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Asset Management of the Foundations of the City of Göteborg

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Abstract

The investment policy is the primary step in portfolio management because it sets the future investment guidelines. A lot of research has focused on the relative importance of the major investment decisions - target asset allocation, market timing and security selection, and their contribution to portfolio performance. The purpose of this study is to provide deeper insights into the investment management process by evaluating the old foundations' management policy of the City of Göteborg and determining the relevant problems with its asset allocation, performance evaluation and managers' incentives. Due to the specific objectives of the foundations, the analysis is specially designed by constructing three portfolios under the new investment policy: a pure stock portfolio using the Markowitz portfolio optimizing technique; a pure bond portfolio using the fundamentals of fixed-income portfolio management; and a mixed portfolio presenting different risk-return scenarios. The results confirm that the asset allocation is a crucial aspect of portfolio management; however, it must be seen as a dynamic process if one is to take advantage of new market conditions and investment opportunities.

Key words: asset management, asset allocation, investment policy, portfolio construction

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1. Introduction

1.1. Background

The investment policy is the primary step in portfolio management because it sets the future investment guidelines. Due to different objectives, constraints and ethical rules, fund investment policies vary substantially. For traded investment funds, such as mutual funds and hedge funds, the main objective is to obtain higher returns usually from capital gains. The performance of these funds is typically evaluated by several widely used performance measures, such as the Treynor measure, the Sharpe's ratio, and Jensen's alpha. However, other fund managements can have quite different objectives, for example municipality foundations' management often requires attaining a certain level of dividend returns while keeping the capital intact.

The value of the City of Göteborg's foundations assets was approximately 650 MSEK at the end of October 2005, most of which comes from donations to the city. According to the investment policy, the capital of the foundations has to be kept intact and the only part of the return that can be used to fulfill the foundations' purposes is the dividend and coupon income, rather than the capital gains. In order to achieve these objectives the City of Göteborg's Financial Department has been using the services of financial institutions, including Nordea, SEB, Enter, Carnegie and ABN. As with all other investment funds, the incentive schemes for fund managers and the asset allocation rules are a crucial part of the foundations management.

In the old investment policy, which was in effect from 1995 to August 15th, 2006, the incentive structure was based on comparison between the performance of the portfolios having the same restrictions and asset allocation plan. Each manager was assigned between one and five individual foundations and the management fee was a percentage of the capital value of the portfolio at the year-end. The results from the investment policy were systematically evaluated and showed that the predetermined investment objectives were not appropriately met.

A natural inertia was inherent to the system when it came to the allocation of the assets between different securities, which often lead to adjustments taking place too late. Another interesting observation is that asset managers did not appear to be equally skilled in managing equity or fixed income investments, which at times was resulting in large fluctuations of the distribution of dividends across foundations. Moreover, the market in recent years has drastically changed, implying increased price fluctuations for individual securities and increasing difficulties to reach long-term stability in the investments. Therefore, the demand for specialization in the administration of assets has increased which prompted the City of Göteborg to change thoroughly their investment management policy.

In the new policy, which started operating on August 15th, 2006, there are only three portfolios which are clearly separated by the type of asset allocation. Pure stocks and pure bonds portfolios are mainly aimed at achieving value growth and each portfolio amounts to 30% of the foundations' assets. The mixed portfolio amounts to 40% of the foundations assets and its main goal is to reach a certain level of dividend income.

1.2. Research Problem

When considering different investment management styles and strategies, a number of important issues must be addressed. A lot of research has focused on the relative importance of the major investment decisions - target asset allocation, market timing and security selection, and their contribution to portfolio performance. Some studies have shown that the variation of total portfolio returns is mostly affected by the asset allocation mix (Brinson and colleagues, 1986; 1991), implying that the choice between different asset classes is much more important than the choice of particular securities within each asset class. Other studies have suggested that on average actively managed portfolios underperfrom the market (Sharpe, 1991; Ibbotson, Kaplan, 2000). Therefore, it can be extremely challenging to improve returns by varying the target allocation or selecting securities in highly efficient priced markets, explaining why often active management contributes little on average to the improvement of the portfolio performance.

Furthermore, in order to reflect the investors' long-term goals and to take advantage of changing market conditions and new investment opportunities, an asset allocation policy should be viewed as a dynamic process (Jahnke, 1997; Tokat, Wicas, Kinniry, 2006). Even though the importance of the asset allocation decision has been well recognized, many studies have pointed out that active management decisions (market timing and security selection) can be as important and noteworthy as asset allocation decisions (Hensel, Ezra, Ilkiw, 1991).

Another important concept to be considered in investment management is whether the market is believed to be efficient. A belief that the market is efficient would effectively result in employing a passive investment strategy, such as buying and holding a certain market index, since no one is expected to be able to outperform the market by managing portfolios actively (Fama, 1970). On the other hand, a belief that the market is not perfectly efficient would lead to utilizing active investment strategies (Reilly, Brown, 2002).

Moreover, many studies have attempted to find any relationship between dividend yields and stock prices, an information which can be vary valuable for funds with investment objectives aiming at high dividend returns. However, controversial results have been reported where some authors state that there is only marginal evidence for a positive relationship (Walter, 1956; Black, Scholes, 1974), whereas others have found a significant positive relationship (Grant, 1995). After decades of research the literature still provides conflicting results on the "positive" correlation between stock returns and dividend yields.

The specific managers' compensation schemes should also be carefully considered so that the City of Göteborg, as an investor, can induce the managers to work for the city's best interests. Different authors have examined the effectiveness of linear contracts (Cohen, Starks, 1998), nonlinear contracts (Stoughton, 1993) and incentive schemes of mutual funds' managers (Berkowitz, Kotowitz, 1993; Chevalier, Ellison, 1997). Although there has been extensive research on the first best incentive contract scheme, the discussion in previous researches has still not come to a common agreement.

The City of Göteborg is facing all these relevant problems of portfolio management. On one hand occurs the question whether mixed portfolios or pure stocks and bonds portfolios should be held and whether changing the asset allocation rules would lead to substantial benefits, if any. On the other hand, the City's old policy not only induces managers to work for higher capital gains rather than higher dividends, but it also induces all managers to keep portfolios with approximately the same asset allocation structure. The latter fact comes as a result from the managers being afraid to take active actions that could possibly reduce their portfolio's capital value and thus reduce their compensation. Therefore a related concern is whether changing the asset allocation structure would actually have any effect on the degree to which the managers are motivated to work in the City's interests and furthermore in what other ways could the manager's incentives be increased.

