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How has the differences in the Norwegian and Swedish investment approaches led to differences in performance outcomes?

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## Abstract

This thesis examines the similarities and differences between the Swedish and the Norwegian pension funds, the AP-funds and the Government Pension Fund Global (GPFG), respectively. That is, we are interested in investigating whether the difference in investment management approaches has led to differences in outcome, and whether these differences can be attributed to the differences in the public pension system in the two countries or in the investment management approaches of the funds. The thesis is comprised of two main issues, the investment management part, which includes legislations and mandates, asset allocation and risk, and a quantitative part, which calculates and compares returns, costs and risks of the funds. The investment management approaches are also compared to the Endowment Model and the OECD best practices for pension fund.

## 1. Introduction

Norway and Sweden are two very similar countries with respect to government structure, social values, and the fact that they are both successful welfare states. Despite the similarities they have chosen to structure their pension systems and their pension funds differently. Both the Government Pension Fund Global (GPFG) and the AP-funds are state owned funds, but were established to serve different purposes.

Both funds have grown to become large and have a significant impact on the market. The GPFG is defined as a sovereign wealth fund, while the AP-funds are classified as public pension reserve funds, meaning that their overarching purpose which also affect their structure is different, also due to the liability structure of the two funds being different. As a pension reserve fund, the AP-fund's main purpose is to cover pension liabilities, while the GPFG as a sovereign wealth fund also fund other social obligations, both through their mandates of achieving the highest possible returns within an applicable framework.

The thesis is in essence comprised by two main parts, the investment management part and the investment performance part. The first part consists of comparing the Norwegian and the Swedish funds in terms of how the two countries legislation defines their mandates, and how the mandates in turn defines the funds management, structure, asset allocation, and risk. The second part of our thesis is a quantitative part, which focuses on comparing the return, costs and risks of the two funds, and using a standard valuation and calculation methodology for both funds, which will allow us to compare the numbers and data of their performance.

The investment performance part is where we calculate and compare the returns, risks, and costs of the funds, which can give an indication of how the funds have performed, but has little explanatory power viewed in isolation. In order for the quantitative part to have explanatory power it is necessary to view it in light of the investment management part of the thesis. The restrictions imposed in the investment management part in terms of the legislation and mandates will ultimately affect the funds investment approaches and strategies, which then in turn will affect the investment performance part. Ultimately, this thesis will

examine how the different underlying purposes of the funds, which affect the investment management, can explain the differences in performance.

The research question we wish to examine is:

*“How has the differences and similarities in the Norwegian and Swedish investment approaches led to differences in performance outcomes?”*

Institutional investors have become major players in national and international financial markets, and it is therefore interesting to compare and see how two large players such as the GPF and the AP-funds have chosen to navigate in that landscape. Comparing the funds will also give interesting insight into how funds interpret and incorporate their mandates into their investment strategies, and how this causes differences in performance. It is also interesting to see how funds who have a responsibility to secure the long-term welfare of its beneficiaries remain sustainable. To our knowledge there are no previous studies comparing the GPF and the AP-funds in terms of both investment management and returns.

In section 2 we will present the background and literature relating to the topic. Section 3 consists of a description of the Endowment Model, the OECD best practices, as well as the liability structure of a pension plan. Further on in section 4 we describe the mandates of the funds, and the funds developments where we link them to the Endowment model and the OECD best practices. In section 5 we present the investment performance part where we describe how we are going to compare returns, risk, and costs.

## 2. Background and Literature Review

### 2.1 Background

“Pension funds are one of the most important players in the financial markets of the OECD countries” (OECD, 2006). These funds manage large amounts of assets on a worldwide basis and has therefore a large impact on the world economy and are important to provide financial security to the public. Norway and Sweden have grown to become two important players, although they have vastly different fund structures.

