corresponds to low book-to-market. It is also popular to refer to the stock of the firms with high P/B as the growth stocks and those with low P/B as the value stocks. The intuition behind such classification is that the market is prepared to pay premium for the stocks of the companies it believes to have strong (earnings) growth perspectives that are not captured by the balance sheet value of the shares. By the same token, value stocks are called like this because the market underprices them, and, therefore, there could be unrecognized value opportunity for an investor from buying something cheap. Although, the intuition for the growth stocks is rather straightforward, one should be rather cautious about believing that buying a P/B-underpriced stock is always a good deal. The reference to value stocks being underpriced goes back to the famous investing framework developed by Benjamin Graham and David Dodd and summarized by Benjamin Graham in *Security Analysis* (1934). In the book, the author argues that in order to derive value from an investment, an investor should go long in stock that appear to be underpriced by the market in relation to some of the indicators of stock prices attributed to fundamental analysis, as, for example P/B ratio.

The empirical evidence has demonstrated a rather high explanatory power for SMB and HML factors.

Momentum factor

In addition to SMB and HML, the momentum factor ("MOM") was suggested by Carhart (1997). Momentum investing strategies had been known previously, as mentioned in the overview for the market anomalies, and are based on buying the previous period's winners and shorting the previous period's losers.

Summarizing all previously said, the improved multi-factor model can be presented in this form:

$$E(r_i) = r_f + \beta_0 + \beta_1\left(E[r_m] - r_f\right) + \beta_2 SMB_i + \beta_3 HML_i + \beta_4 MOM_i$$

where β_k are sensitivity coefficients, or loadings, to the discussed factors, with β_0 being the intercept for the linear model. An important remark here is that β_1 is different from the CAPM-derived beta, as the latter incorporates the effects of other factors.

The optimal factor loadings can be predefined and incorporated in a portfolio benchmark. The portfolio manager's skill to deliver excess returns will, then, be evaluated against this more appropriately adjusted for risk benchmark.

Given there is neither straightforward evidence for markets being perfectly efficient, nor EMH has been fundamentally proven to be wrong, it is possible to conclude that the markets are, on average, fairly but not perfectly efficient. In addition, after adjusting a benchmark against which abnormal returns are measured for systematic risk factor premiums, a quest for systematically positive excess returns becomes extremely challenging.

4.2 Fund management theory

From purely financial theories that discuss a setup of market mechanisms in general, the discussion's focus becomes more concentrated on theoretical review of methods for fund management which, essentially, build up on the theories overviewed previously. To pick up from where the theoretical review of finance theories has been left, there exists a number of views on managing a portfolio under various factor models.

To begin, a simple CAPM-based benchmark incorporates only one rather wide-scope factor as a source for systematic risk, the market risk. Under CAPM theory, a manager has two basic approaches alternative to merely holding the market portfolio comprised of the assets allocated in the same proportion as they should have been allocated in the global portfolio of all risky assets.

First approach is based on the manager's decision to incorporate more or less market portfolio over time. If the decision is to incorporate less in the market portfolio due to, say, manager's expectation of temporary market instability and, therefore, more risk from increased volatility and, eventually, poor performance of the market, the weight for the riskless asset will be increased. In case of expectation of favorable economic conditions and markets growth, a manager can obtain more than 100% exposure to the market by leveraging his position through borrowing (theoretically, it is implied that the manager can borrow at the risk-free rate, which, clearly, is somewhat unrealistic). Such portfolio management approach goes in line with CAPM theory and is intuitively described by moving along SML. By diligently performing her economic forecast analyses and responding to the expected market conditions appropriately through dynamic shifting between the risk-free rate and the

market portfolio, the manager is able to deliver positive excess returns to that of the benchmark.

The second way to approach abnormal returns generation having the end-period results evaluated against CAPM benchmark is, actually, deviating from the benchmark. This deviation is expressed in setting up the weights for the assets in a manner that is different from the market-weighted proportion. In this case, a manager would incorporate more/less risk in relation to that of the market without linearly shifting between the market portfolio and the risk-free asset as in the first case.

This latter approach takes us directly to discussing portfolio management under a multiple factor model based benchmark. By deviating from the market portfolio weights, a manager, in essence, changes the overall risk profile of the portfolio by over-/underweighting stocks with higher/lower betas, the measure of market risk. The excess returns to such approach can be attributed to the fact that the manager has exposed her portfolio to additional to market systematic risk factors and, this way, was able to harvest extra risk premiums.

Since there exist more than one such well documented systematic risk factor, it makes sense to include them in a portfolio's benchmark. This will not only ensure that the manager's results will be evaluated more properly, but will also give more discretion over the desired risk profile to the portfolio's owner who sets the benchmark.

In order to deliver positive excess returns under the condition of a multifactor model based benchmark, a manager can deviate from the risk factor weights assigned by the benchmark, and, this way, take on more systematic risk with the purpose of harvesting premiums associated with the risk by the end of the reporting period. This approach can be undesirable as it can be regarded as a divergence from the initial portfolio's mandate set forward by the portfolio owner. The benchmark can incorporate some particular risk profile due to constraints faced by the owner and increasing risk profile could, therefore, be unfavorable. In addition, there exists a possibility of a manager identifying new systematic risk factors that are not defined by the benchmark and using them to earn premiums in excess of the benchmark's return.

Another alternative to delivering abnormal returns, which is believed to be demonstrated by truly talented managers, is through selection of stocks that correspond to the risk profile of the factors from the benchmark, but yield higher return than that of other similar assets due

to being underpriced at the time the manager incorporated it in the portfolio. It is, therefore, up to the manager's ability to spot such undervalued assets, and, then, obtain some sort of reasonable assurance that the market will converge to the true price estimate in the future.

4.2.1 Fund management performance evaluation

In academia, there has been much research dedicated to finding appropriate measures for evaluation of fund management performance. One of the most acknowledged early works dedicated to the study of management performance was undertaken by Jensen. In his study (Jensen, 1968), he developed the so-called "Jensen's alpha", or just "alpha", which, ever since, has become synonymous to positive management performance. Having CAPM as the only widely accepted framework for benchmarking in the late 60s, alpha, originally, was the difference between the realized return of the portfolio by the end of a period (r_i) and the expected return for the benchmark defined by the market:

$$\alpha_J = r_i - [r_f + \beta_{iM}(r_m - r_f)]$$

This way, in the study, Jensen used alpha to account for the return delivered by management relative to the portfolio exposure to the market. Having performed his test on 115 mutual in mutual funds for the period of 1945-1964, Jensen did not find any significant evidence for systematic management outperformance.

The alpha tests were run later on various samples for funds given different benchmarks. Currently popular standard approach is to use Fama-French three factors and Carhart's momentum, all of which are discussed earlier, as systematic risk factors for funds' alpha measure.

A prominent study of mutual funds performance over the period of 44 years starting from 1962 by Fama and French (2008) was approached this very same way. The results did not turn out to be optimistic for managers as the annual alpha for the sample turned out to be around negative 1%, adjusted for the costs. In addition, for the period of 1984-2006 the number of outperformers of Fama-French plus momentum factors benchmark in the sample distribution was considerably lower than expected under standard statistical assumptions (Fama & French, 2010). Other studies on mutual funds have yielded similar results of slightly inferior to market performance of mutual funds after adjustment for management costs (Wermers, 2000).

An important remark should be made here is that most of the studies dedicated to the broad question of fund management performance have been revolving around mutual funds performance. The primary reasons for this are believed to be their longer endurance over time (hedge funds, for example, are a few decades younger), relative homogeneity due to similarities of investors and operated markets, and stronger regulation of this kind of investment entities due to their direct connection to various pension plan systems. This has resulted in accumulation of rather comprehensive well-organized datasets that are more available for studies than those for other type of funds.

The data on SWFs, on the other hand, are relatively young. However, in recent studies, there has been evidence that SWFs management performance is not extensively different from that of the non-SWF counterparts in long run if adjusted for SWFs specifics like size, liquidity and horizon (Kotter & Lel, 2011), (Dewenter, Han, & Malatesta, 2010).

The differences that still can be observed in the individual performance of stocks of the companies that SWFs invest in can be attributed to the SWF's corporate governance policy regarding the investment after the purchase rather than management superior stock-picking skills. In other words, it is an SWF's corporate procedures for actively monitoring firms' executive management that can add up to abnormal performance after the fund becomes engaged with the company (Bortolotti, Fotak, & Megginson, 2013).

4.2.2 Active vs. Passive fund management strategies

In practice, the manager's ability to "beat the market" is often referred to as an ability to deliver abnormal returns over a low-cost alternative of simply replicating the benchmark assets weights for the portfolio. Many benchmarks are readily observable on the market through indexes for market portfolios and other popular systematic factors, like size. In addition, there exist various financial products readily available on the market that replicate major indexes. Buying such product like an ETF that corresponds to the desired benchmark can be a cheaper alternative for an investor that doesn't have much capital to invest, which made these products rather popular among private investors. An investing strategy based on replication of a benchmark is denoted by so-called "Passive" investing strategy.

Given the absence of strong evidence for the superior mutual fund management skill and the lack of substantial proof that SWF managers demonstrate better results than their mutual fund colleagues, an alternative for adoption of Passive strategy by SWFs comes into the

daylight rather naturally. Again, it would not be inappropriate to emphasize that the Passive strategy for an SWF under discussion here is not based on a benchmark formed on the basis of a single factor market model. A definition of the benchmark for an SWF should be derived on the basis of the multi-factor model that would specifically be adjusted to SWFs according to their size, liquidity and long-term investment horizon.

Overview of the Fund's active management strategy

Such a question regarding the evaluation of the active management strategy of the Fund had been asked by Norwegian government previously. This has resulted in a report written by Ang, Goetzmann and Schaefer (2009).

In their work, after careful assessment of the results of the Fund, with consideration of its specifics, the authors concluded the following. Given the most recent outlook on EMH that incorporates costs to obtaining information, transactions costs, financing, agency costs, and other real-world frictions, some balance between indexation and active management is the right choice. Given the objective of the Fund's management to deliver passive return based on the benchmark predefined by the investing Mandate and the portfolio manager team's task to explore opportunities in order to gain positive excess return over the benchmark, the authors list the following factors that should be incorporated in the Fund's benchmark: term structure risk, credit risk, foreign currency risk, value-growth risk, small-large risk, momentum risk, and volatility risk.

For fixed income securities portfolio, term structure risk factor premium is the premium for holding longer maturity period securities over the short-period, and the credit risk is based on the probability that the borrowing firm will default on its obligations; the higher the probability, the higher premium for compensating this risk to an investor should be. Foreign currency risk factor is, mostly, a factor for cash holdings and is grounded on an ability to obtain premium by going long in currencies with high yields and shorting currencies with low yields. For the Fund's equity securities portfolio, value-growth and small-large factors are taken from the HML and SMB Fama-French factor model, and momentum is the Carhart's momentum factor. Finally, volatility premium arises, among other reasons,

because “agents are averse to periods of increased volatility and are willing to pay high prices to hedge against significant increases in market volatility”[4].

The exposure to these factors should be changed over time, and this dynamic factor weights adjustment should account for the active part of managing a portfolio.

4.2.3 Fund management incentives

The systematic risk factor premiums, as explicitly discussed before, can be regarded as only an attempt to interpret systematically observed returns that excess the return of the market. This, naturally, does not mean that they are the only reasons for funds to outperform the market.

A notable alternative to systematic risk factors explanation for a fund’s steady superior performance is that it could be this fund’s incentives that motivate managers to do their job better. There has been evidence that management incentives matter in mutual funds industry. Elton, Gruber and Blake (2003) have empirically tested the relationship between management fees and fund performance and found explicitly positive relationship.

Furthermore, well-performing funds in the past attract more funds from the clients. Managers being interested in higher compensation tied to the value of assets under management will, therefore, be interested to perform better (Chevalier & Ellison, 1997). Moreover, there are indications that the funds where management co-owns the assets together with the clients outperform other similar funds where managers are not co-invested (Khorana, Servaes, & Wedge, 2007)[5].

4.2.4 Evidence for imprudent fund management

A paper by Zweig (1997) attracted much attention to the evidence of seasonality in mutual funds performance. For the period of 1985-1995, an average equity fund outperformed

[4] Cited from Bakshi and Kapadia (2003), as in Ang et al (2009).

[5] Given the Fund’s owners are citizens of Norway, the Fund managers of Norwegian origin can be regarded as the Fund’s co-owners, and, perhaps, be more motivated than the managers of other nationality. Appropriate testing for such systematic difference in performance, however, is hardly possible, due to each manager’s individual previous professional experience, education and other considerations that should be taken into account. One manager can be better than another simply because she has better prior training or possesses some specific expertise in the field of investments she is responsible for. In addition, the numbers of total managers and the Norwegian managers employed by the fund would, perhaps, be not sufficient for sound statistically significant conclusions.

S&P500 by 53 basis points (bp) on the last trading day and underperformed by 37 bp on the next day, which is the first day of the next trading period. The outperformance on the last day and underperformance on the first day effect was even stronger for the small capitalization funds. The data from the funds performance were compared to the appropriate stocks indexes. The shifts of the stock indexes did not match the shifts of the funds performance, which meant that it was not the stocks fluctuation in prices that was accountable for the funds' abnormal period end results. The explanation for this was that the fund managers caused pattern by manipulating year-end valuations of the stocks, or, in other words "window dressing" the funds performance for better looks on the period-end reports.

The suggestion that fund managers engaged in manipulations with the end-period NAV (net asset value) in order to beat the benchmark was rigorously tested by Carhart et al (2002). By performing tests for abnormal returns over S&P500 on daily returns data from nine fund investment style-based indexes set up by Lipper and their own database of 2,829 mutual funds, the authors found strong evidence that equity fund returns, net of the S&P 500, were abnormally high on the last day of the quarter, especially the fourth quarter, and abnormally low the next day.

In addition to that, the authors noticed that the top ten overall funds outperformed other funds by an extra 42 bp on the last day of the year and underperform these funds by an extra 29 bp on the subsequent day. Based on subsequent analysis, the authors concluded that this was motivated by a desire to demonstrate consistently superior performance by those managers who did well previously.

But why would the managers of the top performing funds engage in the quarter-end window dressing on the systematic basis? Should not those managers who used their superior skills in the past be able to further demonstrate excellent results consistently?

4.2.5 Rationalization for management's imprudent conduct

Empirical results show that when fund managers' compensation is linked to relative performance, those managers of investment portfolios who are likely to become winners by the end of the reporting period might engage in less risky behavior than those managers who would realistically not expect to finish first (Brown, Harlow, & Starks, 1996).

Fund managers are also more likely to engage in increasing risk behavior if their compensation is tied to the funds' new capital inflows based on the manager's previous year's performance (Chevalier & Ellison, 1997). Moreover, those funds that have their managers compensated for running low-risk strategies gradually transit to holding more government issued securities at the time close to disclosure periods. This is because the government issues, generally, have lower volatility profile which makes them account for a safer strategy, for which the management gets better compensated (Musto, 1997).

An explanation supported by the evidence is that the management performance deteriorates as the scale of the fund grows. Perold and Solomon (1991) argue that the reason for this could be larger transaction costs as the positions of a fund become larger with the attraction of new capital. In addition to this, they argue that as the size of the fund grows, at some point, the costs of additional trading exceed the opportunity cost of not trading. Their conclusion is that if the management fee is tied to the percentage of assets value under management, the managers will pass on many smaller trading opportunities in order to avoid trading costs.