Previous literature has evaluated the portfolio performance based on the total risk-adjusted returns, which indicates that the objective of the portfolio management is achieving total return rather than dividend/coupon incomes. This is because the investment objectives of most traded or private funds to maximize the total returns over the investment horizon, which is capital gains plus dividend/coupon returns. This study attempts to generate some insights into the investment management process under very specific investment objectives, such as the foundations' minimum requirements to keep the capital intact and to obtain a certain amount of dividends/coupons. We have approached this research by evaluating the City of Göteborg's specific investment policy and designing a comparison method of the new and old policies, which focuses separately on the absolute capital and dividend/coupon returns during the sample period, rather than risk adjusting by complicate asset-pricing models used throughout large amount of the mutual and pension fund literature. In spite of the special comparison technique, some classical performance measures, like the Sharpe's ratio and Jensen's alpha are employed for the analysis of the constructed portfolios.

1.3. Purpose

The purpose of this study is to evaluate and compare the old and new foundations' management policy of the City of Göteborg. We further attempt to determine if the new policy would benefit the City more than the old one and give suggestions and recommendations about how the asset management policy can be improved.

This study attempts to generate some insights into the investment management process under very specific investment objectives. The pure bonds and stocks portfolios in the new policy are designed to achieve value growth of the foundations assets. This objective is analogous to most mutual funds management; therefore similar performance measures can be applied. For the mixed portfolio, the main aim is to attain a certain level of dividend income, therefore an important issue here is to examine whether the dividends provided mainly from the mixed portfolio and the additional minor dividend returns from the two pure portfolios would satisfy the City's requirements.

Moreover, the capital returns and dividend incomes from the old and the new policies are compared, and the benefits from introducing the new policy are evaluated. Thus the purpose of this master thesis is to explore the fields of asset management under very specific investment objectives and constraints, portfolio performance and management incentive schemes, and examine the links and interdependence between them. This is empirically investigated and demonstrated through the case of the City of Göteborg in order to provide further insights and better understanding of the raised issues.

1.4. Outline

The following chapter presents a literature review in order to give the reader an idea about the most important and relevant issues concerning portfolio theory, asset allocation, market efficiency and the principal-agent theory. Based on the different studies and theories described the study is performed, the outcomes are evaluated and meaningful suggestions and conclusions are drawn. Chaper 3 consists of a description of the data used to perform the empirical study taking into consideration the different requirements in the new policy description and the methodology with which the empirical study has been approached. The specially designed methods applied to perform the study are described in detail in chapter 4. Analysis and comparison of the new and old policies, as well as the relevant management problems, empirical evaluation of the policies' performance and limitations of the study are presented in chapter 5. The final conclusions and recommendations are drawn in the last chapter 6.

2. Literature Review

In the following sections we review and present different literature researches, studies and theories, which give insights into the basics of portfolio theory, asset allocation, market efficiency and principal-agency theory. We find this necessary as those theoretical ideas and empirical results are used in order to perform our study, evaluate the outcomes, draw conclusions and relate those to the literature.

2.1. Modern Portfolio Theory

Modern portfolio theory was developed by Harry Markowitz during the 1950s. The leading perception before Markowitz' breakthrough was represented by John Burr Williams, in his book "The Theory of Investment Value", stating that the value of a stock should be thought of as the present value of its future dividends. Markowitz extended this theory to value a stock according to the present value of its expected future dividends (Markowitz, 1952). He also pointed out that investors care both about risk and return, therefore he tried to find an optimal portfolio by minimizing its variance and taking as a constraint the required expected return. By doing this he came to two conclusions, first that it is not possible to pick a single optimal portfolio and only a set of efficient portfolios can be found. By efficient is meant the portfolios with the lowest possible risk for each potential level of return. The second conclusion was that the risk that is important for investors measures how much the return of a portfolio of risky assets fluctuates, known as systematic/undiversifiable risk.

The next stage in the development of the portfolio theory was to include a risk-less asset. Motivated by Keynes' theory of liquidity preferences, Tobin developed this idea in 1958. Tobin discovered that the set of efficient risk-return combinations was a straight line. He also found that an efficient portfolio of both risky and risk-less assets can be achieved by combining two portfolios, one consisting only of risky assets and another one of the risk-less asset. This discovery simplified the portfolio selection and Tobin found that the same portfolio of risky assets is appropriate for everyone. The only thing that varies between investors is how much funds they invest in the risky and in the risk-less assets. However, this does not solve the problem of choosing which specific stocks to include in the portfolio and in what proportions (Tobin, 1958).

Sharpe (1963) simplified this process by introducing an approach known as the market model or single factor model. In this model it is assumed that the return on each asset is linearly related to an index. The motivation for this is that most of the time stock returns move together, therefore it is natural to believe that a single factor determines most of the cross-sectional variations in returns. The linear relationship can be estimated by least squares and the estimated coefficients are used to construct the covariances, which in turn are used to construct the optimal portfolios.

Markowitz portfolio theory is simplified in the sense that it just includes the mean return and variance of the portfolio. The original Markowitz approach to portfolio optimization is as well a static one. Metron (1971) introduced the notion of dynamic portfolio management, arguing that means and variances of returns are not constant over time and investment strategies should reflect any changes in the market conditions.

Other researchers such as Kraus and Litzenberger (1976) offered an alternative portfolio theory by including other moments that might more precisely describe the distribution of portfolio returns. In their paper "Skewness Preferences and the Valuation of Risky Assets", they extend the Capital Asset Pricing Model (CAPM) to include the effect of skewness when evaluating the return of the portfolio. They present empirical evidence that is consistent with a three moment valuation model, were investors are found to have preferences for positive skewness and have an aversion to variance. Fama (1970) also introduced a multi-period solution, however, he found that the behavior of the consumers in the multi-period problem is indistinguishable from that of a risk avert consumer in the single period problem.

The separation theorem has also received a lot of attention in the literature. It states that when a risk-less asset is available the optimal portfolio of risky assets is independent of the investor's preference for variance and expected return (Elton, Gruber, 1997). According to Elton and Gruber (1997) this has some important implications. First, the portfolio problem could be declared as finding the portfolio that is tangent to the risk-less asset line in the efficient frontier space. This tangency portfolio maximizes the ratio of expected return minus the return on the risk-less asset to the standard deviation. The separation theorem also leads to a mutual fund theorem, which implies that by mixing two mutual funds, one consisting of the risk-less asset and another one of the tangency portfolio, investors can find their optimal portfolio.