The main difference between the funds, besides their structure, is that they were established with somewhat different purposes. The Swedish AP-funds are exclusively used to pay pensions, while the Norwegian GPFG also funds other social obligations. Hence, the GPFG is classified as a Sovereign Wealth Fund (SWF), as these usually have objectives to diversify and improve reserves or commodity such as oil revenues, and to shield the domestic economy from fluctuations in commodity prices, resulting in investing in mostly foreign assets (Blundell-Wignall et.al., 2012). The GPFG, despite its name, has no formal pension liabilities (NBIM, 2016). The AP-funds are classified as Sovereign Pension Reserve Funds (SPRF), which is a type of Public Pension Reserve Fund (PPRF) that is owned and established directly by the government, and its financial inflows are mainly from direct fiscal transfers from the government (Blundell-Wignall et.al., 2012).

Sovereign Wealth Funds (SWF) and Public Pension Reserve Funds (PPRF) share many similarities such as being large in terms of assets under management, have long-term investment horizons, and are accountable only to governments or public-sector institutions. They are both also investing increasingly abroad and moving into more alternative assets such as real estate, private equity and hedge funds. Their similarities give rise to same concerns such as financial stability, corporate governance and political interference and protectionism. Despite the similarities, Blundell-Wignall, Hu and Ilmanen (2012) identified that SWFs and PPRFs tend to differ with respect to their objectives, investment strategies, funding sources, and their requirements to transparency.

Both funds are owned by the government on behalf of the Swedish and Norwegian people, where the people have not self-selected into the fund. This, in addition to being providers of welfare, increases the need to act and invest responsibly, and also the need to be transparent. On their webpage NBIM (2018) state that they are “dependent on confidence to achieve our mission”, and that they therefore “aim to be a professional, transparent, and responsible investment manager”. Most of the information, such as annual reports, is available to the public, except for market sensitive information.

## 2.2 Literature Review

This section will briefly describe the existing literature on the two fund's background, mechanisms and investment approaches, benchmarks with which we can conduct a comparative study, guidelines for "best practices" of such funds, and typical differences and similarities of such funds, and how these impact the factors we will study.

Ang (2010) examined benchmarks a Sovereign Wealth Fund (SWF) should take into account in establishing SWF and in the role SWFs have in the government's overall policy in a economic and political context. The paper reviews four main benchmarks which allows SWFs to compare their activities, including financial performance and optimal asset allocation policies, management structure, and the long-run equilibrium of markets. The first benchmark of legitimacy ensures that the capital managed by the SWF is gradually dispersed across the present and future generations, instead of being immediately consumed. The second benchmark of integrated policy and liabilities recognizes the implicit liabilities of SWF's by taking considering its role in government fiscal and policies. The third benchmark of governance structure and performance are concerned with that different governance structures require different financial benchmarks to reach their mandate. The final benchmark of long-run equilibrium requires SWF with long-term horizons to consider the markets in which they invest and the long-term externalities affecting the SWF.

Blundell-Wignall, Hu and Ilmanen (2012) analyzed similarities and differences between Sovereign Wealth Funds (SWF) and Public Pension Reserve Funds (PPRF), where SWFs are pools of assets owned and managed by governments to achieve national objectives, while PPRFs are pools of capital to finance the public pension system. Their similarities causes the two types of funds to have similar concerns, particularly about financial stability, corporate governance and political interference and protectionism. The study found that SWFs and PPRFs mainly differs in four dimensions; objectives, investment strategies, sources of funding, and transparency requirements. They also found that a particular concern of SWFs is how the strategic and political objectives impact exchange rates and asset prices, but they also found that SWFs also provide mechanisms for breaking up concentration of portfolios that otherwise increase risk. They conclude that

enhancing governance and transparency of SWFs are important, but needs to be weight against commercial objectives.

Chambers, Dimson and Ilmanen (2012) presented and evaluated strategies followed by the Norwegian Pension Fund, review of long-term performance and described how the fund responded to the financial crisis. They present how the fund's long horizon and low spending needs have equipped it exceptionally well to bear short-term losses, and also has enhanced Norway's reputation as an investor. They further explain how the fund has relied almost exclusively on publicly traded securities constrained to a low tracking error, has had rigorous asset allocation that allows little deviation from the policy portfolio, and how it depends mostly on beta returns, not alpha returns. The paper found that the Norwegian fund reduces risk through diversification, focuses on cost efficiency, embraces elements of active management, is committed to transparency and openness, and has a clear governance structure designed to deliver a well-considered strategy.