The observation that managerial ability to deliver excess return is convexly related to the fund's size was also rationalized and empirically proven by Berk and Green (2004). The general rationale behind this relation is that the management talent is a scarce resource which gets simply dissolved as the size of capital flow increases. Apparently, as the past superior results attract more capital, the manager feels more challenged to demonstrate excellent outcome given the challenges of the larger capital size and the higher pressure from not only the old but also the new investors whose expectations for the return, in addition to that, have been updated upwards by the previous success.

The haste for demonstration of positive abnormal returns, given limits for management skills and an incentives system tied to the current performance, can develop into a strong motivation for managers to cheat by window dressing the results of their performance.

4.2.6 Hazards of manager's imprudent conduct for sovereign wealth funds

The described problem of window dressing is particularly acute for SWFs. As discussed earlier, the SWFs size has been continuously growing for the last decades at a rather rapid pace. Moreover, constant inflow of funds from the owning countries' revenue sources is in

the SWFs core nature. This is an essential difference between investment institutions competing for investor clients in the market-based environment.

Moreover, managers who get employed by SWFs, most usually, come from commercial funds. This means that they are used to working under commercial conditions, and the results which they demonstrated in the past, which could have been the reason for hiring them for an SWF on the first place, will not necessarily be demonstrated during involvement with the SWF. In addition, management is hardly in position of controlling the inflows of capital in SWFs, and, simply, can't refuse signing in another client in order to preserve an optimal balance of expertise and the fund size.

Furthermore, the market-based incentives system employed by most of the commercial funds that operate in the competitive environment and targeted at attracting new customers with demonstration of superior to rival's performance is not appropriate for SWFs. However, most of the SWFs offer performance-based compensation in addition to a fixed salary for the management, which is also the case of the Fund (Norges Banks Executive Board, 2011).

These major discrepancies in the SWFs organizational structures have an enormous potential for creating a situation where an SWF management can't deliver the expected performance due to SWFs specifics and is still being compensated relatively to the results demonstrated at the end of the disclosure period. This evident inconsistency can become a strong motivation for window dressing of the reporting period-end results by SWF managers.

In addition to acting opportunistically in order to demonstrate superior performance and, as the result, obtain some personal benefits, an SWF's management can be not diligent in execution of the fund's investment strategy without a self-benefitting motive. Such inappropriate attitude can be the result of a number of reasons.

Besides a manager's incompetence due to the fund's growth in size, specific SWFs' related tasks that the manager should address can become another reason for not coping with the duties appropriately. In a situation like this, a manager simply might not know how to accomplish the tasks set out by the fund, as those tasks are nothing like what she has been doing previously in the commercial industry. Another possibility is that the methods used in the industry for accomplishing similar tasks can turn out to be either inappropriate or just ineffective.

Moreover, an SWF's structural setup can become a reason for managers' negligence. It could be a poorly thought through compensation system that does not motivate, but rather discourages a manager to perform diligently. As an example, the internal fund's bureaucracy can penalize initiative in some way. Or it could be a lack of control due to corporate charter loopholes of which a manager is aware that would allow her to get away with irresponsible conduct.

Given the Fund's uniqueness, its largest SWF capital position in the world with the steady inflows of funds on a regular basis, and the incentives for competition among the Fund's managers due to the adopted compensation system, the risk that the Fund's management might engage in opportunistic activities or become indiscreet in execution of the Fund's investment strategy along the Mandate's guidelines for other than opportunistic reasons is potentially present.

5. Empirical assessment of the Fund's management prudence

In order to investigate whether the Fund's managers do their job thoroughly, firstly, two tests for opportunistic conduct are performed. Then, the management's diligence for the Fund's strategy execution is assessed with the help of another six tests.

5.1 Data

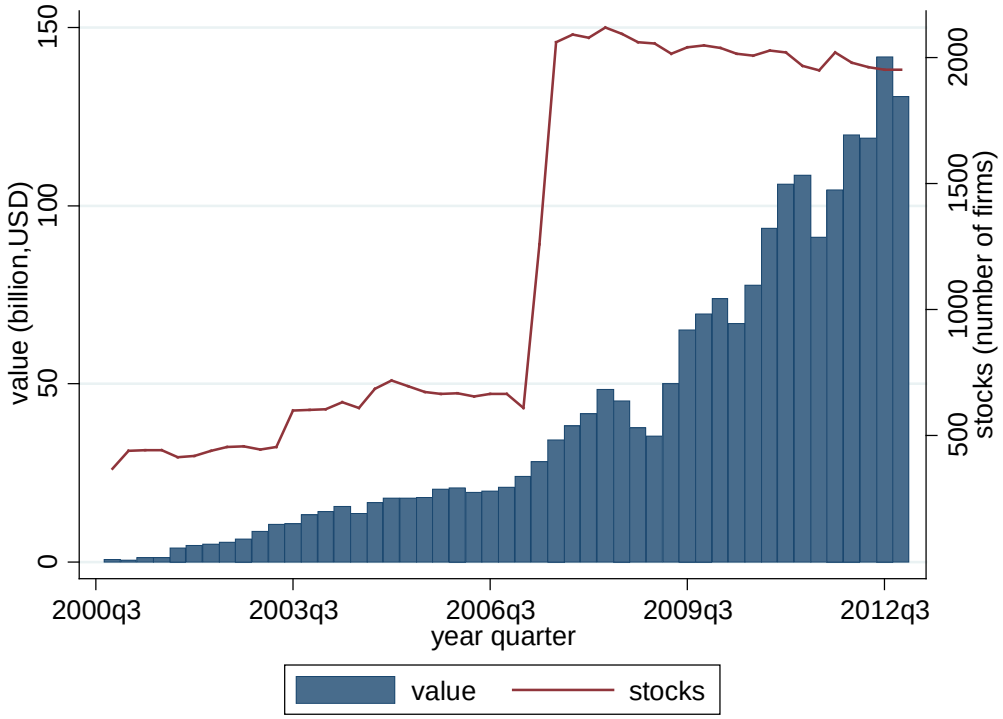
The empirical tests are performed on the Fund's equity portfolio historical data. Since the Fund does not disclose fixed income or real estate holdings on a regular basis to some public service in some standardized manner, like the US SEC in the case of equity holdings, it was hardly possible to incorporate non-equity portfolios of the Fund in the analysis.

To obtain the data on the Fund's equity securities positions, Norges Bank's 13F-HR quarterly reports were used. The stocks that are reported on form 13F-HR are those that are on the list of "Section 13(f) securities"[6] (US SEC, 2014). The reports were downloaded from the US SEC website (*www.sec.gov*) that uses EDGAR browsing system to locate the needed documents. Each report contains the information on the Fund's equity holdings with, among other details, specifications for the securities' issuer, class, CUSIP, market value of the total value of stock holdings and the number of shares owned for the end of the day of the last day of the reporting period (quarter end).

The data for each individual stock were accessed using Bloomberg terminal. With the help of CUSIP of each stock from the 13F-HR reports, historic closing prices for the end of the trading week, market capitalization, P/B ratios, country of origin, and principal sector of operations were obtained for the total number of 3,213 stocks. The Fund's holdings, as represented by the data, are described in more detail in Appendix 1 and graphically summarized in Figure 5.

[6] The list is published quarterly. *"Section 13(f) securities" are defined by Rule 13f-1(c) and is made available to the public pursuant to Section 13 (f) (3) of the Securities Exchange Act of 1934.*

Figure 5. Summary of the Fund's holdings value and stocks (number of firms) as represented by the data



As demonstrated by the diagram, the value of the Fund's equity portfolio holdings, as given by the data, ranges from 586.6 million (USD) in the beginning of the period to 131.6 billion. The number of companies included in the data ranges from 369 to 1,951. Further dynamics in the Fund's holdings, as well as additional details for stocks owned by the Fund and the Fund's trading history are covered along the overviews of methodologies for the empirical tests. Such general organization of the analysis ensures both information consistency and logical flow of the discussion.

For the data on the indexes that were used for the empirical tests setup, MSCI ACWI and the MSCI ACWI family indexes for 10 sectors, 3 company sizes and 2 investment styles were used. In particular, for firms size: MSCI AC World Index Large Cap, MSCI AC World Index Mid Cap, and MSCI AC World Index Small Cap indexes; for investment styles: MSCI AC World Growth and Value indexes; for sectors: MSCI AC World Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecommunication, and Utilities Sector indexes. The weekly price quotes for each index were accessed using Bloomberg terminal. In addition, MSCI ACWI Momentum index weekly price quotes and the US Treasury 10-year weekly bonds yields were obtained from Datastream.

The classification for sector indexes and stocks' industry and sector are set up in accordance with the Global Industry Classification Standard (GICS) that was developed by MSCI and Standard & Poor's. All data used for the empirical tests are for the period of 12 years from 2001 to 2012 and the currency used is USD. The data was adjusted and processed using MS Excel, Visual Basic (VBA) and Stata statistical package software.

5.2 Testing for opportunistic conduct

To examine opportunistic conduct of the Fund's management, first, a test for significant difference of abnormal returns for the weeks of the beginning and the end of each month, quarter, and year is performed. Then, the data are tested for significant difference of abnormal returns between the reporting week and each of the rest of the weeks in order to assess a hypothesis that there might exist some other than articulated by the first test pattern for investment decisions with a purpose of demonstration of abnormal performance for periods other than reporting dates.

A noteworthy challenge for the tests setup was to appropriately model the Fund's returns over the periods between the reported dates, as these data are not readily available for public access. To address this problem appropriately, three portfolios are constructed using different methods in order to replicate the Fund's returns time series properly. Together with the setup of the replicated portfolios, some appropriate results regarding the Fund's portfolio allocations are deliberated upon along the theoretical background presented earlier. Each of the tests is performed on each of the three replicated portfolios and the results are compared to each other and discussed.

5.2.1 Methodology

In order to discuss the dynamics of the Fund's investments during the 12 years period, and, eventually, empirically test for signs of the Fund's management opportunistic conduct, the time series for the Fund's weekly returns need to be constructed. The precision of the tests would, undoubtedly, be improved given it could be possible to obtain trustful information for the Fund's daily returns. However, since the Fund reports on quarterly basis, the approximations for the Fund's time series on the weekly basis introduce significantly less noise than if the time series for the Fund's performance were set up as daily returns.

To simulate the weekly returns of the Fund's equity portfolio, three replicating portfolios have been set up. The Fund's portfolio could hardly be replicated by imitating the holdings based on weighting individual stocks from year to year, as the Fund keeps buying and selling stocks between two reporting dates. A large allocation in one particular stock would be simply not observed if the position was changed closer to the reporting period. Hence, the portfolio should be replicated along steady equity factors that are constantly present for the entire period of replication.

Each replicating portfolio uses specific attributes of stocks that can be related to the appropriate MSCI's indexes. The decision for the broad categories for stocks on which the replicating portfolios should be constructed was based on two important criteria. Firstly, a specific attribute for each broad category should be objectively identified as a unique attribute that excludes other attributes of the category. The second criterion is that the categories should be widely recognized and an appropriate index historic time series can be readily accessed.

In addition, having MSCI ACWI index as the Fund's equity portfolio benchmark and using other MSCI indexes for categories' attributes that are constructed based on the MSCI's All World that includes both Developing and Emerging markets ("All World" and "ACWI" are essentially the same) ensures consistency of the results. This is another important reason, besides the correlation of almost equal to 1 (0.999) between FTSE GACI, the index used as the Fund's benchmark in the Mandate, and MSCI ACWI for deciding to use MSCI ACWI as the Fund's and the Fund's replicated portfolios' benchmark further on.

As mentioned, there are three approaches to replicating portfolios. The stocks are categorized into broader groups according to the criteria discussed above. One group is the size of the companies based on their market capitalization. Next group is the broad investment style that the firms can be attributed to. Finally, the firms are sorted by the primary sector of economy in which they operate.

The capital allocation weights are defined for each attribute within each of the three groups, where one group constitutes 100% of the portfolio. For example, the weight of the stocks

invested in Canada[7] is defined relatively to other countries, where all countries are one group that is equal to 100%. These relative weights for each attribute are then used to replicate the Fund's weekly returns by assigning these weights to an appropriate index according to the attribute. Continuing the earlier example, if the Fund's holdings invested in Canada are 10%, these same 10% are assigned to an appropriate index that represents Canadian market.

Since the aim is to replicate the Fund's returns over the periods between the reporting dates[8], the attributes weighting should be dynamic in order to reflect the changes in the attributes weighting over time. A simple, but not dynamic alternative to account for the change is to take the average for the attribute's weights between two dates. For dynamic weighting, the in-between number of weeks is estimated. Since there are two time dates for which the attribute weights are observed, the reference reporting date and the next reporting date, it is plausible to assume that the next week's period after the reference date should have weights for the stocks' attributes closer to those of the reference date rather than the next reporting date.

To incorporate this effect in the model for the replicating portfolios, the attribute weights from the next reporting date are weighted by the number of weeks starting from the reference period, and the reference date weights are weighted by the number of weeks remaining to the next reporting date. These products are, then, added up and averaged across the total number of weeks between the two reporting dates. The formula for dynamic weighting for one attribute on week i after the reference period t can be presented in the following way:

$$w_i = \frac{w_{t+1} \times i + w_t \times (N - i)}{N}$$

where N is the total number of weeks between the periods.

[7] A country-based example here is only for clarification purposes; country attributes are not used in the replicating portfolios setup.

[8] Some 13F-HR reports have reporting dates that are not end of week (like other time series weekly data used throughout the analyses) or trading days (e.g. weekends, holidays), as the calendar end-of-quarter days are required for reporting; for consistency, the reporting dates were adjusted in the following manner: if the reporting date is Saturday, Sunday or Monday it is taken back to the preceding Friday, if it is on other days of the week, it is taken to the following Friday.

Again, using the previous example, if Canada on the reference reporting date (w_t) is 10% of all the countries, and only 5% on the next reporting date (w_{t+1}), having 12 weeks between the quarter ends (N) when the reports become available, for the week 2 after the reference date, Canada is assigned the weight of:

$$\frac{5\% \times 2 + 10\% \times (12 - 2)}{12} = 9.167\%$$

For the given week, Canada index is multiplied by 9.167% to reflect the dynamic change in the Canada-attribute weighting for the replicating portfolio. Gradually, Canada's weight will be closer to 5% until it is, actually, equal to 5% on the day of the next reporting period.

Size portfolio

The first replicating portfolio is set based on the size of the firms that were listed in the Fund's quarterly reports. All stocks are sorted into three size categories according to their market capitalization: Large, Mid, and Small. Such categorization of stocks based on their size is chosen because size is a stock's property that can be objectively identified as a unique attribute. Moreover, since size is one of the widely recognized systematic risk factors from Fama-French three factor model, which is commonly used for benchmarking and other purposes in the industry, appropriate indexes for Large, Mid and Small capitalization stocks are readily available from MSCI.