To sum up, Markowitz portfolio theory has been the leading theory despite that it has been criticized a lot and other theories have been developed. Elton and Gruber (1997) believe that there are two reasons for this. First, there is no evidence that the selected portfolio using the mean variance theory would be more advantageous by including more moments. Second the mean variance theory is well developed and is also the most widely used and known theory.

Thus in constructing the portfolios in the empirical part of this study, the essentials of the mean-variance technique developed by Markowitz are used in order to identify the optimal portfolios, which involves utilizing the expected returns, variances and covariances of the individual investment opportunities. The static nature of the mean-variance technique is also addressed by employing a dynamic application, which takes into consideration that market conditions and investment opportunities change over time. This is done by applying a stock selection procedure and rebalancing and adjusting the weights for the portfolios every year.

2.2. Asset Allocation

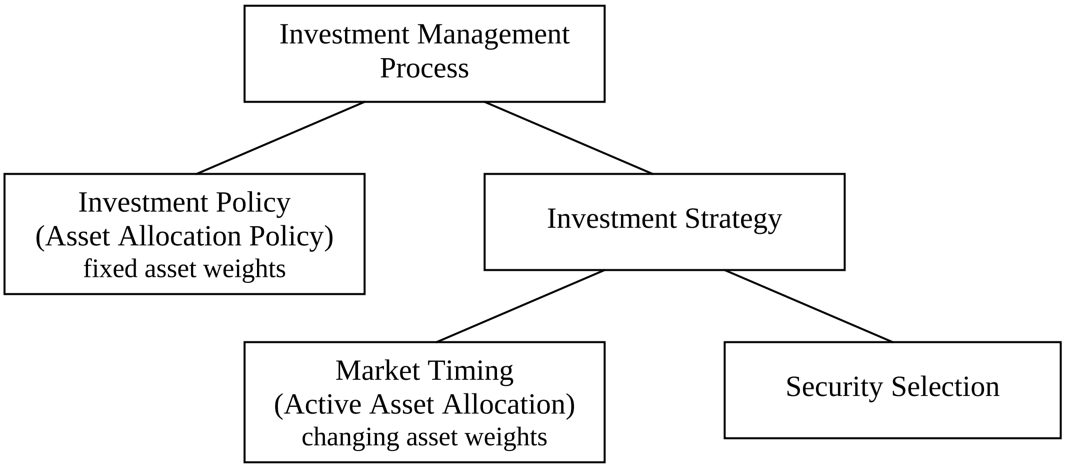
The main change in the new investment policy of the City of Göteborg is the asset allocation mix of the portfolios. Thus, we examine previous researches and studies about the relevant importance of the asset allocation policy on the portfolios' performance. Moreover, the asset allocation mix can either be held constant over the investment horizon or can be periodically adjusted. Therefore, we provide insights into the choice between static and dynamic asset allocation. We further examine the different asset allocation strategies and determine which one will suit better the City's objectives and needs.

2.2.1. The Importance of the Asset Allocation Decision

The asset allocation decisions represent a crucial part of the portfolio management process. Asset allocation entails determining in which asset classes to invest and what proportion of the risky portfolio should be invested in the different asset classes (equity securities, fixed income securities and cash). The asset allocation strategy is mainly guided by the investment policy which specifies the investor's objectives, constraints and investment guidelines. Therefore, the investment policy is a fundamental determinant of the future long-term investment decisions.

There has been considerable amount of research and studies aimed at examining the effect of asset allocation on investment performance. Some of the breakthroughs in the area are the Brinson studies (Brinson, Hood, Beebower, BHB, 1986; Brinson, Singer, Beebower, BSB, 1991). Both studies presented a framework that can be used to decompose portfolio returns. The purpose was to attribute returns to the activities/investment decisions composing the investment management process and in such a way to determine the contribution of each activity to the total return of the investment portfolio. The investment management process was separated into three main activities – investment policy (asset allocation policy), market timing (active asset allocation), and security selection. The last two investment decisions represent the investment strategy. Moreover, what the authors mean by asset allocation policy is the establishment of long-term allocations among asset classes that do not change over the investment horizon and market timing represents any change in asset class weights from the policy mix in order to take advantage of new investment opportunities.

Figure 1. The Investment Management Process



The methodology of the Brinson studies was to regress each fund's total return on its investment policy returns. Then R^2 values were reported for the regressions from each fund and the average return, median, and distribution of these results were examined. In the first paper, BHB studied quarterly returns from 91 large U.S. pension funds over the 1974-83 period. In the second one, BSB studied quarterly returns from 82 large U.S. pension funds over the 1977-1987 period. The average R^2 values from the regressions were 93.6 and 91.5 percent, reported in the first and second study respectively. These results inferred that more than 90 percent of the variation in total fund returns is explained by the fund's asset allocation mix. Thus, the authors concluded that it was difficult to find positive explanatory relations between performance and investment behavior and furthermore, the extra returns seemed to be unrelated to the level of active management.

The Brinson studies have provoked a lot of discussions and debates on the importance of asset allocation. Ever since many studies have been performed and many opinions have been stated, both supporting and criticizing the Brinson studies' results, and mostly their interpretation. A well known research supporting the Brinson studies was performed by Ibbotson and Kaplan (2000). They examined 10 years (1988-98) of monthly returns from 94 U.S. balanced mutual funds and 5 years of quarterly returns from 58 pension funds. The authors used a similar methodology to that from the Brinson studies. The analysis of both the mutual and pension funds data resulted in R^2 values of 81.4 percent and 88.0 percent respectively, which confirms the Brinson studies' results.

Table 1. Comparison of Time-Series Regression Studies

Measure	Brinson 1986	Brinson 1991	Mutual Funds	Pension Funds
Average R^2	93.6%	91.5%	81.4%	88.0%
Average Annual Active Return	- 1.10%	- 0.08%	- 0.27%	- 0.44%

In addition, Ibbotson and Kaplan examined how much of the variation in returns among different funds is explained by the differences in their asset allocation. In order to compare the funds with each other, they performed cross-sectional analysis. The results showed that for mutual funds 40 percent and for pension funds 35 percent of the variation of returns across funds was due to their specific asset allocation policies, while the rest of the variation was explained by other factors, such as market timing, security selection, and fees.