The OECD (2006) has provided a set of guidelines on pension fund asset management, which is a basic framework for the regulation of pension fund investment, and they address regulatory concerns that arise in the asset management of pension funds. These guidelines are non-binding but aim to present good practices and guide policymakers, regulators, supervisors, and other entities involved in pension fund administration and management. The guidelines suggest that the governing body of the fund should be subject to a "prudent person standard", what the investment policy should contain, implications of different types of portfolio limits, and how the pension assets should be valued.

### 3. Theory

#### 3.1 The Endowment Model

The Endowment Model is a investment philosophy conventionalized by David Swensen, who is the chief investment officer at the Yale Endowment Office. It has gained popularity, largely due to the increase in the Yale endowment which grew from \$1 Billion in 1985 to \$23.9 billion in 2014 (Ferri, 2014).

The model suggests that investors such as endowments and pension funds can receive great returns by moving a large portion of their investment away from the traditional portfolio allocations and into more alternative assets in accordance with modern portfolio theory, such as hedge funds, private equity, real estate and others (Curtis, 2012).

The Endowment Model has a strong equity orientation, since only around 4% of the portfolio is invested in bonds. The model invest in much more non-liquid assets, meaning that there is a large willingness to trade liquidity for return. Including hedge, private equity and real assets, roughly 82% of Yale's portfolio is illiquid. The model believes that more illiquid assets will generate higher returns, and that the risk that comes with the illiquidity is less prominent due to the long investment horizon through diversification (Curtis, 2012).

The model also believes in active management, as Yale own almost no index-like investments. The active management can largely be attributed to a wide use of external managers, and the strategy is based on a commitment of active management of portfolio diversification which underpins the success of the model (Akintona, 2017).

### 3.2 OECD Best practices (2006)

The OECD have created a set of guidelines of pension funds asset management. The guidelines are recommendations for the basic regulatory framework of pension fund investment and they address regulatory concerns that arise in the asset management of pension funds.

In terms of investment policy, the guidelines for best practices recommend that there should be clear objectives that have to be consistent with the retirement income of the pension funds, and therefore have to include acceptable degrees of risk, identify a strategic asset allocation strategy, and have clear criteria for how the governing bodies assess effectiveness and changes and implementation of policies.

The best practices also include guidelines on portfolio limits, such as a maximum level of investment by asset classes, but no minimum limit. Furthermore, also that

there should be no excessive risk exposure above a certain level of risk in order to remain sustainable. The limits set for the portfolio need to be regularly assessed particularly in the use of external asset managers to implement optimal investment strategies.

The best practices also recommend having a proper, transparent and disclosed basis for valuing the assets managed by the pension fund, and that the valuation methodology should rely on market value or fair valuation methodology, and be consistent.

### 3.3 Defined Benefit vs. Defined Contribution

“The liability structure is the starting point for the investment strategy of a pension plan” (OECD, 1998 p. 22). The liability structure of a defined contribution (DC) plan differs significantly from that of a defined benefit (DB) plan.

#### *Defined Benefit (DB)*

A Defined Benefit plan is a plan where the sponsor agrees to make specified payments to members at retirement. “A defined benefit plan is any pension plan other than a defined contribution plan, including all plans in which the financial or longevity risk are borne by the plan sponsor” (Tapai, 2008 p.5). Thus, the plan sponsors assume the risk of having insufficient funds (OECD, 1998). The pension obligations are effectively the sponsors debt obligations, which implies that the sponsor needs large reserves to cover its liabilities (Folpmers, 2012).

#### *Defined Contribution (DC)*

Under a DC system, in contrast to under DB, the sponsor is only responsible for making specific contributions into the plan on behalf of the participant (Ponds et al, 2011). In order for the participants to receive a certain amount of money at a future point, the participants in a DC system are required to pay a contribution today (OECD, 1998). Despite of the paid contribution being specified, the participants do not know what the amount of the payout benefits will be until the time of retirement. This means that the amount of payout depends on the realized

investment results, not on the paid contribution (BIS, 2012). Under the DC system the participant bears all the risk.