To assign each stock held in the Fund's equity portfolio a proper attribute of its size, an approach somewhat different from the original one (Fama & French, 1993), which has only small and large size stocks defined around the stocks sample median, was implemented. The average market capitalization of the stocks included in the MSCI ACWI over 12 years period was readily obtained from Bloomberg. Then, leaning on the MSCI's methodology of defining 70% of the world's stocks as large, 15% as mid, and 15% as small capitalization as proxy, the 15- and 30-percentiles for the sample were estimated. After that, all stocks whose market capitalization is less that 15-percentile, which is equal to 8,582.72 million, were assigned the attribute of small size, and all stocks whose market capitalization is more that 30-percentile, equal to 9,514.38 million, were denoted as large size. All the remaining stocks whose market capitalization falls in the interval between 15- and 30-percentiles fall into the category of mid-size. The summary for the categorization of the Fund's equity holdings by size is presented in Table 3.

Table 3. Summary for the Fund's holdings categorized by size

Attribute	Number of firms	Percentage of total number of firms	Average percentage of the Fund's total capitalization	Standard deviation	Min	Max
Large	462	14.38%	79.40%	6.91%	69.70%	90.70%
Mid	35	1.09%	1.50%	0.30%	0.84%	2.57%
Small	2,716	84.53%	19.1%	6.86%	8.13%	28.60%

From the summary table it comes clear that, although, 84.53% of the total number of firms was small capitalization companies, the Fund has been mostly investing in large capitalization firms. For the period of 12 years, on average, large companies accounted for 79.40% of the Fund's total capitalization, small companies for 19.1%, and mid-cap firms for only 1.50%. The standard deviation is close to zero for mid-cap firms, and the maximum and minimum percentage of the Fund's total capitalization for the period is 0.84% and 2.57%, respectively. The Fund's maximum allocation of capital in large firms stocks is 90.70% and the minimum is 6.91%. For small firms the maximum is 28.60% and the minimum is 6.86%. The dynamic change in weights for each attribute is graphically presented on Figure 6.

Figure 6. Dynamics for the Fund's holdings categorized by size

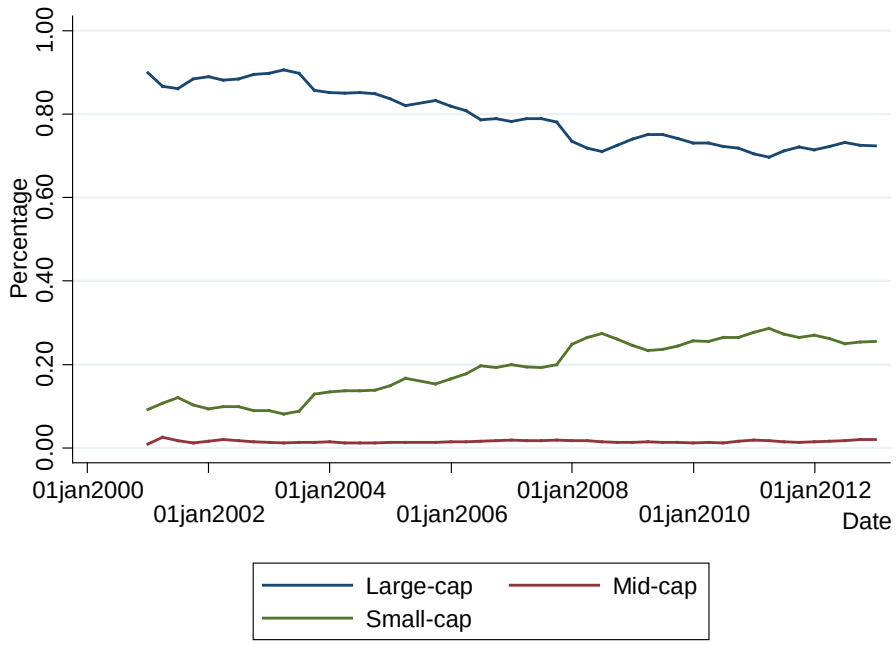


Figure 6 gives a rather evident picture for the dynamics of the Fund's attitude towards the systematic risk factor of the firms' size. Again, referring to SMB factor in the Fama-French

model, it can be concluded that the recent trend in the increase of the Fund's equity portfolio allocation of capital in small-cap stocks is aimed at harvesting the premium from the aforementioned systematic risk factor.

Using the dynamic weights for the size attributes for stocks and MSCI AC World indexes for large, mid, and small capitalization stocks respectively, the size-based replicating portfolio for the Fund's equity portfolio ("Size portfolio") is constructed.

Style portfolio

For the next portfolio, a style attribute of a stock is used as the basis for category formation. The idea for the investment style has already been tackled in the relevant theory discussion section. The stocks are assigned an attribute of growth, core or value, based on its average P/B ratio. Each attribute is also objectively identified as a unique property of a stock and there exist appropriate indexes that can be accessed easily.

The idea for the stocks style is based on the Fama-French HML factor that accounts for premium for holding stocks of underpriced firms. Although, the original approach is based on the book-to-market ratio, the P/B ratio is, in essence, the reciprocal for book-to-market which, perhaps, for its simple intuitive appeal, is more widely used in the industry. The P/B, as discussed, is a fundamental analysis indicator that shows if the stock is overpriced by the market relatively to the book value of the company's per share residual after the debt, and other relevant obligations are satisfied.

A simple rule of thumb that if P/B is higher than 1 than this is an indication of a stock being overpriced by the market is hardly the most appropriate way for categorization. The reason for this is that different industries have different perspectives, dynamics and market agents' outlooks on growth. All this is incorporated in the stock prices and, subsequently, in P/B ratios.

In order to incorporate the differences in P/B ratios throughout different industries consistently in the replicating portfolio based on the investment style, the industries average P/B ratios were downloaded from A. Damodaran's website[9] and used as proxy for definition of the stocks' investment style attributes (Appendix 2). Each stock's P/B is averaged for the

[9] Source: *http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/pbvdata.html* (accessed May 4, 2014)

period of 12 years, then, the average is compared to that of the firm's industry. If the firm's P/B ratio is two times larger than the P/B ratio of the relative industry, it is assigned the attribute of growth; if the average P/B ratio is two times less than its industry's P/B ratio, then the stock is assigned the attribute of value. The rest of the stocks are entitled to be core stocks as they represent the industry average P/B ratio, and, therefore, are not significantly over- or underpriced.

According to Benjamin Graham, the father of the Value Investing, an investor should have a particular number, or "margin of safety" when scanning the market for undervalued opportunities. His suggestion that the speculative stock should be paid 50 cents for a dollar and 90 cents for a dollar of a high-grade investment stock (Graham, 1934) back in 1930s did not include an adjustment for different industries, nor were the stock industries growth expectations so fundamentally diverse as they are today. The factor of 2 for the industry's average P/B is, surely, somewhat arguable, but is believed to be a decent neutral-conservative approximation. The resulting Fund's summary for holdings is presented in Table 4.

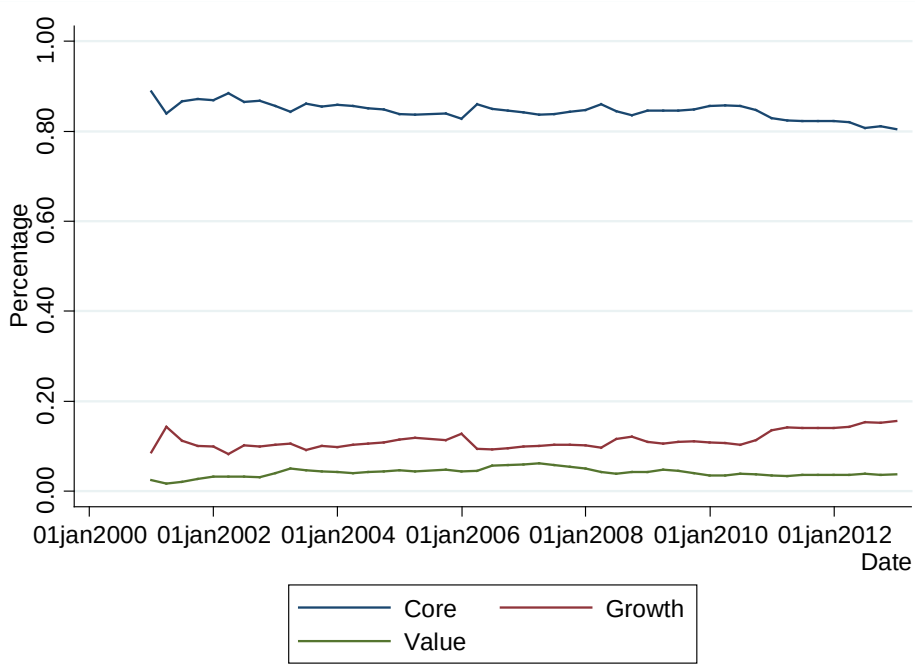
Table 4. Summary for the Fund's holdings categorized by style

Attribute	Number of firms	Percentage of total number of firms	Average percentage of the Fund's total capitalization	Standard deviation	Min	Max
Core	2,645	82.32%	84.60%	1.81%	80.50%	88.80%
Growth	472	14.69%	11.30%	1.87%	8.22%	15.70%
Value	96	2.99%	4.12%	0.95%	1.69%	6.24%

From the table, it can be concluded that the Fund has steadily been invested in the core stocks, which comprise 84.60% average percentage of the Fund's total capitalization with the minimum of 80.50% and maximum of 88.80%. This shouldn't come as a surprise given the Fund's large size, rather risk-averse investment mandate tied closely to the world-wide benchmark performance, and relative scarcity of reasonably underpriced value stocks. The dispersion for each of the stock attributes is not very high either, with standard deviation of 1.81%, 1.87%, and 0.95% for core, growth, and value stocks, respectively. The Fund is invested, on average in 11.30% of growth stocks with the maximum and minimum of 8.22% and 15.70%, respectively, and 4.12% in value stocks with the maximum equal to 6.24% and

the minimum of 1.69%. How the weights in each style category changed over the 12 year period can be observed on Figure 7.

Figure 7. Dynamics for the Fund's holdings categorized by style



The conclusions about relatively stable change in the weights for the style attributes over time, made in the previous paragraph due to low standard deviation, are supported by the diagram. A noticeable but not dramatic change can still be observed starting from the second half of 2010, when the Fund gradually began to increase its position in growth stocks at the cost of the core stocks. This, perhaps, can be explained by the Fund's objective to harvest risk premium from the stocks with high growth perspectives given the Fund's low liquidity constraints. In a sense, therefore, this should be regarded as a liquidity premium, rather than management engagement in speculative behavior due to the market's positive outlooks and higher P/B ratios for the stocks.

Having the weights for the style-based attributes for stocks defined at hand, a portfolio replicating the Fund's investment style ("Style portfolio") can be finalized. The weights are assigned to MSCI's value and growth indexes for growth and value, and MSCI ACWI for core stocks.

Sector portfolio

The following Fund's replicating portfolio is constructed with the stocks sector being a principal attribute by which each stock is categorized. A principal sector of a firm's business operations is a unique identifiable attribute of a stock. A sector is a broader category than an industry which perfectly suits the purpose of constructing a replicating portfolio for the Fund as it is easier to categorize firms with different degrees of diversification of operations by sectors without overlapping. Moreover, since many practitioners and academics constantly monitor performance of one sector over another, proper indexes that can be used for setting up the replicating portfolio are readily available.

This interest to sectors performance can be explained by a widely recognized approach to portfolio diversification by sectors of economy. Since for the last twenty years or so national markets have become rather well integrated, and, therefore, highly correlated with each other, risk managers attended more often to an alternative to countries diversification approach of hedging risk with positions in different sectors. Important reasons for this are that correlation among sectors is lower than between countries and transaction costs for shifting among sectors can also be significantly lower than if shifting internationally. Moreover, there are other risks connected with a foreign country's political situation and regulation, whereas, for sector rotation, one can stay invested in one country's market at any time, given all sectors are well presented there.

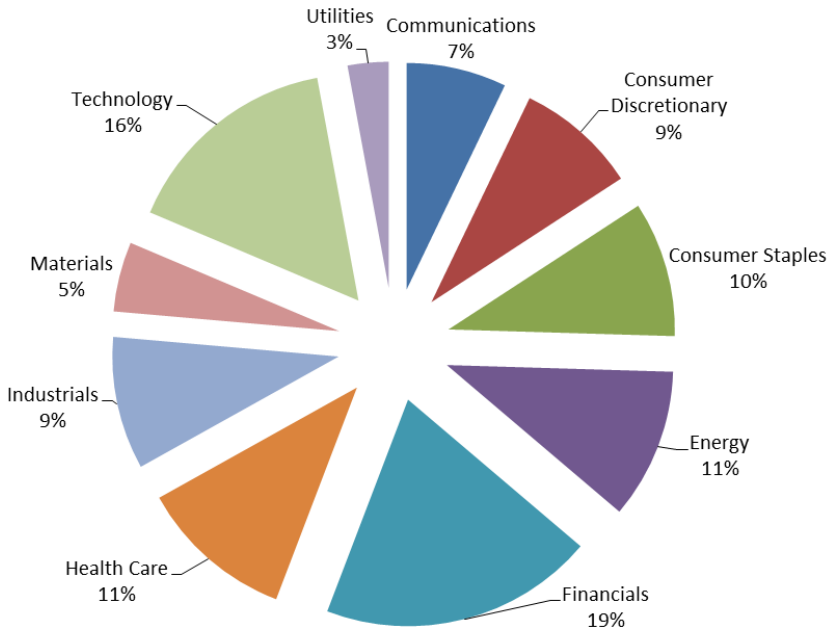
At the sector diversification foundation, there lies the intuition that it is, simply, the nature of economy that all sectors can hardly do well at one time. A more formal explanation for sector diversification as not only means of hedging risk but also shifting portfolio positions to various economic risk factors in order to arbitrage associated with the risk premiums is provided by APT, as it has been discussed in the relative theory overview section earlier.

The summary for the Fund's holdings classified by sectors in accordance with GICS is presented in Table 5 and Figure 8 graphically presents average percentage of the Fund's total capitalization for each sector.