Another important issue to point out is that the Brinson studies found that asset allocation policy explains approximately 90 percent of the variability in return level, not 90 percent of the return level itself as it has been mistakenly thought by many investors. Ibbotson and Kaplan addressed this question and found that for a single fund asset allocation explains slightly more than 100 percent of the average fund's level of return. This result is further confirmed by Sharpe (1991), who suggested that the average return before cost for all investors in the market cannot be greater than the return on the market. Thus, the average actively managed portfolio must underperform the average passively managed portfolio (the market). This implicitly implies that the asset allocation policy would contribute on average to more than 100 percent of the fund return.

William Jahnke (1997) was one of the authors who criticized the results, the interpretation and the application of the Brinson studies by individual investors. First of all, he pointed out that what investors are really concerned about is not the volatility of returns but rather the likely returns they can acquire over the investment horizon. Second, Jahnke argued that the Brinson studies misinterpret the relative importance of asset allocation on portfolio volatility because they report the variation in portfolio returns by using the returns variance, whereas the standard deviation is the most appropriate measure as it operates in the same units of measurement as return. Third, since the Brinson studies were directed to large tax-exempted, institutionally managed portfolios, they didn't consider any costs. According to Jahnke, the issue of cost is much more important to individual investors and could turn out to be the most important contributor to the portfolios' performance. Based on all these flaws in the Brinson studies, Jahnke concluded that they give the wrong advice by implicitly suggesting that asset allocation policy in terms of determining fixed asset weights is more important than either market timing or stock selection. As investor's circumstances and investment opportunities change over time, the idea that long-term fixed asset weights should be set doesn't go a long way.

The same issues were addressed by Tokat, Wicas, Kinniry (2006). They discussed that the Brinson studies' approach may indicate that the return volatility of two funds with the same asset mix is explained primarily by their asset allocation. However, what this methodology doesn't reveal is that these funds may have very different total returns, which can be a result from active management. Furthermore, 20 years after the first Brinson study was published, one of his authors, Hood (2005) gave further insights into the ideas and purpose of the paper. According to him there is no doubt that asset allocation is an important determinant of portfolio performance and the study never suggested that active asset management is irrelevant. As the investment goals and opportunities change, asset allocation should be viewed as a dynamic process, rather than a static one. Furthermore, active management decisions (market timing and security selection) can be as important and noteworthy as the asset allocation decision (Hensel, Ezra, Ilkiw, 1991).

2.2.2. Static vs. Dynamic Asset Allocation

There has been a lot of debate whether an asset allocation policy should be static or dynamic, that is whether the asset weights should be kept fixed over the investment horizon or should be constantly adjusted. One of the first authors to criticize static asset allocation was Jahnke (1997), stating that it rarely reflects the investor's specific circumstances of long-term goals. Other authors have suggested that the asset allocation should be seen as a dynamic process taking into consideration changing capital market conditions and investment opportunities (Tokat, Wicas, Kinniry, 2006).

Initially Jahnke (1997) noted that static asset allocation is usually based on historical returns, which are unreliable predictors of future long-run returns. Thus, keeping fixed asset weights prevents taking advantage of new investment opportunities. More recently, Jahnke (2004) argued that the notion of static asset allocation is based on the assumption that asset class returns follow a random walk, that is consequent returns can be generated by a stochastic process with a stable mean and standard deviation and the resulting return values are independent, identically and normally distributed. However, empirical research has shown that returns are not normally distributed but their distributions have "fat tails," which is a result of instability in the return-generating process due to market bubbles or changes in expectations for example (Jahnke, 2004). Jahnke further suggested that the variation in return expectations can be consistent with market efficiency but it can as well imply that the market is inefficient. Therefore, believing in efficient markets or not won't go a long way in supporting the static asset allocation decision.[1]

Static asset allocation has been favoured, because it is easy to implement and works well in situations where asset class returns are well behaved. However, in the long run this approach would fail to identify and react to market bubbles (Jahnke, 2004). Therefore, dynamic asset allocation is a better and more reliable approach.

[1] More detailed discussion of the Efficient Market Hypothesis is presented in section 2.4.

2.2.3. Asset Allocation Strategies

As discussed in the previous sections, the asset allocation mix is an important determinant of the portfolio's performance. William Sharpe (1987) introduced a general method for determining asset allocation, referred to as ***integrated asset allocation***. He argued that the traditional asset allocation approaches – strategic, tactical, and insured – can be seen as special cases of the more general integrated asset allocation.

The major steps involved in the integrated asset allocation process, as defined by Sharpe, are presented in Figure 2. The first step is to analyze the capital market conditions (*C1*) and the investor's current net worth (*I1*, defined as assets less liabilities). Based on these factors the expected returns, risks and correlations for the considered asset classes are derived (*C3*) and the investor's current tolerance to risk[2] is determined (*I3*). The results for *C3* can be achieved by using methods such as constructing an efficient frontier of the portfolio with optimal risk-return combinations.[3] Whereas the information contained in *I3* is essentially captured by the investor's asset investment policy and guidelines.

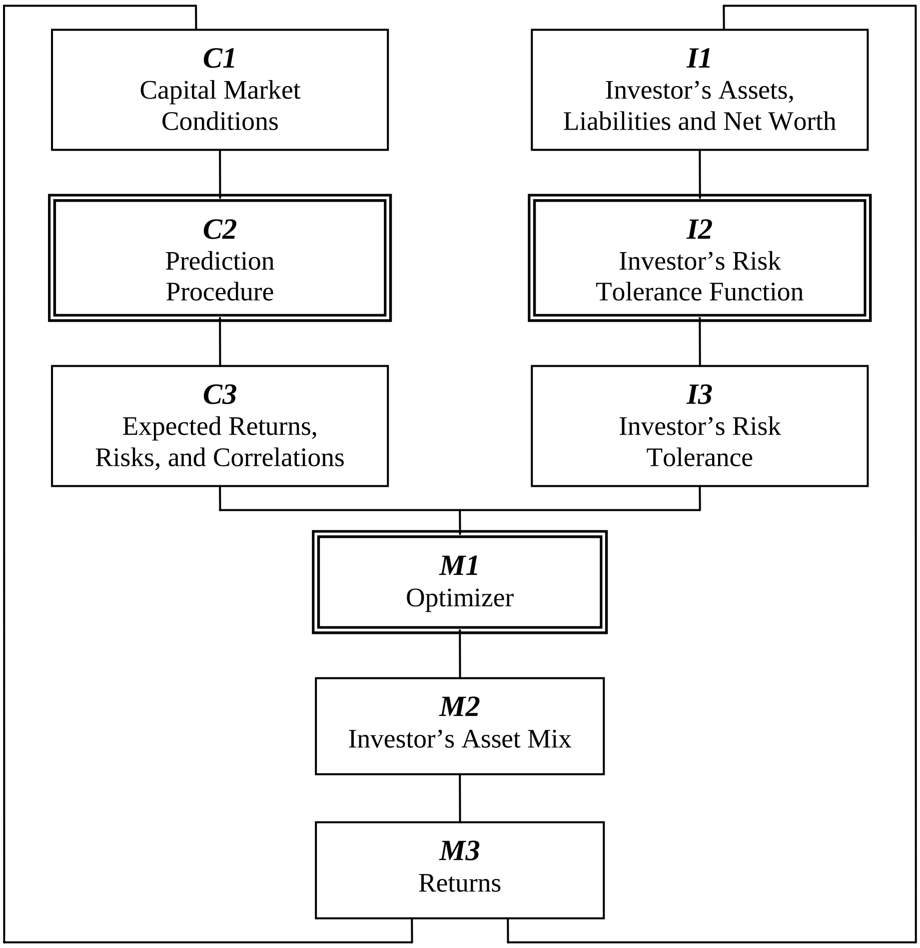
The second step in the integrated asset allocation process is to combine the information on the capital market and investor's requirements and use an "optimizer" to determine the best asset mix. By optimizer Sharpe denotes any decision rule, mathematical function or computer program, used to select the optimal portfolio for the particular investor under the given market circumstances.