Norway has a final pay DB scheme, while Sweden has a hybrid scheme that is a combination of DC and DB (Ponds, E. et al., 2011 p. 16). Thus, the liability structures of the pension plans in the two countries differ, which in turn can affect the investment strategies.

## 4. The Investment Management Part

### 4.1 Mandates

The GPFG and the AP-funds are owned by the government on behalf of the Norwegian and Swedish people, respectively. The day-to-day operational management of the funds are administered by NBIM and AP. The fund's governing bodies issue mandates the investment managers must follow, this is to ensure that the fund is managed in the best interest of the ultimate owners and with a long-term perspective. The mandates specify which markets to invest in, the allocation of assets in different asset classes, and the risk the fund is allowed to bear.

#### 4.1.1 GPFG

“The Norwegian Government Pension Fund - Global (GPFG) was created to serve as a long-term savings vehicle that would secure income from oil revenues as a non-renewable resource for future generations by diversifying into a broad portfolio of international securities” (Chambers, D, et al., 2012). The NBIM's overall mandate for the fund is that they “shall seek to achieve the highest possible return after costs measured in the investment portfolio's currency basket and within the applicable management framework.” (NBIM, 2017).

#### 4.1.2 AP-Funds

AP1 through AP4 are classified as a public pension reserve funds, and they manage parts of the buffer capital of the income pension system, and their “role is to equalize the fluctuations in the balance between pension contributions and pension payments” (Aktiespararna, 2017). If the pension contributions do not

cover the pension payments the funds will cover this, and thus suffer a loss. The four funds have one overarching mandate which states that the funds should “manage fund assets in such a manner so as to achieve the greatest possible return on the income-based retirement pension insurance. The total risk level of the investments made by the Funds must be low” (Riksdagen, 2014). Each of the four AP-funds are free to interpret this mandate independently, which can lead to four drastically different investment objectives. These investment objectives are further restricted by Swedish law.

## 4.2 Development of the funds

### 4.2.1 Norway GPFG

The Ministry of Finance in Norway is responsible for the managing of the Government Pension Fund of Norway, but it is Norges Bank who is managing the operative part of the Government Pension Fund, in accordance with guidelines and frameworks set by the Ministry of Finance. The department in Norges Bank called “Norges Bank Investment Management” (NBIM) is the department who is actually managing the fund on an operational basis, while the board of Norges Bank has the role as the board of the fund (Chambers et al, 2012). The fund is made up by two separate investment funds that also have separate mandates; the Government Pension Fund Global (GPFG) and the Government Pension Fund Norway (GPFN). The GPFN invest in Norway, while the GPFG invests outside of Norway, so this study will only focus on the GPFG (Ang et al, 2009).

The Government Pension Fund of Norway (GPFG) was initially founded to preserve the oil revenues for future generations. The Government Pension Fund Global was officially established in 1990 to invest the surplus revenues of the Norwegian petroleum sector. Up until 1997, the fund only invested in government bonds, but in 1998 the Ministry of finance decided to invest maximum 40 percent of the fund in equities and the remaining 60 percent in fixed-income assets (Chambers et al, 2012).

The funds investment strategy leaned toward a traditional portfolio allocation with passive indexing at this point, but during the beginning of the 2000’s the fund added five emerging markets to the funds benchmark equity index, and corporate

and securitized bonds were added to the funds benchmark fixed income index, so the investment strategy switched to more enhanced indexing (Vittas et al, 2008).

In 2007, the ministry of finance decided to increase the fund's shares of equity investments from 40 to 60 percent. It also decides to add small-cap companies to the benchmark portfolio. In 2008, the Ministry of finance included a maximum share of 5 percent of total assets of real estate investments in the funds investment spectre (NBIM, 2017). By adding the real estate portion into their investment portfolio, the funds allowed for enhanced protection against inflation risk (Chambers et al, 2012). This was mostly due to creating a more diversified investment portfolio, which the Endowment model was a advocate for and had gained superior profits by implementing more diverse investments (Curtis, 2012).