Table 5. Summary for the Fund's holdings categorized by sector

Attribute	Number of firms	Percentage of total number of firms	Average percentage of the Fund's total capitalization	Standard deviation	Min	Max
Communications	249	7.66%	7.15%	0.99%	5.39%	9.76%
Consumer Discretionary	479	14.91%	8.67%	1.19%	5.41%	10.66%
Consumer Staples	142	4.42%	9.66%	2.22%	6.06%	14.71%
Energy	253	7.87%	10.73%	3.50%	4.65%	17.36%
Financials	646	20.11%	19.61%	2.18%	12.82%	23.38%
Health Care	352	10.96%	11.11%	2.98%	5.83%	16.17%
Industrials	303	9.43%	9.47%	1.62%	6.09%	14.76%
Materials	237	7.38%	4.98%	1.00%	2.44%	6.80%
Technology	450	14.01%	15.71%	2.21%	11.66%	23.70%
Utilities	105	3.27%	2.93%	0.64%	1.70%	4.20%

Figure 8. Average percentage of the Fund's total capitalization by sectors (rounded to percent units)

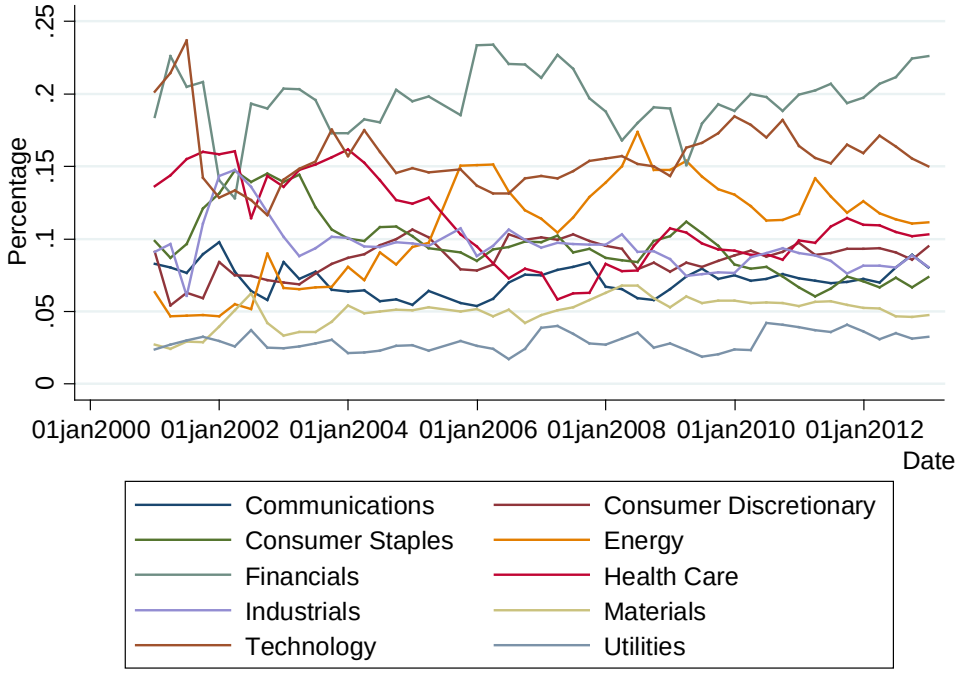


For the period of 12 years, the Fund has been well diversified among the ten listed sectors. The most noticeable holdings that the Fund had were in the sectors of Financials (being the highest with 19.61% average allocation), Technology, Health Care and Energy with the

average allocation of over 10% in each. The lowest average weight among the sectors is the weight for Utilities sector with only 2.93%. This position in Utilities sector, has, however, been the most stable over time, with standard deviation of 0.64% and the minimum and maximum positions corresponding to 1.70% and 4.20%, respectively. Energy sector, on the other hand, has the highest standard deviation of all, 3.50%, and with the minimum and maximum weights in the Fund's portfolio ranging from 1.70% to 4.20%. Other sectors' standard deviations are in the range between that of the Utilities and Energy with allocations, apart from those already mentioned, varying between 5% and 10%.

An insightful picture of the dynamics in sectors allocation over the 12 year period is presented in Figure 9.

Figure 9. Dynamics for the Fund's holdings categorized by sector



Over the period, the Fund had relatively stable positions in Utilities, Materials and Communications. The positions for Financials changed for the time period rather dramatically, with less than 15% in the beginning of 2002, the peak in January 2006 and noticeable slip to 15% from around 18% second half of 2008 – first half of 2009, evidently, due to the Financial Crisis. Since then, the Fund gradually increased its positions in the Financial sector. The allocations to Energy sector, on the other hand have been gradually decreasing after the Financial Crisis. This, can be explained by not only reduction in global

demand for energy sources due to the downturn in the economic cycle, but, also, perhaps, the need to reduce the overall Fund's exposure to the Energy sector due to the Norway's high general dependency on the oil and gas related industries.

Using the weights for each sector and sector-corresponding MSCI indexes, the Fund's equity portfolio replicated by the stocks' sector attribute ("Sector portfolio") can be constructed.

Overview of replicated portfolios

A comparison of the Fund's three replicated portfolios to each other and the benchmark is provided below. All three portfolios, as expected, are significantly highly correlated with each other and with the benchmark (the correlations matrix is presented in Table 6), with Style portfolio's correlation being almost equal to 1. This is not surprising given that, on average throughout the period, the Fund was invested around 85% in core stocks that are reproduced in the Style portfolio with the help of the benchmark.

Table 6. Correlation matrix for replicated portfolios and the benchmark

	Size	Style	Sector	Benchmark
Size	1			
Style	0.9992	1		
Sector	0.9983	0.9991	1	
Benchmark	0.9991	0.9999	0.9989	1

Same conclusion regarding the similarities among portfolios and the benchmark, with particular match between the benchmark and Style portfolio, comes from analyzing the summary statistics for replicated portfolios and the benchmark (Table 7). For 626 weeks of observations, the average weekly return for the benchmark and Style portfolio is 0.024% with the standard deviation of 2.680% for benchmark and 2.678% for Style portfolio. A slight over-performance of Size portfolio with 0.028% mean weekly return is observed. This, perhaps, is due to more volatility exposure coming from the small capitalization stocks and the resulting highest of all four standard deviation of 2.682%. A slight under-performance, on the other hand, is demonstrated by Sector portfolio with the mean weekly return of 0.021%, and the lowest standard deviation equal to 2.669%, but with the highest difference between the minimum (-22.240%) and maximum (11.870%) realizations due to sector rotation sensitivity to extreme events in the economic cycles.

Table 7. Summary statistics for replicated portfolios and the benchmark

	Number of weeks	Mean	Standard deviation	Min	Max
Benchmark	626	0.024%	2.680%	-22.400%	11.700%
Size	626	0.028%	2.682%	-21.860%	11.530%
Style	626	0.024%	2.678%	-22.250%	11.570%
Sector	626	0.021%	2.669%	-22.240%	11.870%

Excess returns for each of the replicating portfolios, or alpha, are discussed further on. To obtain the portfolios' abnormal returns, benchmark returns are subtracted from each portfolio corresponding weekly returns throughout the 12 year period. The abnormal returns are not adjusted for systematic factors, mainly, to imitate the original benchmark set forward by the Mandate. In addition, be there such an adjustment, the individual effects from each portfolio would be significantly smoothened, which would deprive some of the explanatory value that each individual portfolio has. In other words, it would be much harder to trace the origin of abnormal systematic performance to one of the factors using differences among replicating portfolios due to their setups after the adjustment and verify the Fund's management transgression over the abnormal returns, should, of course, such abnormal returns be detected.

Statistical summary for the three portfolios' abnormal returns is presented in Table 8.

Table 8. Summary for portfolios abnormal returns

Portfolio	Mean	Standard deviation	Min	Max
Size	0.004%	0.116%	-0.525%	0.541%
Style	-0.019%	3.27%	-19.3%	16.1%
Sector	-0.27%	12.7%	-71.7%	60.2%

The abnormal returns of the Size portfolio are only slightly different from zero, with the average mean of 0.004% and relatively high volatility of 0.116%. The highest abnormal return is equal to 0.541% and the lowest is -0.525%.

Style portfolio's abnormal returns, just like the abnormal returns of Size portfolio, are close to zero, although, on average, they are negative. The dispersion around the mean is significantly higher for Style portfolio than for Size portfolio, given the standard deviation of 3.27% and the minimum of negative 19.3% and the maximum of 16.1% gain for one week.

High variance in Style portfolio's abnormal returns can, perhaps, be explained by portfolio's exposure to growth stocks. Growth stocks are not only highly volatile, but also rather sensitive to the market fluctuations, in particular, to periods of extreme growth or negative shocks.

The abnormal returns average for Sector portfolio, as in Style and Size portfolios, is close to zero, but negative, as in the Style portfolio's case that had -0.019% of abnormal average return. The standard deviation of 12.7% is, by far, much higher than the standard deviation of Size (only 0.116%) and Style (3.27%) portfolios. Such a high dispersion is the result of significant swings in the excess weekly Sector portfolio returns ranging from negative 71.7% to positive 60.2%. Such enormous weekly returns can be explained by extreme sensitivity of a portfolio set on the sector rotation principles to investment timing. Given the presence of periods of high market volatility, in particular, the Financial Crisis of 2008-2009, wrong timing for sector rebalancing can become rather costly, whereas, a correct outlook on a number of macroeconomic perspectives when moving capital from one sector to another can become fairly rewarding.

Eventually, having abnormal returns time series[10] for the Fund's replicating portfolios ready, it is possible to proceed to the next stage. This next section consists of two parts. Each part is dedicated to testing a zero-hypothesis on presence of empirical evidence for window dressing of the Fund's abnormal performance results at various points in time, with particular attention to month, quarter and year end periods.

The first test examines the differences in abnormal weekly returns around known reporting periods, in particular, first and last weeks of months, first and last weeks of quarters, and first and last weeks of years. The second test tests for the patterns for abnormal returns in all of the weekly returns, as reporting periods other than used in the first test can also exist due to, for example, internal disclosure of performance results.

[10] The portfolios abnormal returns time series were tested for stationarity. The performed unit-root test was Augmented Dickey-Fuller test (Dickey & Fuller, 1979), (Elliott, Rothenberg, & Stock, 1996) with trend for a number of lags. The zero-hypothesis for the unit-root presence was rejected at 1% level of confidence for number of lags from 1 to 6. Please, see Appendix 3 for details.

5.2.2 Test for abnormal performance returns around reporting dates

The first test is set up in the form of an ordinary least squares (OLS) indicator-variable (or "dummy" variable) regression. The abnormal returns $R_{i,t}$ of one of the three replicating portfolios *i* is a dependent variable, and the entire regression expression looks like this:

$$R_{i,t} = b_0 + d_1 MonBeg_t + d_2 MonEnd_t + d_3 QtrBeg_t + d_4 QtrEnd_t + d_5 YearBeg_t + d_6 YearEnd_t + \epsilon_t$$

where d_k are coefficients for six dummy variables for weeks that are beginning of the month, quarter, year and end of the month, quarter, end. Each dummy variable is equal to 1 when a week *t* has a corresponding property, and is equal to 0 otherwise. The b_0 is an intercept and ϵ_t is an i.i.d. error term.

The selection of weeks around months beginning and end for testing is due to monthly reporting filed by the Fund's management to Norway's Department of Finance, in addition to quarter-end reports (13F-HR) and year-end detailed reports that are available to public.

All of the explanatory variables for the regression are indicator-variables. This signifies that the regression is, in its essence, identical to analysis of variance[11] (or ANOVA), which has a purpose of comparing the differences between the average of a dependent variable (left-hand side of the regression equation) and the average of the same variable given a property indicated by a dummy variable is present.

The general validity of such regression is indicated by the F-test. The null hypothesis for the F-test of such kind is that all coefficients of the regression, or average means, are not significantly different from zero, and the alternative hypothesis is that at least one of the means is different from zero. Given the regression's parameters such as total, between, and within group variations (SS) and degrees of freedom (df), the variance due to the interaction between the samples, or MS(B) for "Mean Square Between groups", is compared to the variance due to the differences within individual samples, or MS(W) for "Mean Square

[11] Since ANOVA (and, hence, an indicator-variable regression) is sensitive to the variables' normality assumption and the underlying assumption of homoscedasticity (i.e. homogeneity of variance), portfolio variables were tested for normality fit using Kolmogorov-Smirnov test (Kolmogorov, 1933), (Smirnov, 1948). Please, see Appendix 4 for tests details.

Within groups"[12]. Since for F-test one variance is divided by another to, originally, see how well a sample's variance fits the entire population's variance, the same approach is used for MS(B) and MS(W) to check if MS(B) fits MS(W). If both of the variances fit, this proves that the means of all variables are the same, and therefore, coefficients in the indicator-variable OLS regression are all equal to zero, which is exactly what null hypothesis (H_0) states. H_0 is rejected if the resulting F-statistics is greater than the critical value calculated using F-statistics table, between and within df-s and the desired level of significance.

The H_0 tested can be formalized in the following way: "the Fund's abnormal weekly returns for the weeks at the beginning and the end of months, quarters and years are on average significantly different from the abnormal returns for other weeks". A positive coefficient for period ends would signify window dressing of the performance results before the reports are filed. A negative coefficient would be subsequently expected for the beginning of the next period weekly abnormal returns. The results of the regressions for each portfolio are presented in Table 9.

Table 9. Regression results for weekly abnormal returns for replicated portfolios for weeks around reporting dates (coefficients in percent)

	Size	Style	Sector
MonBeg	0.00472	0.000783	0.00130
	(0.724)	(0.836)	(0.930)
MonEnd	0.0136	-0.000745	0.00165
	(0.311)	(0.844)	(0.911)
QtrBeg	-0.0238	0.000332	-0.0409
	(0.292)	(0.959)	(0.101)
QtrEnd	-0.0296	-0.000346	-0.00490
	(0.191)	(0.957)	(0.844)
YearBeg	-0.0309	-0.0136	0.00790
	(0.423)	(0.212)	(0.853)
YearEnd	0.0323	0.00448	-0.0329
	(0.403)	(0.682)	(0.439)
Constant	0.00428	-2.20e-05	0.000621
	(0.497)	(0.990)	(0.929)
Observations	626	626	626
R-squared	0.009	0.003	0.008
F-test	0.938	0.342	0.800

[12] Please, see Appendix 5 for calculation formulas.

Prob > F	0.467	0.915	0.570

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The results of the regressions don't support the null hypothesis. The primary reason for rejecting the null hypothesis is based on the p-values for F-test for each regression. Based on the F-test p-values, it is concluded that all coefficients are statistically not different from zero, and, therefore, the means for the weekly abnormal returns for the weeks around the reporting periods are the same.

Significance levels, based on the F-test p-values, at which the model could be accepted as jointly significant for each explanatory variable are 0.467 for Size portfolio, 0.915 for Style portfolio, and 0.570 for Sector portfolio. Since the generally accepted significance levels are far below the listed values (0.1, 0.05, or 0.01, as indicated in the bottom of the table), it can be concluded that, given the model, there is no empirical evidence for the Fund's management window dressing the Fund's performance results around known reporting dates.

5.2.3 Test for other patterns of abnormal performance returns

The evidence for the Fund's management window dressing the performance results around disclosure periods has not been found. However, there could be other dates that are not available to public for which the management has to disclose the results based, say, on internal valuation of performance of management teams inside the Bank.

Hence, another test in the form of OLS indicator-variable regression is performed for significant differences in weekly abnormal returns for all weeks. All weekly excess returns are compared to the excess returns for the first week of a quarter. The model for the test has the following form:

$$R_{i,t} = b_0 + \sum_{k=1}^{13} d_k Week(k+1)_t + \epsilon_t$$

where $R_{i,t}$ is excess return for one of the three portfolios i, d_k are coefficients for week dummy variables denoted as *Week* with appropriate number for a week of a quarter, b_0 is the model's intercept and ϵ_t is an i.i.d. error term.

As mentioned, the base for the regression is abnormal return for the first week of a quarter, therefore, coefficient b_1 corresponds to dummy variable *Week2*, and so on[13]. For the period of 12 years (48 quarters), 44 quarters were comprised of 13 weeks and 4 quarters consisted of 14 weeks.

The null hypothesis for the tests is "the Fund's abnormal weekly returns for the weeks other than the first week of each quarter, on average, are significantly different from the excess returns for the first week of a quarter". The results of the regressions are provided in Table 10.