After achieving the portfolio's actual returns (*M3*), they can be compared to the expected performance, which is the final step in the integrated asset allocation process. Sharpe notes that decisions taken in one period would affect those taken the next period as the returns in one period would influence the investor's net worth in the beginning of the next period. Thus, based on the last period's returns and changes in the capital market conditions and investor's circumstances, the manager will incorporate the new information in the optimization process for next period. That should be done having in mind that the prediction procedures (*C2*), risk

[2] Risk tolerance here is a function of the investor's specific way of thinking and his/her personal characteristics, such as age, family status, wealth, insurance coverage, savings and income.
[3] Constructing efficient frontiers is a method we utilize and it is described in detail in section 4.1.

tolerance function (*I2*), and optimizing method (*M1*) should not be changed over time[4]. Then the optimal portfolio will be adjusted in order to reflect that new information. This is shown by the "feedback loops" from *M3* to *C1* and *I1*, showing that portfolio management is a continuous and dynamic process.

Figure 2. Integrated Asset Allocation



Source: Sharpe, William F. (Sep/Oct. 1987), "Integrated Asset Allocation," *Financial Analysts Journal*, Vol. 43, Issue 5, pp.25-32

Further Sharpe described the three basic asset allocation approaches – strategic, tactical and insured, which focus on situations where only asset classes are considered and liabilities equal zero. The ***strategic asset allocation*** determines the long-term investment policy specifying how much of the fund's assets should be invested across the different asset classes. This is

[4] The boxes containing these factors are highlighted in Figure 2.

usually achieved by applying techniques such as Monte Carlo simulation or efficient frontiers on historical data in order to generate possible returns and risk level outcomes. Based on these results the manager chooses the most appropriate asset allocation mix. Sharpe clarified that this approach differs from a simple buy-and-hold strategy because it requires periodic rebalancing of a portfolio and adjusting to the chosen asset weights. Once the asset allocation mix is established, the manager doesn't take into consideration any temporary changes in the capital market conditions or investor's circumstances. Therefore, strategic asset allocation can be seen as a specific case of the integrated asset allocation, where new capital market conditions (*C1*) don't influence the risk and return predictions (*C3*) and new circumstances (*I1*) don't influence the investor's relative attitude to risk. This can be represented in Figure 2, by omitting boxes *C2* and *I2*. Thus, the strategic asset allocation approach is not designed to beat the market but rather to accomplish an organization's long-term funding goals, for instance covering pension funds liabilities (Anson, 2004).

Conversely to the strategic asset allocation approach, the ***tactical asset allocation*** does take into consideration the changing market conditions by frequently adjusting the asset class weights. However, it still assumes that the investor's relative risk tolerance remains constant over time, which can be shown by omitting box *I2* from Figure 2. Since asset mix tactical changes are driven by changes in the risk and return predictions, the tactical asset allocation is often based on the ground of mean reversion (Reilly, Brown, 2002). The idea is that regardless a security's return in the near past, it will eventually revert to its long-term mean value. Consequently tactical asset allocation is contrarian in nature (Sharpe, 1987), implying that an investor will always be buying an asset class that is undervalued according to his/her perception, and selling the asset classes with the highest market value.[5] Thus tactical asset allocation implicitly assumes that markets overreact to information, implying market inefficiency.

The last asset allocation strategy that Sharpe describes is the ***insured asset allocation***. Under this approach the investor's objectives and constraints change as his/her wealth changes, whereas the market conditions are expected to remain relatively constant over time. In the perspective of integrated asset allocation, insured asset allocation can be described by Figure

[5] The notion of contrarian strategies and efficient markets is further developed in section 2.3.

2 with box *C2* missing. Often, insured asset allocation strategies involve only a risky and riskless asset and make frequent adjustments to the portfolio allocation determined by the surplus of the current value of an investor's net worth over a specified floor. In case asset values will decline below the floor, nothing will be invested in the risky asset.

Thus, the integrated asset allocation and the other three approaches differ solely by the perceived variability in the capital market conditions and the investor's circumstances. If investor's objectives, risk tolerance and investment constraints, as well as the market conditions are relatively constant, strategic asset allocation should be used. Alternatively, whenever it is presumed that the investor's circumstances or market conditions are subject to change, respectively tactical or insured asset allocation strategies should be used. However, the integrated asset allocation is an approach that considers the effects and influences of all possible new alterations that can occur and updates regularly the portfolio mix to reflect those changes. Therefore, we consider that integrated asset allocation would be best to implement for managing the City of Göteborg's foundations.

2.3. Efficient Market Hypothesis

Portfolio theory provides guidance for investors to build up their portfolios. However, how to rebalance and hold the portfolio is another important issue discussed in the literature, where the Efficient Market Hypothesis (EMH) is one of the most significant classical theories.