A mandate was introduced in 2010, where the fund was allowed to invest maximum 5 percent in real estate only though a corresponding reduction in fixed-income holdings (NBIM, 2017). The OECD best Practices (2006) recommend only setting maximum levels of investment by category, and not prescribing minimum levels, which GPFG is in accordance with. The fund still held a share of equity investments up to 60 percent and up to 40 percent in fixed-income securities, which compared to the Endowment model still was seen as more conservative and passive (Curtis, 2012).

In 2012, the Ministry of Finance announces plans to gradually reduce the share of European holdings to about 40 percent of the fund and increase investments in emerging markets to 10 percent. In accordance with the Endowment model they now invest in more illiquid assets with higher risk, but also with more diversification (Curtis, 2012)

In 2017, a new management model was introduced. From 2017, Norges Bank decides the real estate allocation within the mandate's restriction that the unlisted real estate portfolio may constitute up to 7 percent of the investment portfolio (NMIB, 2017). As of September 2017 the fund's asset allocation was 65.9 percent equities, 31.6 percent fixed income and 2.5 percent unlisted real estate. We see that the development of the asset allocation has moved away from a passive

strategy to a more active, but compared to the Endowment model they still maintain a large amount of their holdings in fixed-income assets.

#### 4.2.2 The AP-funds

The AP-funds is managed by the state. Each of the funds have their own separate board of directors who is fully responsible for their fund's operations and are appointed by the Government of Sweden. The fund's have similarities to limited companies, as the board of directors delegate tasks for operating activities to a CEO. Each of the different funds are annually reviewed by the Ministry of Finance who present the review to the Parliament, but the government has waived its regulatory oversight, so that the operations of the funds is almost exclusively prescribed by laws (AP3, 2016).

When the APT-system came into effect in the 1960's, the national pension fund were split into 3 funds in order to secure long-term savings. These three funds permitted investments only in fixed-income securities, and asset management for the three funds were coordinated in a single organization (AP1, 2012).

In 1974 the fourth fund was established and only permitted to invest in equities, and in 1988 the fifth fund was created and also only permitted to invest in equities. As the two new funds arose, the three first funds were given less restrictive investment rules, being permitted to investing in real estate. In 1996, the sixth fund was created which invested in equities, riskier markets and focused on small to medium sized companies, and was responsible for the funds from wage-earners (AP2, 2016). The fund thus started to move away from the traditional portfolio management strategies and take into account more diverse and alternative investment methods as in accordance with the Endowment model (Curtis, 2012).

A forecast indicated that the APT-system was not financial stable and there was a risk that the current AP funds could be drained in the beginning of the 2000's (AP4, 2014). So in late 1990's the Swedish Parliament decided to reform the national pension system into a five-party agreement. The first through fourth fund, as well as the sixth fund became buffer funds which in the longer term would manage pension capital according to identical investment rules, this providing the

opportunity to invest in a diversified asset classes. They act independently and have separate management plans, investment and ownership policies (AP4, 2014).

The main reasons for the multiple fund structure was to reduce market impact, to diversity management risks, allow competition to reduce costs and improve performance and reduce political interference. The reason they had independently set goals and decided on asset allocation was to diversify strategic risks (Sveinson and Stewart, 2012). However, the lack of coordinated and targeted investment objectives and long-term performance measures for all of the AP funds have resulted in that the funds mainly just benchmark their performance against each other, which is not recommended by the OECD best practises as this do not show the full picture of the performance of the funds on a larger level (OECD, 2006).

There are certain investment rules all the AP-funds are obligated by law to follow. Among these, they have to invest at least 30 percent of their assets in fixed income securities, face no more than 40 percent currency risk exposure of the assets, cannot hold more than 10 percent of the voting rights in a single companies, no more than 5 percent of asset can be invested in unlisted securities, and that external managers should manage at least 10 percent of assets (AP2, 2017). Beyond these, the funds have chosen to interpret their broad mandate as they see fit. The floors on the fixed-income securities is not in accordance with the OECD best practices (2006) as it is only recommended to have ceilings on the investment limits.