Table 10. Regression results for weekly abnormal returns for replicated portfolios for different weeks of a quarter (coefficients in percent)

	Size	Style	Sector
Week2	0.0716***	0.0114*	0.0428
	(0.00229)	(0.0869)	(0.100)
Week3	0.0141	0.00422	0.0345
	(0.547)	(0.527)	(0.185)
Week4	0.0374	0.00362	0.0380
	(0.110)	(0.588)	(0.144)
Week5	0.0438*	0.00482	0.0551**
	(0.0616)	(0.470)	(0.0343)
Week6	-0.00543	-0.00381	0.00679
	(0.816)	(0.568)	(0.794)
Week7	0.0262	0.00374	0.0467*
	(0.262)	(0.575)	(0.0732)
Week8	0.00103	0.00628	0.0255
	(0.965)	(0.347)	(0.327)
Week9	0.0310	-0.00364	0.0218
	(0.185)	(0.585)	(0.402)
Week10	0.0613***	0.00108	0.0250
	(0.00891)	(0.872)	(0.337)
Week11	0.00901	-0.00348	0.0641**
	(0.700)	(0.603)	(0.0140)
Week12	0.0495**	0.00268	0.0557**
	(0.0346)	(0.688)	(0.0325)
Week13	0.0151	0.00290	0.0294
	(0.522)	(0.667)	(0.264)
Week14	-0.0235	-0.0239	0.0343
	(0.694)	(0.160)	(0.605)
Constant	-0.0226	-0.00232	-0.0370**

[13] Having dummy variables in the model for each week would lead to a multicollinearity problem.

	(0.172)	(0.624)	(0.0448)
Observations	626	626	626
R-squared	0.042	0.020	0.020
F-test	2.076	0.980	0.978
Prob > F	0.0139	0.469	0.472

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The results of the regressions are somewhat different for three portfolios. Regressions for Style and Sector portfolios can be dismissed for the reason of all weeks' returns expectations being equal to that of the first week of a quarter. The F-test p-values values are 0.980 and 0.978, with significance levels of acceptance of 0.469 and 0.472, which are not realistic. However, for the Size portfolio, it is not possible to reject the null hypothesis over the equality of all weeks' returns means, based on the F-test p-value value.

The results for Size portfolio regression, therefore, should be discussed further. The intercept (constant) of the regression is statistically insignificant. Yet, the constant should not be dismissed, but rather interpreted as the expectation for abnormal returns of Size portfolio on the first week of a quarter being statistically not different from zero. The regression's coefficients are significant only for weeks 2 (β_1= 0.0716), 5 (β_4= 0.0438), 10 (β_9= 0.0613), and 12(β_{11}= 0.0495) at significance level of 10%, 2, 10, and 12 at 5%, and 2 and 10 at 1%. Given a rather low coefficient of determination or R-squared (R^2) that explains how well the data observations fit the model of only 4.2%, it is decided to proceed with the level of significance equal to 1% and attend to coefficients of only week 2 and week 10.

According to the results of the regression, on average, the abnormal returns for Size portfolio on weeks 2 and 10 of a quarter are expected to exceed those of the first and the other weeks (equal to zero) by 0.0716% and 0.0613%, respectively. But does this mean that the Fund's management is responsible for this expectation?

To answer this question, it is necessary to examine the effect of the constituents that were used to construct Size portfolio, namely the indexes for global Large-cap, Mid-cap, and Small-cap firms. In order to do this, the following OLS regression where the returns of the indexes in excess of the benchmark are used as explanatory variables is set up:

$$R_{Size,t} = b_0 + b_1 R_{L,t} + b_2 R_{M,t} + b_3 R_{S,t} + \epsilon_t$$

where $R_{Size,t}$ is Size portfolio abnormal returns, $R_{L,t}$ is Large-cap index abnormal returns, $R_{M,t}$ is Mid-cap index abnormal returns, $R_{S,t}$is Small-cap index abnormal return variables, b_k are regression coefficients where b_0 is a constant, and ϵ_t is an i.i.d. error term. The output for the regression is presented in Table 11.

Table 11. Regression results for Size portfolio and Large-cap, Mid-cap, Small-cap indexes abnormal weekly returns (coefficients in percent)

	Size
$R_{S,t}$	0.173***
	(0)
$R_{M,t}$	0.0105
	(0.288)
$R_{L,t}$	0.778***
	(0)
Constant	-0.00288
	(0.250)
Observations	626
R-squared	0.713

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The regression has resulted in rather noticeable R^2 that states that 71.3% of the variance of the abnormal returns of Size portfolio is explained by the model's independent variables. However, the coefficient for the Mid-cap excess returns is not statistically significant at any level. In order to arrive at the parsimonious model, the regression is rerun without the Mid-cap variable and the results are provided in Table 12:

$$R_{Size,t} = b_0 + b_1 R_{L,t} + b_2 R_{S,t} + \epsilon_t$$

Table 12. Regression results for Size portfolio and Large-cap, Small-cap indexes abnormal weekly returns (coefficients in percent)

	Size
$R_{S,t}$	0.177***
	(0)
$R_{L,t}$	0.761***
	(0)
Constant	-0.00291
	(0.246)

Observations	626
R-squared	0.713

p-value in parentheses
*** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)

The updated regression for the abnormal returns of Size portfolio has the same 71.3% of R^2. Both explanatory variables have coefficients significant at 1% level. The coefficient for $R_{S,t}$ is equal to 17.7% and the coefficient for $R_{L,t}$ is 76.1%. The constant is not significant, which means that it is not different from zero.

However, out of two explanatory variables, which one has most of the explanatory power for the excess returns of Size portfolio? In order to approach this question, partial r^2 for each variable should be estimated. Partial r^2 measures the degree of mutual relationship between the dependent ($R_{Size,t}$) and one of the explanatory variables ($R_{L,t}$ or $R_{S,t}$), when other explanatory variables are held constant with respect to the two variables involved in the explanation. In a multiple regression, partial r^2 allows to directly estimate the proportion of unexplained variation for the dependent variable that becomes explained with the addition of each of the explanatory variables to the model.

To find the partial r^2 for $R_{L,t}$, first, the effect of the other variable $R_{S,t}$ should be removed from the dependent variable $R_{Size,t}$. For this, $R_{Size,t}$ is regressed on $R_{S,t}$ and the residuals are stored as a separate variable. Next, in order to eliminate the part of the variance of $R_{L,t}$ that is explained by its covariance with $R_{S,t}$, the first is regressed on the latter, and, again, the resulting residuals are stored as another variable. This last step would not be needed if both of the explanatory variables were orthogonal, which is, hardly, the case given the data are for firms traded in the same markets. Finally, the first residual variable is regressed on the second residual variable and the resulting r^2 is compared to the partial r^2 for the other explanatory variable, $R_{S,t}$, which is estimated in the identical way by stripping off the effect of $R_{L,t}$for other variables and regressing the resulting residuals.

Table 13. Comparison of explanatory power of Large-cap and Small-cap indexes abnormal weekly returns for Size portfolio abnormal weekly returns, using partial r^2 approach (coefficients in percent)

	Large-cap	Small-cap
Residuals coefficient	0.761***	0.177***

	(0)	(0)
Constant	0	0
	(1.000)	(1.000)
Observations	626	626
r-squared	0.529	0.713

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

Table 13 summarizes the results. Given the obtained partial r^2 equal to 52.9% and 71.3% for Large-cap and Small-cap abnormal weekly returns, respectively, it is possible to conclude that the Size portfolio's abnormal returns variance is explained mostly by Small-cap weekly abnormal returns.

Eventually, to see if Size portfolio abnormal weekly returns' significant differences in weeks 2 and 10 can be explained by the excess returns of Small-cap companies around the globe, an OLS indicator-variables regression for differences in weekly returns, similar to that of the regression for Size portfolio executed earlier, is set up:

$$R_{Small,t} = b_0 + \sum_{k=1}^{13} d_k Week(k+1)_t + \epsilon_t$$

where $R_{Small,t}$ is excess return for the Small-cap index, d_k are coefficients for quarter's week dummy variables *Week*, b_0 is the model's intercept and ϵ_t is an error term. The regression output is presented in Table 14.

Table 14. Regression results for weekly abnormal returns for Small-cap index for different weeks of a quarter (coefficients in percent)

	Small-cap
Week2	0.429***
	(0.00505)
Week3	0.158
	(0.300)
Week4	0.409***
	(0.00745)
Week5	0.363**
	(0.0173)
Week6	0.0778
	(0.609)
Week7	0.128

	(0.400)
Week8	0.274*
	(0.0728)
Week9	0.537***
	(0.000447)
Week10	0.427***
	(0.00525)
Week11	0.101
	(0.508)
Week12	0.213
	(0.163)
Week13	0.293*
	(0.0576)
Week14	0.115
	(0.767)
Constant	-0.164
	(0.128)
Observations	626
R-squared	0.044
F-test	2.157
Prob > F	0.010

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

According to the F-test p-value of 2.157, the model's coefficients are different from that of the constant's value at significance level equal to 1%. This makes it possible to continue the discussion of the model due to its structural consistency. The expected abnormal returns for weeks 2 and 10 for Small-cap index are significantly higher than that of the base-case for the first week. Given high explanatory power of this index for the Size portfolio's time series, it is concluded that it is the variance of the small-cap stocks that explains Size portfolio's abnormal returns for weeks 2 and 10.

5.2.4 Results for testing for opportunistic conduct

Due to overall validity of the last regression model, significant positive coefficients for the abnormal returns of the index on weeks 2 and 10 of a quarter, and high explanatory power of the index for Size portfolio's excess returns, it is plausible to infer that the Fund's management does not have discretion over the difference in the observed abnormal weekly returns if the Fund's portfolio is replicated continuously using the firms size method.

Furthermore, incorporating the results of the regressions for Style and Sector portfolios, which also did not support the null hypothesis that the Fund's abnormal weekly returns for the weeks other than the first week of each quarter are significantly different from the excess returns for the first week of a quarter, it is reasonable to conclude that no empirical evidence, given the used model, for the Fund's management manipulation of the Fund's weekly excess returns was found, whatsoever.

5.3 Examination of strategy execution diligence

Putting aside any self-beneficial motives of the Fund's management, the next set of empirical tests is primarily concerned with how well the Fund management's actions correspond with the investment Mandate for the Fund. The management actions are tested on the decisions to buy and sell stocks that can be extracted from the Fund's quarterly 13F-HR reports. The results of the analyses are summarized and compared with the targets set forward by the Fund's investment strategy articulated by the Mandate.

The following set of empirical tests is an attempt to examine the Fund's trading decisions that can be observed using the publicly available information. The test questions are formulated around the Fund's decisions to buy and sell equity securities. The decision to buy is analyzed as a function of the stocks' performance relative to a number of systematic factors that were earlier discussed in finance theory section, a set of attributes of the stocks that were also covered previously, a previously made similar decision for the same stock and the overall tendencies over the years. The decision to sell is analyzed only for the overall tendencies for each year for a number of reasons that are discussed later in the section.

In order to test how a stock's past performance, its attributes, and the Fund's earlier trading decisions regarding this stock are related to the decision to include or exclude the stock from the next quarter's portfolio, the method of binomial logistic regression for panel data is applied.

5.3.1 Methodology

The intuition behind the logistic regression is, primarily, based on logistic function, which, unlike linear function that takes values from minus to plus infinity, has a property of taking values from 0 to 1. Hence the dependent variables are decisions of binary nature, namely,

"buy – not buy" and "sell – not sell" that can be represented as 1 and 0, accordingly. The probability of a decision, i.e. event happening, therefore, lies in the range [0, 1], and can be represented by the logistic function constructed by regressing a binary event dependent variable on a set of explanatory variables which transform the linear function of the regression in a function whose values are within the necessary range of [0, 1] rather than (-∞, + ∞).

A coefficient of the resulting logistic regression (or "logit") is interpreted as the log odds or natural logarithm for odds (L) that an explanatory variable will make the event (dependent variable) happen, given the explanatory variable is increased by one unit. If the explanatory variable is an indicator variable that takes 1 when a variable has a defined property and 0 otherwise, the coefficient is interpreted as the log odd for an event to happen given the dummy variable's property. For one variable, the expression formally looks like:

$$L(y) = \beta_0 + \beta_1 x_1 = \ln(odd) = \ln\left(\frac{\Pr(x)}{1 - \Pr(x)}\right)$$

By taking the exponential of the regression's coefficients, one obtains the odds of the event to happen:

$$\frac{\Pr(x)}{1 - \Pr(x)} = e^{\beta_0 + \beta_1 x_1}$$

The odds can further be interpreted as the probability of the event (Pr) given the explanatory variable increase by one unit (or its property if it's a dummy variable) divided by the probability that the event does not happen given the increase (or the property). Same applies to a logit regression with multiple variables.

An alternative to logit regression is probit regression which addresses the transformation of linear function into a function with the range of [0, 1] in a different manner. The approach is based on transformation of the linear function into cumulative distribution function (under assumption of normality). The probit function gives the "inverse" computation, generating a value of a normally distributed random variable (or "z-score"), associated with specified cumulative probability that the event, i.e. dependent binary outcome variable in the probit regression, will happen given a one unit increase in an explanatory variable or the property defined by a dummy variable. The probit regression coefficients explain the change in the z-score for the event (dependent variable) to happen for a one unit change in the predictor.

Both logit and probit regressions produce rather similar to each other results and, therefore, can hardly be used as an alternative to each other for verification of a model. Although the decision of choosing one is, usually, more of a question of personal taste, the logit method is preferred here due to its appeal of more intuitive interpretation for the regressions output.

The logit regression is structured as panel data in order to incorporate the effects of variance across stocks and across time. The variables used for the logit regressions are set up and adjusted in the following way.

The decision variables "Buy" and "Sell" indicate the decision of the Fund to either buy or sell a stock from the portfolio. The decision variables are based on the inter-quarter differences in the Fund's stock holdings, reported by the Fund as the number of shares for an issuer in 13F-HR form reports. If the difference between the reporting date and the previous date is larger than 0, the Buy variable is assigned 1 and 0 otherwise. By the same logic, if the difference for the number of shares is negative, the Sell variable is assigned 1 and 0 otherwise[14].

Abnormal returns for the stocks listed by the Fund in its quarter reports act as explanatory variables and are composed in the following manner. Firstly, the expected returns for the stocks are derived using the Fama-French three factors and Carhart's momentum factor model, which was extensively discussed in previous sections. The validity of this approach as being a reasonable one has been proven by numerous empirical studies (Hibber & Lawrence, 2010), (Ang, Liu, & Schwarz, 2008). The formula used is:

$$E(r_i) = r_f + \beta_0 + \beta_1\left(E[r_m] - r_f\right) + \beta_2 SMB_i + \beta_3 HML_i + \beta_4 MOM_i$$

where $E(r_i)$ is the expected return for a stock, β_k are coefficients for the stock return's explanatory variables derived with an OLS multiple regression (β_0 is constant), and r_f is the riskless rate of return. The time series for the factors that explain the returns for the stocks were set up as follows. The first factor $\left(E[r_m] - r_f\right)$ is the market risk premium adjusted for

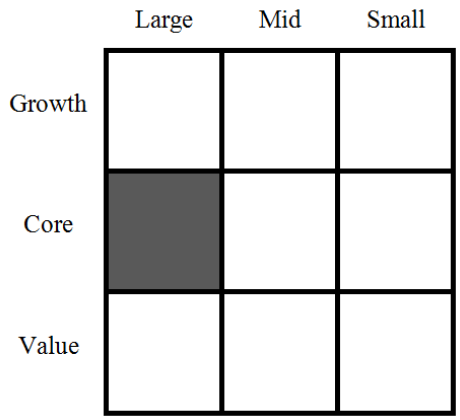
[14] The first appearance of a stock on the reports is interpreted as a "buy". The last appearance on the reports is, on the other hand, seldom taken for a "sell", as the reasons for writing off a stock could be different from selling, like a restructure or even bankruptcy. No adjustments have been made for the stock splits or stock dividends for buy/sell variables, for the lack of a reliable instrument that would be generally consistent. This, however, might result in slight upward biasness of the model predictions, which, given a large number of stocks used for the regressions, the panel data setup, and overall probability for dilutive actions for the periods of the Fund's holdings, should not significantly distort the regression results. The stock prices are adjusted for dilutive corporate actions.

the risk-free rate. For the market return, the market benchmark previously used for the portfolios (MSCI ACWI index) tests was utilized. For the riskless rate, the time series for the US Treasury 10-year bonds yields were converted into weekly rates. To set up the *SMB* factor, MSCI ACWI Large-cap index returns were subtracted from MSCI ACWI Small-cap returns. For *HML*, MSCI AC World Growth returns were subtracted from MSCI AC World Value[15] returns. Finally, the MSCI ACWI Momentum index returns were used for *Mom* factor. The factors betas result from the regressions run for the period of 52 preceding weeks. Eventually, the resulting estimates for stocks' expected weekly returns were subtracted from the corresponding realized returns in order to obtain the abnormal returns for the stocks.