The EMH is a fairly simple statement that the prices of securities instantaneously and fully reflect all available relevant information (Fama, 1990). Compared to the assumptions of a perfect market, the EMH is much less restrictive because all the conditions for a perfect market to exist, i.e. no transaction costs, priceless information and uniform application of current information, are sufficient for EMH but not necessary (Fama, 1970). This illustrates that we can still have an efficient capital market with the existence of transaction costs, costly information, imperfect competition or even investors' diverse preferences, which are not necessarily sources of market inefficiency. Therefore, the EMH indicates that the buy-and-hold strategy is the best choice for investors since no one can outperform the market by active management of portfolios. As an investor, like the City of Göteborg, a belief in the EMH will lead to a passive investment policy, such as buying and holding a certain index on the Swedish market. Most investors wouldn't adopt such a strategy.

A lot of research and studies have been devoted to test the validity of the EMH on real market data and have presented contradictory results. However, anomalous evidence can be due either to market inefficiency or to misspecification of the asset pricing models based on the EMH assumptions, which is known as the joint-hypothesis problem. Fama (1970) pointed out that there is extensive evidence in support of the efficient markets model, however "we can only test whether information is properly reflected in prices in the context of a pricing model that defined the meaning of properly." In this aspect, the Efficient Market Hypothesis cannot be absolutely verified.

Nevertheless, the faith in market efficiency is attenuated by various empirical results which seem to be conflicting with the neoclassical theory asset-pricing models from the 1970s. These anomalous results can be classified into two groups. The first group of abnormalities results from the correlations between stocks returns and their cross-sectional characteristics. Keim (1983) discovered a negative relationship between the abnormal returns and the size of the companies by examining the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX) common stocks. This relationship is referred to as the size effect. Reinganum (1983) found that the size effect of returns is exceedingly apparent in the beginning of the year, more specifically, in the first days of January, known as the January effect. The weekend effect is another anomaly resulting from the abnormal return on Mondays.

Nearly at the same time when the size effect was discovered, another anomaly, the value effect, was derived by statistical data. The results revealed that the stocks of firms having high earnings-to-price (E/P) ratios, gained higher risk-adjusted returns than the stocks of lower E/P firms. Moreover, the size effect nearly disappeared for returns of stocks with higher E/P ratios (Basu, 1983). DeBondt and Thaler (1985) disclosed that the stocks with lower returns in the last three to five years seem to have higher returns today than the ones with higher returns in the past three to five years, which is called "contrarian" effect. Comparably, Jegadeesh and Titman (1993) discovered that stocks with higher returns in the near past surpassed those with lower returns, which is called "continuation" or "momentum" effect.

The other group of abnormalities results from the time-series correlation with returns. A great deal of apparent evidence discloses some irregular relationships, like the negative correlation between the common stock returns and the expected inflation rate (Fama, Schwert, 1977), the positive connection between the expected stock risk-premium and the predicted level of volatility (French, Schwert, Stambaugh, 1987) and the relationships between the stocks returns' time-series variation, the book-to-market ratio (B/M) and the dividend yields (Kothari, Shanken, 1997). One of the most notable long-run abnormal returns anomalies is known as the Initial Public Offerings (IPOs) anomaly. The abundant statistical evidence shows that the post-IPO stocks have a poor long-run performance (Loughran, Ritter, 1995).

There are a lot of studies and research in support of the EMH. Fama (1990) reviewed various literatures about anomalies and their impact on market efficiency. He suggested that the short-term abnormal variation of expected returns through time is economically insignificant. Besides that, the long-term anomalous bubbles in stock prices are too ambiguous to be distinguished from rational time-varying expected returns. Fama (1998) concentrated on the long-term return anomalies which are more challenging to the market efficiency. He believed that the over- and under-reaction anomalies are just a chance effect because they happened most often which is consistent with the EMH. The same explanation works well on post-event continuation and post-event reversal[6]. Due to the joint-hypothesis problem, he classified the long-term return anomalies as a "bad-model" problem rather than market inefficiency as they tend to weaken or disappear with suitable models.

Schwert (2002) made progress to review the evidence and explanations of most of the anomalies. He found that most anomalies of predictable differences in returns across asset types can either be explained by the three-factor characterization of Fama and French (1993) or seem to be substantially attenuated after being published. The anomaly of the time-series predictability of return is more likely to be simply an evidence of time-varying equilibrium than a contradiction with market efficiency. Schwert and Fama indicated that these various anomalies are more apparent and arbitrage opportunities will cause them to vanish, which might make the market more efficient.

[6] Sometimes, after one "event", the stock price continues growing (declining) as it was, but sometime, after that "event", the stock price changes its moving trend.

Since the beginning of the 90s, different specifications of asset pricing models have been proposed to capture excess returns. The standard CAMP model is questioned with substantial abnormal returns. The three-factors model (Fama, French 1993) is one of the most successful models. It manages to explain most of the anomalies, such as the size effect, the value effect and certain level of the over-reaction behavior. Moreover, a multi-asset-classes model based on Sharpe's style investment theory (Sharpe, 1992) also shed a light on capturing mutual funds' risk-adjusted returns.

2.4. Dividends and Stock Returns

Among all the investment strategy literature based on anomalies, the Dividend Yield strategy is one of the widely used strategies for investors. The strategy involves investing an equal of dollar amount in each of the ten stock of the Dow Jones Industrial Average with the highest dividend yields. A lot studies have been designed to find the correlation between stock returns and dividend yields, where dividends are reported as a percentage of the stock price (Dividends/Stock Price), or to find how dividend ratios can be used to predict equity premiums.

Pioneers in this area, such as Walter (1956) and Black and Scholes (1974) have questioned the relationship between dividend yields and common stock prices, showing that there is no, or only marginal, evidence supporting a positive relationship between dividend yields and stock returns. Fama and French (1988) studied stocks on the NYSE during the period 1927-1986 and using holding periods from one month to four years. They found that this correlation depends on the return horizons. Measured by the R^2 of the regression, the dividend yields explained less than five percent of the variation in monthly or quarterly stock returns; however, they captured more than 25% in two to four year horizons. Furthermore, Grant (1995) also reported a positive relationship between dividend yields and stock returns, but believed that due to the relatively low risk level of high dividend yield stocks, returns of high dividend yield stocks would fall with time.

There are two contradictory hypotheses whether higher anticipated dividend yields earn higher risk-adjusted returns: the tax-effect hypothesis and the dividend-neutrality hypothesis. Proposed by Brennan (1970), the tax-effect hypothesis states that investors receive higher risk-adjusted returns on stocks with higher expected dividend yields to compensate for the past higher taxation of dividend income as compared to capital gains. In contrast, the dividend-neutrality hypothesis, first introduced by Black and Scholes (1974) claims that in the situation of a positive relation between dividend yields and stock returns, indicating that investors require higher returns for holding higher dividend yield stocks, companies would adjust their dividend policy to restrict the amount of dividend payments to lower their capital cost and increase the share price. In the opposite situation, market equilibrium can also be reached by value maximizing behavior from the corporations. As a result, no predictable relation between anticipated dividend yields and risk-adjusted stock returns should be found in a market in equilibrium.