## 5. The Investment Performance Part

In order to measure and compare the two pension fund's performance, it is necessary to gather data on different investment regulations and restrictions, and supervisory authority, assets under management, portfolio composition, costs and fees and valuation and methodology used to calculate investment returns.

Particularly, we need to carefully examine how the funds values their managed assets, and need to consider the potentially different approaches to reporting investment returns. Both pension funds use a valuation methodology which is based on the market value for reporting their returns, but the reporting approaches

also may differ. According to OECD (2008) to compare investment performance of different pension funds, one should ideally compare returns of net investment management costs, but this forces us to address another widely known difference in calculation of returns in different countries, which is the treatment of costs and particularly management fees (Antolin, 2008).

For example, it appears that both GPF and AP1-4 and 6 have to some degree, a lack of transparency in the approach to calculate fees, particularly related to transaction costs. A report by Swedish Social Insurance Inspectorate on administrative costs concluded that it was difficult to estimate what had been calculated as transaction costs as this can differ across several definitions, and that is can be a problem as the public do not know how much that is paid in transaction costs (Fixen, 2016).

The treatment and lack of transparency of transaction costs can potentially distort and underestimate the total costs, which again will affect the calculations of return. Due to potential differences in reporting frameworks, valuation methodology and regulatory differences, it is not efficient to compare investment performance just using the pension fund's reported returns. However, it is also useful to see how investment returns have evolved and developed in the two different countries in isolation, so we will look at the average real return, which is the nominal return in local currency less price inflation, but also make the returns comparable by converting the data into one common currency (Antolin, 2008).

Global Investment Performance Standards (GIPS) is a much used valuation methodology for performance measures and is the calculation methodology we chose to follow in order to compare the funds. They have recommended methodologies for calculating returns, costs, and risks, and the complementary ratios for comparability.

## 5.1 Returns

In accordance with the methodology based on the GIPS, the return is calculated as the change in market value, adjusted for incoming and outgoing payments since the last calculation date. In the calculation we will implement a time-weighted quarterly rate of return (NBIM, 2017).

The use of quarterly time-weighted rate of returns is required by the GIPS and involves adjusting for cash flows to remove the effect cash flows have on the performance returns. In calculating the total portfolio returns, the returns for cash and cash equivalents that are held in the portfolios must be combined with the returns of other assets as well. Performance is then calculated after removing all trading expenses since these are the costs paid to implement the investment strategies (NBIM, 2017). Additionally, we will use log-returns as a risk-adjusted performance measure when evaluating performance based on volatility.

### 5.1.1 Benchmarks

We will also compare how the two pension funds perform against benchmarks. For NBIM it is the Ministry of Finance that define the benchmark index for two asset class indices – an equity index which is the FTSE Global Equity Index Series All Cap index, and a bond index, which is composed by indices from Barclays Capital, however, the third asset class of real estate have no good market index benchmark available (NBIM, 2012). Both the AP funds and NBIM have strategic weights for their actual and strategic benchmark portfolio's which we will use to calculate the returns against the strategic benchmarks (AP2, 2016).

### 5.2 Costs

As recommended by the OECD (2008) in order to compare pension fund performance, one should ideally compare returns of net investment management costs. Pension funds incur many costs, however, in order to produce a comparison of the investment performance, only costs associated with the investment activities of pension funds should be netted out. Unfortunately, there is often a lack of consistent and complete available data on investment management cost, such as the lack of complete transparency of the transaction costs for both pension funds which can make the total costs underestimated.

Nonetheless, as total costs are still the best indicator of costs, we will make use of total costs which are costs related to their investment activities. This will be the respective funds operating expenses, transaction costs and external management fees (OECD, 2015). Due to the uncertainty of the transaction costs, we will also examine and compare each of these three costs in isolation. But looking at the

total costs in isolation will not give a full picture of the fund's management, which is why we need ratios and benchmarks in order to make comparisons. CEM Benchmarking Inc (CEM) recommends using total costs over total assets when comparing pension funds (Regeringen, 2017). CEM has also created general cost benchmarks based on fund's asset mix for large pension funds for comparable purposes. These benchmarks are based on a peer group which consists of the largest funds in the CEM survey, which we will utilize to compare costs management across several countries (NBIM, 2011).