Other explanatory variables used for the logit regressions are dummy variables that control each stock's attributes that were discussed previously. Each dummy variable takes the value of 1 for a defined property and the value of 0 otherwise.

Each dummy variable of the first set of dummy variables is constructed to imitate the popularized by Morningstar so-called "equity style box". The dummy variables for the stocks' size and style properties are set up in accordance to each cell of the Figure 10: Large-, Mid-, Small-Growth, Large-, Mid-, Small-Value, and Mid-, Small-Core. The darkened segment ("Large-Core") does not have a dummy variable, as it is the base case against which the rest of the size-style attributes are compared.

Figure 10. Equity style box graphic image



[15] The original high-minus-low book-to-market ratio was extrapolated as low-minus-high P/B ratio, which is the reciprocal for book-to-market.

Of all 3,214 stocks, there are 2.15% that are Large-Growth (69 firms), 0.25% Mid-Growth (8 firms), 12.29% Small-Growth (395 firms), 0.81% that are Mid-Core (26 firms), 69.72% Small-Core (2,240 firms), 0.44% Large-Value (14 firms), 2.52% Small-Value (81 firm) and only 1 firm that is Mid-Value (0.03%). The rest of stocks are Large-Growth. An important note should be made is that, here, each stock is equally weighted, and a large number of Small-Core stocks do not constitute the largest share in the Fund's portfolio, as when each stock is weighted with its value in the portfolio.

Next, sector dummies are created to analyze what sectors the Fund's management favors over the other. The sector dummies correspond to the ten sectors that were described earlier, with the relative number of stocks attributed to a corresponding sector summarized earlier in Table 5 (Summary for the Fund's holdings categorized by sector).

A dummy variable is created for Emerging markets. Classification of Emerging economies is according to OECD's definition (OECD, 2014). Among the Emerging economies[16] that are part of the dummy are Argentina, Brazil, Chile, China, Greece, Hungary, India, Mexico, Peru, the Philippines, Poland, Russia, South Korea, South Africa, Taiwan, and Turkey. There are 3.52% of companies (113 firms) that are identified as Emerging economies.

Additional dummy variables for years and interaction dummies for the stocks past performance will be formulated and explained along the analysis rather than here for the consistency of the overall logic behind testing.

5.3.2 Test for relation between "buy" decision and stocks' earlier abnormal returns

To begin with testing for the Fund's buy decisions, the variable Buy is logit-regressed[17] on the following set of abnormal returns:

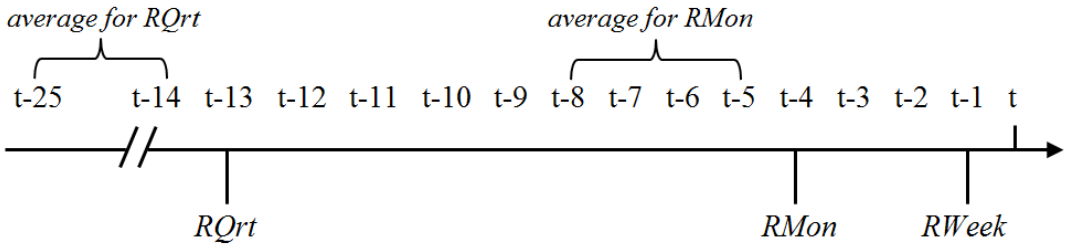
$$L(Buy_{i,t}) = b_0 + b_1 RQtr_{i,t-13} + b_2 RMon_{i,t-4} + b_3 RWeek_{i,t-1}$$

[16] The countries that are not Developed economies, but that are widely recognized as tax havens are not considered as Emerging markets here.

[17] Logit regressions are run under random effects condition.

where $RQtr_{i,t-13}$ is a stock's average weekly abnormal return for the previous quarter on the last week of the quarter preceding the reporting quarter. In other words, it is what the stock's abnormal return was on average before the reporting quarter when the decision to buy was made. $RMon_{i,t-4}$ is the stock's average weekly abnormal return for the month preceding the reporting date and $RWeek_{i,t-1}$is the abnormal return for the week preceding the reporting week. The setup of the variables ensures that none of them overlap with each other. All averages are equally weighted over the period. The setup of the abnormal returns variables is graphically presented in Figure 11.

Figure 11. Schematic structure of abnormal returns explanatory variables for logit regression



Essentially, the logit regressions are an attempt to estimate the odds of stocks that, on average, outperformed the market's expectation by 1% during preceding quarter, month and week to appear on the Fund's quarter reports. The results of the logit regression for Buy are presented in Table 15.

Table 15. Logit regression results for "buy" decision, abnormal returns explanatory variables

	Coefficient	Odds ratio
$RQtr_{i,t-13}$	-0.00541	0.995
	(0.373)	
$RMon_{i,t-4}$	0.00730**	1.007
	(0.0256)	
$RWeek_{i,t-1}$	0.00368**	0.996
	(0.0253)	
Constant	0.298***	1.347
	(0)	(0)
Prob > χ2 (Wald test)	0.0131	
Prob ≥ $\bar{\chi}$(Likelihood-ratio test of rho)	0.000	
Observations	53,938	

Number of id[18]	2,864

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The model has a rather stable fit since the probability for the Wald test defined chi square (χ^2) value for the model being lower than the critical value is almost zero (0.0131). The probability for statistical insignificance of the panel level component (Likelihood-ratio test of rho) is equal to zero[19]. Given the model has a stable structure both across time and across panel variables, the resulting coefficients are statistically significantly different from zero at 5% significance level for all explanatory variables but $RQtr_{i,t-13}$. From the odd ratios, it is possible to conclude that the abnormal return for the month preceding the reporting month has a slight effect on the inclusion of a stock in the Fund's portfolio by the end of the quarter with the odds of being included increasing by 1.007 with each additional percent of abnormal return. This odds ratio can also be interpreted as an increase in probability for buying a stock by 0.7% for each 1% of positive excess return for the preceding month[20]. The last week's abnormal return, on the other side, does not have a similar effect. Quite the opposite, with each additional percent in weekly abnormal returns the odds of inclusion in the portfolio decline due to the resulting odds ratio being equal to 0.996, which means that the opposite option takes a larger value in the denominator with odds for being not included equal to 1/0.996 = 1.0037. Finally, the overall odds for buy decision for stock rather than not buy, on average for the entire period, amount to 1.347, according to the intercept.

5.3.3 Test for relation between "buy" decision and combinations of periods for stock's abnormal performance

For the next model, the chances for the Fund's management to buy an equity security are tested based on past performance of a stock for a combination of periods. The explanatory variables for Buy this time are dummy variables for stocks that demonstrated positive return

[18] The number of id categories for stocks is less than original 3,214 since some of the stocks time series did not have enough observations for deriving expected return for all periods or it was not possible to appropriately define buy/sell decision for some of the stocks.

[19] Rho (ρ) parameter explains the proportion of total variance contributed by panel variance component. Simply speaking, if rho is equal to 0 the panel variance component is not important and the panel regression is not superior to pooled regression format. The Likelihood-ratio test of rho gives the probability for rho being not significant, if it is equal to 0, then, rho is higher than the critical value and the panel data setup is superior to the pooled regression.

[20] This is equivalent to marginal effect ("dy/dx" for derivative notation) for the explanatory variable.

in excess to the expected return for preceding quarter, month and week, previous quarter and month, and previous month and week. The expression for the logit regression for Buy looks the following way:

$$L(Buy_{i,t}) = b_0 + d_1 Well_i Q_{t-13} M_{t-4} W_{t-1} + d_2 Well_i Q_{t-13} M_{t-4} + d_3 Well_i M_{t-4} W_{t-1}$$

where variables $Well_i Q_{t-13} M_{t-4} W_{t-1}$, $Well_i Q_{t-13} M_{t-4}$, and $Well_i M_{t-4} W_{t-1}$are dummy variables for the stocks that, on average, performed well for the previous quarter at time *t-13*, month at time *t-4*, and week at time *t-1*. Each dummy variable takes the value of 1 if the defined performance property is fulfilled and 0 otherwise. Coefficients for the dummy variables are expressed as d_k and b_0 is the model's intercept.

The results of logit regressing of Buy on the set of dummy variables for the previous winners is presented in Table 16.

Table 16. Logit regression results for "buy" decision, previous outperformers dummy explanatory variables

	Coefficient	Odds ratio
$Well_i Q_{t-13} M_{t-4} W_{t-1}$	-0.101**	0.904
	(0.0346)	
$Well_i Q_{t-13} M_{t-4}$	0.0691**	1.073
	(0.0152)	
$Well_i M_{t-4} W_{t-1}$	0.0719**	1.076
	(0.0129)	
Constant	0.277***	1.319
	(0)	
Prob > χ2 (Wald test)	0.0117	
Prob ≥ $\bar{\chi}$(Likelihood-ratio test of rho)	0.000	
Observations	*53,938*	
Number of id	*2,864*	

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The logit regression has acceptable fit and panel data stability. The intercept is statistically different from zero, and demonstrates the Fund's management readiness to buy rather than not buy a stock has the odds ratio of 1.319. The coefficients for the explanatory variables are significant at 5% level. The stocks that performed well during the earlier quarter and month, and previous month and week have, on average, 7.3% and 7.6% more chance for being

purchased by the management by the end of a reporting quarter. The stocks that performed well during all three periods, on the contrary, have an odds ratio of 0.904, which signifies that the odds for not buying these stocks are 1.106.

5.3.4 Test for relation between "buy" decision and stocks' categories characteristics

Moving forward, the decision to buy is analyzed with logit panel data regression and explanatory variables based on the stock's previous month performance and a set of dummies to control for the stock's attributes that were discussed previously. The formal representation of the model is:

$$L(Buy_{i,t}) = b_0 + b_1 RMon_{i,t-4} + \sum_{n=1}^{8} d_n SizeStyle_i + \sum_{m=9}^{18} d_m Sector_i + d_{19} EmMkt_i$$

where $RMon_{i,t-4}$ is the previous month abnormal returns observed at the end of this month with a coefficient denoted b_1 , b_0 is an intercept, $SizeStyle_i$ is a set of eight dummy variables for a stock's combined size (Large, Mid, Small) and style (Growth, Core, Value) attributes and $Sector_i$ is a set of nine dummy variables that denote the firm's sector attribute, $EmMkt_i$ is a dummy for Emerging markets, and $d_{n\ or\ m}$ is a coefficient for a dummy variable. Additional details for the dummy variables have been provided earlier. The Large-Core, Financials sector and Developed markets variables are omitted since they constitute the base case against which stocks with other attributes are compared.

The logit regression was performed with the full set of variables, the most statistically insignificant variable was omitted, and the regression was re-performed. Such re-performance was repeated for a number of times omitting the weakest variable at a time. The output for resulting logit regression with explanatory variables that have statistically significant explanatory power for corresponding coefficients and odds ratios is presented in Table 17.

Table 17. Logit regression results for "buy" decision, stocks' previous month average abnormal returns and attributes dummy variables

	Coefficient	Odds ratio
$RMon_{i,t-4}$	0.00747**	1.007
	(0.0216)	

Large-Growth$_i$	0.177**	1.193
	(0.0469)	
Small-Growth$_i$	-0.415***	0.660
	(0)	
Small-Core$_i$	-0.510***	0.600
	(0)	
Large-Value$_i$	0.344**	1.411
	(0.0273)	
Small-Value$_i$	-0.620***	0.538
	(0)	
$EmMkt_i$	-0.659***	0.518
	(0)	
Communications$_i$	-0.187***	0.829
	(0.000793)	
Consumer Discretionary$_i$	-0.196***	0.822
	(0)	
Health Care$_i$	-0.187***	0.830
	(0)	
Constant	0.781***	2.185
	(0)	
Prob > χ2 (Wald test)	0.000	
Prob $\geq \bar{\chi}$(Likelihood-ratio test of rho)	0.000	
Observations	*53,938*	
Number of id	*2,864*	

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

Since the probabilities for the model's poor fit and the panel data instability criteria for the structural fit equal zero, further inferences regarding the Fund's management decision to buy stocks can be made. Under the base case scenario, Large-Core stocks that operate in Financials sector and originate from a Developed economy have odds of being bought rather than not bought equal to 2.185. On the other hand, the value for likelihood of a stock being purchased based on the previous month's outperformance has a value of 1.007, which is almost identical to the first model where this variable is used. The Fund is even more willing to purchase Large-cap stocks if they can be attributed to Growth and Value stocks, with the probability of buying such stocks equal to 19.3% and 41.1%, respectively, over just the majority of Large stocks attributed as Core. Other size - style combinations and sectors have inferior odds for being purchased compared to that of the base group. The odds for stocks to be purchased if they fall out of the Large-Core category are 0.660 for Small-Growth, 0.6 for Small-Core, and 0.538 for Small-Value. For sectors that are non-financial the odds are 0.829

for Communications, 0.822 for Consumer Discretionary and 0.830 for Health Care. The probability for a financial Large-Core stock to be purchased if it originates from an Emerging economy is 48.2% less (odds ratio is 0.518) than if it comes from a Developed economy.

But the Fund is not buying a stock on the market only once. After a stock has been purchased for the first time, management adjusts the Fund's position over time. This means that a decision to buy a stock can be also motivated by an earlier purchase.

5.3.5 Test for relation between "buy" decision, earlier decision to buy and stocks' categories characteristics

To analyze the effect of an earlier purchase of a stock, the last regression is re-performed, but with a new variable. The new variable is a lagged dummy variable for Buy. The rest of the model is identical to the previous. Formally, the logit regression model can be expressed like:

$$L(Buy_{i,t}) = b_0 + b_1 RMon_{i,t-4} + d_1 Buy_{i,t-1} + d_2 LargeGrowth_i + d_3 SmallGrowth_i + d_4 SmallCore_i + d_5 LargeValue_i + d_6 SmallValue_i + d_7 EmMkt_i + d_8 Communications_i + d_9 ConsumerDisc_i + d_{10} HealthCare_i$$

where $Buy_{i,t-1}$ is the new variable that denotes lagged dependent $Buy_{i,t}$ variable.