The results of more recent studies are also contradictory. Naranjo, Nimalendren and Ryngaert (1998) employed an improved measure of a common stock's annualized dividend yields and various specifications of multifactor asset pricing models on the NYSE stock returns from 1963 to 1994. They demonstrated that risk-adjusted returns are positively related to dividend yield and the yield effect is too large to be explained by a ''tax penalty'' on dividend income or other previously documented anomalies. Nevertheless, no ability of dividend yields to predict equity premium[7] is found in the research of Goyal and Welch (2003). They applied a recursive residuals graphical approach on time-series data of the CRSP[8] value-weighted index from 1926 to 2002. In only two of the years, 1973 and 1974, the dividend ratios seemed to have a predictive ability in equity premium. They also argued that this is mostly due to the increasing persistence of the decline/increase trend of the dividend-price ratio.

Dividend yield strategy, as one of the value investment strategies, has been in existence for a long time. William Rukeyser (1996), in the "Your Money" segment of the CNN Business Day, said that this strategy consists of investing an equal dollar amount in each of the ten stocks of the Dow Jones Industrial Average with the highest dividend yields. With annual rebalancing, the portfolio return over time has exceeded that of Dow. However, the dividend yield strategy doesn't seem to be effective in the British market between 1984 and 1994 (Filbeck, Visscher 1997), as the portfolio returns exceeded the market returns in only four years.

[7] The equity premium in their paper is defined as the return on the stock market minus the return on a short-term risk-free Treasury bill.
[8] Center for Research in Security Prices (CRSP).

2.5. Principal-Agent Theory

Another important theoretical framework in investment management is the principal-agent theory, involving evaluating the optimal incentive contracts with the managers. As all agency relationships, the problem between asset managers (agents) and fund owners[9] (principals) occurs from the existence of asymmetric information. The investor cannot observe all the actions of the asset manager, which is referred to as the hidden action problem. The manager is induced to construct a portfolio which is optimal in terms of his or her own welfare, while the investor wants that choice to be optimal in terms of the investor's interests. Moreover, the uncertainty about the distribution of the portfolio's total returns makes this problem more complicated. Most of the time the outcome of the manager's work can be fairly observed and can be used to infer the underlying stochastic process of stock returns. Therefore, the investors would attempt to set up incentive compensation contracts, which will motivate the managers to take actions in the investor's best interest. The discussion of the optimal form of incentive contracts has gained much attention in the literature.

Cohen and Starks (1998) employed "the assumptions of the CAPM model and of estimation risk concerning beta to develop a model in which portfolio managers can, though effort, choose the parameters of the beta distribution" on the common linear contract[10] between managers and investors. They concluded that under the moral hazard problem[11], the risk tolerance relationship between managers and investors is a crucial factor in the selection of portfolio mangers and usually the principal would prefer a less risk averse agent than himself. However, no first best optimal linear contract exists. Furthermore, Stoughton (1993) investigated the significance of the nonlinear contracts, especially the impact on the incentives for managers to collect information. They pointed out that there is a serious lack of effort by the managers working under linear incentive contracts, whereas the use of quadratic contracts can solve this problem to a certain extend.

On the other hand, there are extensive studies evaluating the incentive schemes of mutual funds' managers. The empirical results from examining the contracts of the Canadian equity

[9] In this case, the foundations' assets are managed but not owned by the City of Göteborg.

[10] Under linear contracts, the manager's compensation is determined as a linear relationship with the portfolio returns.

[11] The moral hazard problem occurs in situations with hidden action where the redistribution of risk leads to changing the agent's/manager's behavior. The moral hazard problem is widely discussed in the literature in relation with insurance contracts.

mutual funds managers, attained by Berkowitz and Kotowitz (1993), suggest that a compensation scheme based on the market value of the assets generates superior performance on average. Thus, the incentives offered with asset-based compensation schemes result in outperforming the market which more than compensates the investor for the management fees. Chevalier and Ellison (1997) analyzed the managers' responses to the asset-value based incentive schemes using 839 cases (including 398 different funds) from Morningstar and CRSP in the period 1982-1992. They reported certain "window-dressing" behavior from the mutual fund managers, that many of them do alter the risk of their portfolios at the end of the year in a manner consistent with their incentives.

Although there has been extensive research on the first best incentive contract, the discussion on optimal incentive schemes has still not come to a common agreement. Both linear and non-linear contracts have been proved to be effective in solving the moral hazard problem. For the case of the City of Göteborg, the real incentive for their portfolio managers is the long-term significant relationship with the City, in other words, the threat of firing mangers if the needs and requirements are not met. Thus, keeping the City as an important client and a fixed management fee seem to be strong enough incentives for the managers (financial institutions, investment banks) to work for the City's best interests.

2.6. Passive vs. Active Management

The City uses the services of financial institutions for managing the foundations' assets. Alternatively, the City could choose to manage the assets passively by investing in a market index. Therefore, we provide insights in the choice between active and passive management.[12]

Passive management doesn't involve particular estimation of the future performance of the asset classes in which it will be invested. The most popular strategy for passive management of portfolios is indexing, which is constructing of a portfolio so that it will mirror the performance of a predetermined index (Fabozzi, 1993). The disadvantage of this strategy is that matching an index does not necessarily guarantee the optimal performance of the portfolio; neither does it guarantee that the investor's return objectives will be met. Moreover, the asset manager will not be able to take advantage of investment opportunities in the stock and bonds market sectors that are not included in the index.

On the other hand, active strategies can be employed, which involve forecasting of future returns, dividends/coupon payments, and other performance measures. Active asset managers attempt to outperform a passive benchmark portfolio, that is a passive portfolio with characteristics matching the risk-return objectives of the investor. Thus managers that utilize active strategies essentially believe that the market is not perfectly efficient (Reilly, Brown, 2002).