### 5.2.1 Management costs

An important part of the comparison is to look at management costs. Both the AP funds and GPFG largely uses external managers for parts of the fund's investments. The fee to the external manager are normally structured so that they comprise of a fixed component and a performance-based component which is dependent on the managers ability to generate excess return (NBIM, 2016). CEM recommends not just looking at the total external management cost over total assets, but also breaking down the costs into the different asset classes to investigate two factors which drives the contribution to the total cost difference. These two factors are the asset class' share of total assets under management and the difference to benchmark cost per asset class. The benchmarks mentioned are created by the CEM for comparable purposes to review cost management of large pension funds (Regjeringen, 2017).

### 5.2.2 Regression, Jensen's Alpha and Appraisal Ratio

As management costs can grow to be quite large, and they have a performance-based component, we also wish to examine the relation between the paid performance-based costs and the return. In order to investigate whether the usage of external management has attributed to the success of the pension funds, we will regress the fee paid to external managers over total assets. Furthermore, as recommended by GIPS, we will also make use of Jensen's Alpha, which is used to determine the excess average return of a portfolio beyond the expected return, and the appraisal ratio, which is a reward-to-variability ratio similar to the Sharpe ratio, but investment specific returns and risks (NBIM, 2017). These three measures will enable us to get a more complete picture of how the funds are

managing their external costs, and give grounds for comparability between the funds.

### 5.2.3 Aggregate costs, returns and risks

As AP1-4 are four different funds with four different annual statements, we have to consider the aggregate returns of all four funds to make the two funds comparable. However, it is also useful to examine each fund in isolation, but it may not be useful for comparable purposes with NBIM, but rather for the overall performance of the funds in Sweden. All four funds have the same methodology for reporting and valuation in their annual reports, which enable us to compare the disaggregated costs, return and risks in isolation of the 4 funds, but also calculate aggregated returns, costs and risks to allow for a comparable study between the aggregated AP funds and GPF (Severinson and Stewart, 2012).

## 5.3 Risk

Both pension funds aim to get the highest possible return on their investment without taking too much risk. To enable us to compare the risks, we need to identify and measure the risks faced by the two funds.

### 5.3.1 Standard Deviation

Standard deviation is often referred to as the fund's total or absolute risk, and it provides insight into how much return the fund can be expected to fluctuate over a certain time period under normal market conditions. Both funds have a set limit for how much the funds can deviate in relative risk from the benchmark (NBIM, 2016). The standard deviation can provide useful information about the funds' different level of risk during the past for comparable purposes.

Since standard deviation provides little insight in the funds' actual performance, we will also use complementary measures of risk.

### 5.3.2 The Tracking Error

The tracking error measures the variability in the deviations of the composite returns from the benchmark returns (NBIM, 2016). The more variability, the larger is the tracking error, also called active risk. The mandate of the funds do

not necessarily impose a limit of the fund's total risk, but it does set a limit for its relative risk using the tracking error.

### 5.3.3 The Sharpe ratio

The Sharpe ratio measures the excess return (or risk premium) per unit of risk in an investment strategy. Despite certain assumptions that need to be fulfilled, the Sharpe can meaningfully assess whether the different pension fund systems obtained a risk premium, or have beaten their own benchmark or risk limit (Antolin, 2008).

### 5.3.4 Information Ratio

The funds information ratio (IR) is the ratio of the fund's average monthly relative return to the funds tracking error. The IR indicates how much relative return has been achieved per unit of relative risk (NBIM, 2017). The IR can also be used to measure a manager's ability to earn excess returns beyond the benchmark (Grinold and Kahn, 2000).

## 6. Data

### Sources

The information needed to conduct our thesis is found in related literature, in government reports, in the funds financial reports and on their websites. The main source of information and data is found in the financial reports of the funds. In order to compare the numbers and data for the funds, we will use exchange rates found on Reuters Datastream to convert the numbers into one common currency.

## 7. References

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