The results of the logit regression are presented in Table 18.

Table 18. Logit regression results for "buy" decision, previous decision to buy, stocks' previous month average abnormal returns and attributes dummy variables

	Coefficients	Odds ratio
$Buy_{i,t-1}$	0.367***	1.444
	(0)	
$RMon_{i,t-4}$	0.00615*	1.006
	(0.0580)	
Large-Growth$_i$	0.151*	1.163
	(0.0586)	
Small-Growth$_i$	-0.390***	0.677
	(0)	
Small-Core$_i$	-0.478***	0.620
	(0)	

Large-Value$_i$	0.310**	1.363
	(0.0267)	
Small-Value$_i$	-0.578***	0.561
	(0)	
EmMkt$_i$	-0.612***	0.542
	(0)	
Communications$_i$	-0.175***	0.839
	(0.00067)	
Consumer Discretionary$_i$	-0.177***	0.838
	(0)	
Health Care$_i$	-0.170***	0.843
	(0)	
Constant	0.543***	1.721
	(0)	
Prob > χ2 (Wald test)	0.000	
Prob $\geq \bar{\chi}$(Likelihood-ratio test of rho)	0.000	
Observations	*53,938*	
Number of id	*2,864*	

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The model has a proper fit and is acceptably stable across the panel categories. The coefficient for the base case stock, which is Large-Core financial firms from a Developed economy, as the result of inclusion of the new variable has considerably diminished from the odds ratio of 2.185 to 1.721. The same is true for other Large size stocks whose ratios became 1.163 and 1.363, respectively. Given previously a decision to buy has been made, the odds for a base case stock to be purchased again are 1.444, which, according to the model, explains 0.001 of the monthly abnormal returns odds ratio for being purchased, making it 1.006. The odds for the stocks with other size-style attributes have, on the other hand, slightly improved with the odds of 0.677 for Small-Growth, 0.620 for Small-Core, and 0.561 for Small-Value stocks. The same is for sectors that now have the estimates for odds of being purchased against that of for Financials are equal to 0.839 for Communications, 0.838 for Consumer Discretionary, and 0.843 for Health Care. Eventually, the odds ratio for the stocks originating from Emerging economies for being purchased, given other criteria are similar to base-case, is 0.542.

Eventually, the sensitivity of the Fund's management decision to buy a stock to the previous month's abnormal return should not be viewed as being constant over time. The 12 year period was notable for rapid growth in 2003-2006, and 2008-2009 are remarkable for the

Financial Crisis. All this should, certainly, have an impact on the Fund's management decision to buy stocks.

5.3.6 Test for "buy" decision dynamics over the 12 year period

In order to test these differences throughout 12 years a set of yearly dummy variables was created. Each dummy is assigned the value of 1 for a given year and the value of 0 otherwise. There are 11 dummies for years 2001-2011, and the base year against which other years are compared is 2012. The variables are used in the logit regression together with the variable for previous month's abnormal returns ($RMon_{i,t-4}$):

$$L(Buy_{i,t}) = b_0 + b_1 RMon_{i,t-4} + \sum_{k=1}^{11} d_k Year_t$$

where b_1 is a coefficient for previous month's abnormal returns, d_k are coefficients for *Year* dummy variables, and b_0 is the model's intercept.

The results of the logit regression for the model are presented in Table 19.

Table 19. Logit regression results for "buy" decision, stocks' previous month average abnormal returns and year dummy variables

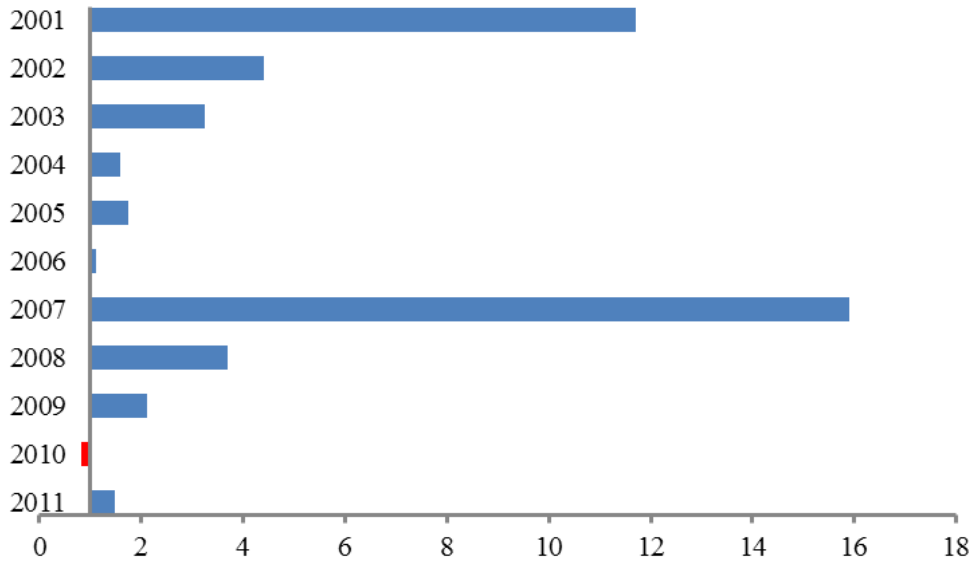
	Coefficients	Odds ratio
$RMon_{i,t-4}$	0.0115***	1.012
	(0.000998)	
2001	2.461***	11.72
	(0)	
2002	1.482***	4.400
	(0)	
2003	1.178***	3.249
	(0)	
2004	0.455***	1.577
	(0)	
2005	0.556***	1.743
	(0)	
2006	0.120**	1.127
	(0.0164)	
2007	2.767***	15.91
	(0)	
2008	1.311***	3.710
	(0)	

2009	0.754***	2.125
	(0)	
2010	-0.194***	0.823
	(0)	
2011	0.398***	1.490
	(0)	
Constant	-0.393***	0.675
	(0)	
Prob > χ2 (Wald test)	0.000	
Prob ≥ $\bar{\chi}$(Likelihood-ratio test of rho)	0.000	
Observations	*53,938*	
Number of id	*2,864*	

p-value in parentheses
**** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The model is appropriately stable across the stock categories and has an adequate fit. All coefficients and the model's constant are significantly different from zero at 1% of confidence, with the only exception of the coefficient for 2006, which is still significant at the level of 1.64%, according to its p-value. For 2012, the odds for buying rather than not buying a stock are equal to 0.675, according to the intercept. Given this, the probability for a stock to be purchased in 2012 given 1% increase in average abnormal return for the month preceding the reporting is equal to 1.2%, since the odds ratio for the coefficient is 1.012. All years, with the exception of 2010 with the odds of only 0.823, have demonstrated higher odds for the stocks to be bought. Remarkably, Fund's management readiness to purchase stocks based on the abnormal returns for the previous month had odds for purchase equal to 11.72 in 2001 and 15.91 in 2007. In addition the odds for the Fund to buy a stock were 3.71 and 2.125, relatively to the base year, in years 2008 and 2009, respectively. The odds for a decision to buy for the remaining years are equal to 4.40 for 2002, 3.249 for 2003, 1.577 for 2004, 1.743 for 2005, 1.127 for 2006, and 1.49 for 2011. The odds for each year are plotted against the 2012 base-case odds (=1) in Figure 12 for visual comparison.

Figure 12. Odds for decision to "buy" based on the previous to quarter's end month's abnormal returns across years relative to that of 2012 (=1)



Finally, the Fund's decision to sell stocks is discussed. An important remark that should be made here is that broad testing of the Fund's management decision to sell stocks, as in case of the buy decision that has been tested across stocks dynamic performance, their qualitative attributes, relation to a previously made analogous decision for the same stock, and for different time periods, is hardly possible.

Firstly, it is the Fund's long-term investment horizon that implies the Fund's trading activity balance is heavily tilted to actively buying stocks for long-term holding rather than benefitting from dynamic timely sales after a short time period, which is more appropriate for a speculative attitude. Secondly, the Fund's strong liquidity positions with more capital relatively steadily coming in every month, allow the Fund to keep up to short-term losers much longer than other market agents. In a sense, it would be rather challenging to articulate the intuition behind stock sales for a particular dynamic performance pattern or type of stocks, given the need for a sale due to pressing liquidity constraints could in most cases be discarded due to the Fund's remarkably deep pockets. Finally, the Fund's investment Mandate, to a certain extent, dictates the rules for sales, in particular, under monthly rebalancing conditions.

5.3.7 Test for "sell" decision dynamics over the 12 year period

Given all of the limitations for the analysis of the Fund's decisions to sell stocks under particular trading intuition that can be clearly formulated, it is still possible to perform a general overview for the Fund's stock sales dynamics across time. For this, a model similar to that of the preceding one is formulated:

$$L(Sell_{i,t}) = b_0 + \sum_{k=1}^{11} d_k Year_t$$

where d_k are coefficients for *Year* dummy variables, and b_0 is the model's intercept. As in the previous model, the base year against which other years' decisions to sell stocks are compared is 2012. The model's explanatory variables are all indicator-variables that take 1 for a given year and 0 otherwise.

The results of the logit regression for Sell variable are presented in Table 20 and the dynamics are plotted in Figure 13.

Table 20. Logit regression results for "sell" decision, year dummy variables

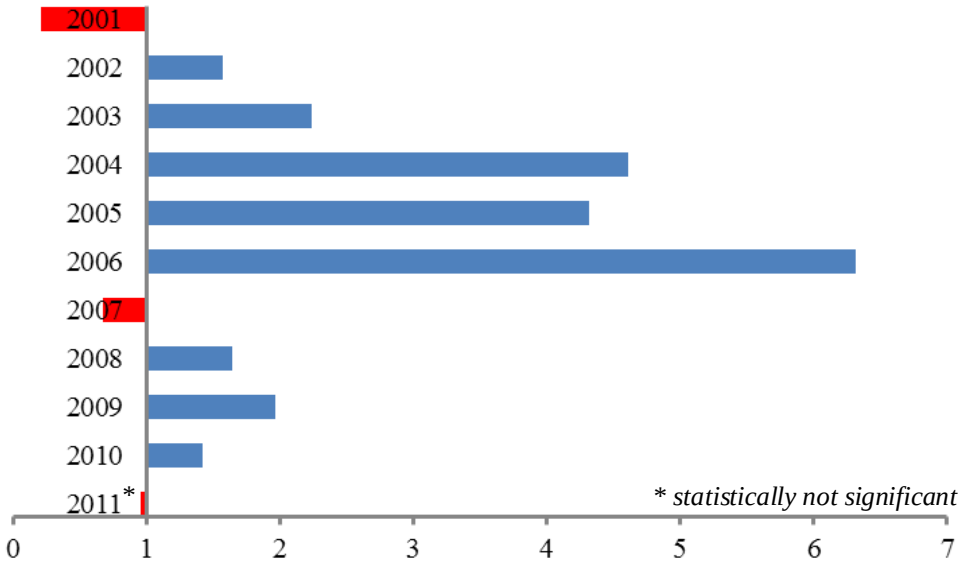
	Coefficients	Odds Ratios
2001	-1.567***	0.209
	(0)	
2002	0.454***	1.575
	(3.63e-08)	
2003	0.806***	2.239
	(0)	
2004	1.527***	4.606
	(0)	
2005	1.462***	4.315
	(0)	
2006	1.843***	6.314
	(0)	
2007	-0.387***	0.679
	(0)	
2008	0.495***	1.640
	(0)	
2009	0.675***	1.964
	(0)	
2010	0.351***	1.421
	(0)	
2011	-0.0421	0.959
	(0.397)	

Constant	-2.022***	0.132
	(0)	
Prob > χ2 (Wald test)	0.000	
Prob ≥ χ̄(Likelihood-ratio test of rho)	0.000	
Observations	*53,938*	
Number of id	*2,864*	

p-value in parentheses
*** p<0.01, ** p<0.05, * p<0.1 (significant at given levels)*

The model has reliable structure. All coefficients are statistically significant from the constant at the level of 1%, except for the year 2011. The odds for selling the stocks that the Fund owns against not selling, on average, are 0.132 or 1: 7.58, for the base year of 2012. For the years of 2001 and 2007, the Fund's management was even more reluctant to sell, with the odds for selling a stock after it had been purchased earlier equal to only 0.209 and 0.679, respectively. The highest odds for selling a stock are estimated for the year 2006 with the odds ratio of 6.314. All years odds, as mentioned, are compared against the base year, and other years have the following odds ratios: 1.575 for 2002, 2.239 for 2003, 4.606 for 2004, 4.315 for 2005, 1.640 for 2008, 1.964 for 2009, and 1.421 for 2010.

Figure 13. Odds for decision to "sell" based across years relative to that of 2012 (=1)



5.3.8 Results for examination of strategy execution diligence

The conclusions for the results produced by the models structured for the Fund's decisions to buy and sell stocks can be summarized as following.

For the stocks that have previously outperformed the market, the odds for inclusion are not dramatically different from the overall odds of purchasing a stock. For the stocks that on average outperformed the market's expectation during the month preceding the reporting there is a slightly higher chance, only 0.7% probability, of being included rather than not included. The weekly outperformers, on the other hand, have a slightly lower chance for being bought, with the odds for being rather not purchased 0.4% higher. This can be perceived as an indication of a fairly sensible approach to buying stocks, since the prices for the stocks have empirically documented signs of inflations by the end of a quarter due to trading activities of commercial investment funds (Carhart, Kaniel, Musto, & Reed, 2002). The evidence that the Fund is reluctant to buy stocks that outperform during the weeks that precede the reporting dates is, yet, another compelling confirmation that the Fund's management is not engaged in window dressing of the Fund's performance figures before their disclosure.

The combined outperformance of a stock during the preceding month and quarter, or month and week yields slightly higher odds for a stock to be purchased by the Fund, which could be an indication that the management might view the monthly outperformance of a stock as an indication for a long-term buy. The odds for being purchased are 7.3% higher for combined outperformance during the previous month and quarter, and 7.6% for month and week. The stocks that on average continuously outperformed during the previous quarter, month and week have, on the contrary, lower chances for being included in the portfolio. The odds for not inclusion are almost 10% higher. This can be interpreted as the management's reluctance for purchasing a stock that could, by the time of the purchase, get "overheated" due to augmented attention from the market caused by remarkable performance. This is viewed as generally a good tack, as such a stock usually becomes overbought rather quickly and, hence, its price has a rather high chance for reverting back to its true value. Managing the Fund with a rather long-term horizon, engaging in short-span market herd behavior could hardly be appropriate for the management.

From all of the universe of the stocks that are traded on recognized and well regulated exchange platforms, the Fund's management favors those that are large in size, operate in Financials sector and originate from a Developed economy. The odds ratio for purchasing a stock rather than not purchasing is 2.185 if a stock is issued by a large company. The decision to buy a stock is more likely if a large stock can be identified as a growth company, with the previous odds for purchase increasing by 1.193, and even more likely if a stock is strongly underpriced in relation to its book value, such as tock adds up another 1.411 to the odds of being purchased if it were market-priced. This can be regarded as another rather suitable position for selecting stocks for the Fund's portfolio appropriate to an investor with a long investment horizon. Apart from large firm stocks being relatively safer than the small ones, considering the Fund's enormous size, investing in a large number of small companies would be rather problematic due to not only higher monitoring costs, but also, the limitations of 10% maximum ownership imposed by the Fund's investment Mandate, as this limit can be reached relatively easily. Communications, Consumer Discretionary, and Health Care sector stocks have odds for being purchased of slightly over 0.8, in comparison to the base case. This, however, still means that the odds for large company stocks from these sectors have odds for being bought rather than not bought equal to 1.75. The Emerging economy origin for a stock lowers its chances for being purchased by almost a half.

After controlling for the previously made "buy" decisions, the odds for the stocks being purchased based on their attributes of size, style, sector, and country of origin have become more moderate, but the overall tendencies with preferences for large financial companies originating from a Developed economy remained generally unaltered. The odds ratio for a stock to be bought if it was purchased previously is equal to 1.44. The intuition behind favoring stocks that are already owned can be the Fund's management being already familiar with the securities they buy. Moreover, stocks for large companies are better covered by analysts and financial information providers. This can also be considered as another indication of the Fund's management being rather conservative in their investment purchases.

Throughout the period of 12 years, the Fund's tendency for buying stocks has not been homogenous. The dynamics for the Fund managers' readiness to buy stocks, roughly, follow the overall markets sentiments over the years. This is not surprising given the Fund's performance is benchmarked along a broad global index. The tendency for purchasing was gradually decreasing from 2001 to 2006. However, the pre-crisis year of 2007 was

remarkable for the Fund's odds ratio for buying equal to 15.91 if compared to that of 2012. This propensity for purchasing stocks can be explained. Firstly, the Mandate's prescription for the assets class allocation was altered from 40% to 60% of total value of the Fund that should be invested in equities (Regjeringen, 2006-2007). This, obviously, led to a massive increase in stocks buys that started in 2007. Another reason is that, together with the prescription to buy more equity, the Fund had to keep up with the assigned 60% of portfolio invested in equity and 40% in fixed income no matter what. This should trigger additional stocks purchases under condition of uneven overall trends for equity and fixed income markets growth. In other words, the equity portfolio should be rebalanced up given the bonds market is performing better than equities or the equity market is depreciating faster than bonds to maintain the Fund's 60% of market value invested in stocks at all time. Given the equity market did not experience its best times during late 2007 and the Financial Crisis of 2008 and 2009, in order to keep up with the 60% value allocation in equity, the Fund's management continued to buy stocks aggressively during this period. The final four year period is noticeable for a rather conservative attitude towards the stocks purchases with the odds ratio for buying rather than not buying equal to 0.675 in 2012.

Finally, the dynamics for selling a stock over the years have not been similar to each other as well. The tendencies for the Fund's management readiness to sell were somewhat the opposite of the decision to buy. For the base year of 2012, the overall odds for selling a stock that is already owned by the Fund are 0.132 to 1, or in other words, only 1 of 7.6 stocks is expected to be sold. The dynamics over the years of 2002-2005 and 2008-2009 can be described as steadily increasing. The highest odds of 6.314 for selling, relatively to 2012, were in 2006. This can partially be explained by exclusion of a number of large companies due to new guidelines for the Fund's Responsible Investing policy (Etikkrådet for Statens pensjonsfond - Utland, 2006) adopted by Norway's Department of Finance, which resulted in exclusion of a number of large tobacco producers (Finansdepartementet, 2014) and some other large companies like Wal-Mart (Finansdepartementet, 2006) for bridging the human rights of their workers. The odds for selling were dramatically down in year 2007, equaling only 0.679. This coincides with the high odds for buying stocks from the previous analysis. Such a relationship is also observed for the year 2001. Although, the odds for both buying and selling are dramatic for this year, it is hardly possible to make solid conclusions without seeing the earlier dynamics.

Generally, the analyses of the Fund's management decision making regarding buying and selling stocks can be summarized as rather conservative and along the Fund's investment mandate.

6. Conclusion

Summarizing the phenomenon of SWFs, it can be concluded that SWFs play important economic and social roles in today's global environment. From being marginal investors they advanced to becoming important players on the international capital markets arena.

Primary differences between commercial funds and SWFs come from SWFs more socially oriented objectives centralized around conserving and further augmenting wealth for future generations of a nation, sources of capital originating from a country's revenues from commodities sales or international trade surplus, and a higher degree of international cooperation. Furthermore, SWFs have substantially outgrown their commercial counterparts for the recent decades. SWFs also have superior to most of the commercial funds liquidity positions. Organizational structure and evaluation of management performance, although different from SWF to SWF, in some cases, resemble commercial funds setups. SWFs have lower management costs and substantial political liabilities that should also be accommodated to by an SWF's management.

The Fund is an SWF that was formed by Norwegian government with the purpose of managing the country's budget surpluses coming from taxation and state-owned companies' participation in exploration and extraction of oil. The Fund invests in three classes of assets, equity and fixed income securities and real estate. Over the time, the Fund has demonstrated adequate performance along the benchmarks prescribed by the Fund's investment Mandate. The Mandate also provides general guidance for the Fund's management for the Fund's investment strategy that can be outlined as fairly conservative due to, primarily, its long-term investment horizon.

The Fund is an SWF with a relatively high degree of its management independence. In addition, there is theoretical and empirical evidence for deterioration of managers' skill with a fund's size growing. Besides, SWFs pose specific challenges for managers coming from commercial funds. All this, in combination with the managers' compensation tied to the results of their performance, makes the matter of how prudent the Fund's managers are in their work exceptionally important.

Addressing the central question of the research of how well the Fund's managers do their job along two view points on imprudence, the conclusions based on the results of empirical analyses are recapped as following.

Based on the results of testing for opportunistic conduct in form of window dressing of the results of the Fund's management performance around known reporting dates and testing for evidence of similar actions around other periods, given the data and methodology used for empirical assessment, no evidence of such opportunistic actions was found. The expectation for abnormal return for each week is not significantly different from that of the expectation for the weeks for which the performance results are disclosed.

After examining the Fund's management decisions regarding buying and selling stocks along the guidelines prescribed by the Fund's investment Mandate, it can be concluded that, given the data and methodological approach, the Fund's management is diligent in execution of the Fund's rather conservative investment strategy. The management is not prone to purchase stocks that can potentially be overpriced due to excessive attention from the market for their consecutive abnormal performance over the period of previous quarter, month, and week. In addition, the evidence for slightly higher odds for not purchasing a stock that showed positive return in excess of widely recognized systematic risk factors over the last week of a quarter is also in favor of the Fund's management savvy since stock prices have a high chance of being inflated during this period. Moreover, the management favors stocks of large companies and prefers to buy stocks of firms that it is reasonably familiar with. Judging by the dynamics of stocks purchases and sells, for the period of 2001-2012, the management has been persistent in the Fund's portfolio rebalancing and acting along the instructions imposed by the investment Mandate and responsible investing guidelines.

Not being able to identify evidence that could be attributed to either the Fund's management acting deviously with a motive to personally benefit from such actions or confirmation that the management decisions to buy and sell stocks notably deviate from the Fund's investment policies set forward by the country's government, it is reasonable to conclude that the Fund's management has actually been prudent in its work.

For further research, the results of the analyses could be substantially improved given it would be possible to obtain additional data. Such data could comprise more frequent changes in holdings over time with a more comprehensive list of securities. The analyses could also

be adjusted for other classes of assets like fixed income portfolio or even real estate, given appropriate data could be obtained. Furthermore, information on comprehensive structure for the internal Bank's reporting, detailed compensation system, trading activities and portfolio holdings data for each division, group of portfolio managers or even individual portfolio managers would make it possible to thoroughly examine the managers' work along the suggested by the research framework and obtain results that could be further implemented to analyze weaknesses of the current Bank's compensation system and, subsequently, improve it.

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Appendices

Appendix 1. Summary of the Fund's holdings as presented by the data

Quarter	Stocks (number of firms)	Total market value (USD)
2000 Q4	369	586,651
2001 Q1	439	519,754
2001 Q2	444	1,157,007
2001 Q3	442	1,189,076
2001 Q4	415	3,849,428
2002 Q1	419	4,610,421
2002 Q2	440	4,880,172
2002 Q3	455	5,424,316
2002 Q4	459	6,362,590
2003 Q1	446	8,463,425
2003 Q2	456	10,585,552
2003 Q3	600	10,752,314
2003 Q4	602	13,127,264
2004 Q1	604	14,169,057
2004 Q2	633	15,514,384
2004 Q3	611	13,630,373
2004 Q4	686	16,667,129
2005 Q1	720	17,884,496
2005 Q2	697	17,933,390
2005 Q3	673	17,982,284
2005 Q4	667	20,468,004
2006 Q1	669	20,801,752
2006 Q2	656	19,490,132
2006 Q3	666	19,885,430
2006 Q4	666	20,990,260
2007 Q1	610	24,024,328
2007 Q2	1,258	28,167,972
2007 Q3	2,060	34,191,872
2007 Q4	2,090	38,163,836
2008 Q1	2,078	41,555,652
2008 Q2	2,118	48,340,088
2008 Q3	2,093	45,135,656
2008 Q4	2,061	37,712,688
2009 Q1	2,056	35,343,640
2009 Q2	2,016	50,112,120
2009 Q3	2,040	65,184,376
2009 Q4	2,047	69,651,624
2010 Q1	2,038	73,914,976
2010 Q2	2,014	66,863,448
2010 Q3	2,008	77,717,040
2010 Q4	2,027	93,682,072
2011 Q1	2,020	106,148,136
2011 Q2	1,966	108,641,712
2011 Q3	1,949	91,148,216
2011 Q4	2,020	104,465,320
2012 Q1	1,980	119,897,248
2012 Q2	1,962	118,991,376

2012 Q3	1,951	141,847,936
2012 Q4	1,951	130,602,264

Appendix 2. Average P/B ratios for industries (source *http://www.damodaran.com*)

Industry Name	Number of firms	P/B
Advertising	65	4.68
Aerospace/Defense	95	4.17
Air Transport	25	7.62
Apparel	70	4.43
Auto & Truck	26	2.48
Auto Parts	75	2.33
Bank	7	1.48
Banks (Regional)	721	1.27
Beverage	47	5.68
Beverage (Alcoholic)	19	2.69
Biotechnology	349	7.88
Broadcasting	30	3.11
Brokerage & Investment Banking	49	1.25
Building Materials	37	3.61
Business & Consumer Services	179	3.71
Cable TV	16	5.81
Chemical (Basic)	47	2.30
Chemical (Diversified)	10	3.06
Chemical (Specialty)	100	3.59
Coal & Related Energy	45	1.52
Computer Services	129	5.54
Computer Software	273	4.16
Computers/Peripherals	66	3.39
Construction	18	2.74
Diversified	20	2.46
Educational Services	40	2.05
Electrical Equipment	135	4.00
Electronics	191	2.09
Electronics (Consumer & Office)	26	1.57
Engineering	56	1.84
Entertainment	85	3.07
Environmental & Waste Services	108	2.69
Farming/Agriculture	29	1.39
Financial Svcs.	76	2.56
Financial Svcs. (Non-bank & Insurance)	17	0.84
Food Processing	97	3.38
Food Wholesalers	18	3.51
Furn/Home Furnishings	36	2.71
Healthcare Equipment	193	3.26
Healthcare Facilities	47	4.77
Healthcare Products	58	3.21
Healthcare Services	126	2.36
Heathcare Information and Technology	125	3.89
Heavy Construction	46	3.28
Homebuilding	32	1.93
Hotel/Gaming	89	3.33
Household Products	139	4.49
Information Services	71	5.72
Insurance (General)	26	0.93
Insurance (Life)	27	1.20
Insurance (Prop/Cas.)	53	1.31

Internet software and services	330	5.09
Investment Co.	65	1.14
Machinery	141	3.23
Metals & Mining	134	1.63
Office Equipment & Services	30	4.60
Oil/Gas (Integrated)	8	2.00
Oil/Gas (Production and Exploration)	411	1.91
Oil/Gas Distribution	80	2.12
Oilfield Svcs/Equip.	163	2.15
Packaging & Container	24	3.38
Paper/Forest Products	21	2.93
Pharma & Drugs	138	3.78
Power	106	1.64
Precious Metals	166	0.96
Publshing & Newspapers	52	1.81
R.E.I.T.	46	0.91
Railroad	10	3.30
Real Estate (Development)	22	1.87
Real Estate (General/Diversified)	11	2.64
Real Estate (Operations & Services)	47	3.15
Recreation	70	4.41
Reinsurance	3	1.00
Restaurant	84	7.56
Retail (Automotive)	30	5.32
Retail (Building Supply)	7	6.19
Retail (Distributors)	87	3.62
Retail (General)	21	3.28
Retail (Grocery and Food)	21	4.35
Retail (Internet)	47	11.00
Retail (Special Lines)	137	3.38
Rubber& Tires	4	2.70
Semiconductor	104	2.80
Semiconductor Equip	51	2.33
Shipbuilding & Marine	14	1.78
Shoe	14	5.32
Steel	37	1.67
Telecom (Wireless)	28	2.21
Telecom. Equipment	131	2.66
Telecom. Services	82	1.86
Thrift	223	1.03
Tobacco	12	103.20
Transportation	22	5.99
Trucking	28	4.20
Utility (General)	20	1.76
Utility (Water)	20	1.96
Total Market	**7766**	**2.60**

Appendix 3. Unit-root tests for replicated portfolios abnormal returns

For Size portfolio (1-6 lags)

Augmented Dickey-Fuller test for unit root — Number of obs = 622

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-17.463	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 621

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-13.414	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 620

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-12.398	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 619

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-10.401	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 618

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-9.648	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 617

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-9.788	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

For Style portfolio (1-6 lags)

Augmented Dickey-Fuller test for unit root — Number of obs = 622

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-17.135	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 621

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-12.968	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 620

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-10.602	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 619

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-10.190	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 618

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-10.234	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 617

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-10.425	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

For Sector portfolio (1-6 lags)

Augmented Dickey-Fuller test for unit root — Number of obs = 622

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-21.368	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 621

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-15.075	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 620

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-13.649	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 619

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-11.084	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 618

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-10.622	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 617

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-10.326	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.0000

Appendix 4. Replicated portfolios abnormal returns residuals normality tests

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
abn_size	626	0.2601	0.0000	39.16	0.0000
abn_style	626	0.0000	0.0000	.	0.0000
abn_sector	626	0.0030	0.0000	68.68	0.0000

Appendix 5. F-test calculation formulas (one-way ANOVA)

1) H_0: all population means are equal, H_a: at least one mean is different.
2) Calculating Grand Mean (x – data values, N – total sample size):

$$\bar{X}_{GM} = \frac{\sum x}{N}$$

3) Calculating total variation:

$$SS(T) = \sum (x - \bar{X}_{GM})^2$$

4) Calculating between group variation (n – sample size within groups):

$$SS(B) = \sum n(\bar{x} - \bar{X}_{GM})^2$$

5) Calculating within group variation (k- number of samples, df- degree of freedom; df = N – k):

$$SS(W) = \sum df \cdot s^2$$

6) Calculating variance due to the interaction between the samples (s^2_w) or MS(B) for Mean Square Between groups: $s^2_w = SS(B)/k\text{-}1$
7) Calculating variance due to the differences within individual samples (s^2_w) or MS(W) for Mean Square Within groups: $s^2_b = SS(W)/N\text{-}k$
8) Calculating F-test statistic:

$$F = \frac{s_b^2}{s_w^2}$$