Sorensen, Miller and Keith (1998) studied the performance of pension funds associated with various degrees of managerial skill for the 1985-1997 period in order to analyze the trade-off faced in deciding how much to index. First they noted that the most important skill to be considered is the manager's stock-picking skill, since even mediocre stock-picking skills were significantly influencing the portfolio's performance as compared to passively managed portfolio's performance. Second, their results showed that the optimal allocation to indexing declines as managerial skill increases. However, Sorensen, Miller and Keith argued as well

[12] Besides the basic active and passive portfolio management, there are a lot of strategies that fall in between these extremes, for example, core-plus strategy or immunization for bond portfolios. However, the specifics of the different portfolio management strategies fall beyond the scope of this paper. Our main purpose here is to determine if it is necessary for the City of Göteborg to manage the foundations' assets actively by using the services of asst managers (banks). It should be noted that even if the City hires asset managers, the asset managers themselves could choose to manage the assets passively, rather than actively.

that some indexing is appropriate for funds in most risk objective classes. They also pointed out that even though investors are considered passive when they decide to index, in essence their investment decision is an active one, since it involves their disbelief in the ability of asset stock pickers and their estimation of the costs of active management.

Other authors like Carhart (1997) demonstrated that common factors in stock returns and the persistent differences in mutual funds investment costs account for almost all the predictability in mutual funds mean and risk-adjusted returns, implying that the managers' stock-pinking stills are not reflected in the performance of the mutual funds. Furthermore, Tokat, Wicas and Kinniry (2006) studied the choice between active and passive management stressing that the ultimate contribution of active management should be possibility to increase the returns or decrease the risk of a portfolio. They found that, on average, active management decreases the returns and increases the volatility of a portfolio, as compared to indexing. They did recognize though that active management could create opportunities for outperforming the predetermined index. Therefore, they suggested that there should be a strong belief in choosing appropriate asset manager able to deliver higher risk-adjusted returns, or alternatively investors should rather focus on broadly diversified, low-cost portfolios with limited market timing.

In the end, the choice comes down to a trade-off between the low cost and less attractive alternative of passive management, or the higher cost and potentially higher returns achieved by active management. Clearly most studies have identified that portfolio returns for actively managed funds are slightly less than what could have been achieved if the manager strictly maintained the target asset allocation. This proves that it can be challenging to improve portfolio returns by market timing (changing the fixed target asset weights) and to select undervalued securities in very efficiently priced markets. In the case of the City of Göteborg the best choice is to use the services of financial institutions (corporate and investment banks) to manage the foundations' assets. This choice is not induced by a belief or disbelief in the efficiency of the market, but rather by the specific risk-return requirements the City has, that make it particularly hard and inappropriate to use a passive management strategy, like indexing.

3. Methodology and Data Description

When evaluating and comparing the old and new investment policies for the foundations, as well as when determining if the new policy is more beneficial for the City of Göteborg than the old one, this study employs a mix of secondary and primary data. The secondary data is mainly data from academic journals, books, financial reports, web sites and data bases. The books and academic articles were chosen on the basis of the relevance to the study, focusing on researching modern portfolio theory, asset allocation and management, the efficient market hypothesis, dividends-returns relationships and the principal-agent theory. We relied on articles by well-known authors in the fields of fund management and performance evaluation, such as Markowitz, Sharpe, Jensen and Fama, whose names are widely known and cited in most books. The theoretical ideas and empirical results presented in these articles and books are used to perform our study, evaluate the outcomes and draw conclusions. However, there are limitations in the use of the secondary data, since little research has been done before in this specific area of asset management (investment management of foundations under specific investment objectives and constraints). There is a lot of research done in the areas concerning risk and return, portfolio optimization and investment management. A lot of data about foundations is also available; however, this information mostly concerns the accounting principles and legal aspects, rather than investment techniques and performance evaluation measures.

The old investment policy is analyzed and its performance is evaluated by collecting historical data in the sample period from 2001 to 2005, since the available data for this period is more accurate and complete. The sources that are used are the monthly reports from the different asset managers, as well as the annual reports from the City of Göteborg. The obtained data includes monthly returns, market values of the foundations, asset allocation between stocks and bonds, and yearly dividend/coupon returns, which are reported per asset manager.

The available data on the new investment policy is only for a few months, since it started operating on the 15th August 2006. Therefore, an accurate and trustworthy comparison between the old and new policy cannot be performed. To be able to obtain reliable results in the comparison we construct portfolios taking into consideration the new investment policy requirements. In total, there are five constructed portfolios based on historical data in the same sample period 2001-2005: a pure bonds and a pure stocks portfolio without dividend target restriction, a pure bonds and a pure stocks portfolio with dividend target, and the last two are then used for the construction of the mixed portfolio.

In order to construct the portfolios data on historical bonds and stocks prices is collected from the database Datastream, which are the official closing price values unaffected by dividend returns. Datastream uses the latest price available on the market, quoted in the primary units of currency (which is SEK in this case). Further, dividend/coupon returns are obtained from Datastream as well, where the dividend yield is expressed as a percentage of the share price and is based on the anticipated annual dividend excluding special or once-off dividends. An important matter in constructing the portfolios is that it can be invested only in stocks listed on the A- and O-lists of the Stockholm Stock Exchange (SSE). The information about which particular stocks are included in those lists can be found on SSE’s Statistics and Analysis webpage. The data on the particular stocks included in the lists is downloaded for each year in the sample period, since stocks may drop off the lists, disappear in case a company experiences a merger or goes into bankruptcy, and in certain occasions stocks are placed from one list to the other.

Additional requirements for the bonds’ selection are that they are listed on the Swedish fixed income market or are under The Swedish Financial Supervisory. Besides that, under the new investment policy the average duration for the bonds can be at maximum 2.5 years. Therefore, yearly duration is obtained from Datastream, where the duration is the weighted average of the times that interest payments and the final principal payment are received.

The main reason for using weekly stocks and bonds prices is that more observations in a sample will give a more accurate result. On the other hand, the weekly prices might not reflect all price fluctuations during the year. Therefore when choosing stocks and bonds to include in the portfolios, the criteria is that the annual return should be higher than inflation, since annual prices are expected to reflect more accurately what happened during the year. The yearly inflation rate in Sweden is obtained from the webpage of the Official Swedish Statistics Bureau. Moreover, indices’ prices used in the analysis, as well as three moths Swedish Treasury bill rates are retrieved from Datastream.

Nevertheless, there will be a bias in the long run when using historical stock prices, because past performance of stock prices gives no reliable indication for future performance. In the short run, however, the best prediction of the stock price one period ahead is the stock price received yesterday.

After importing the data on stocks and bonds prices, and dividend returns from Datastream all stocks and bonds with incomplete information were deleted, as well as those that did not match the ethical requirements. The weekly returns for the bonds and stocks are calculated based on the following formula:

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

The optimal portfolios are the ones for which the Sharpe's ratio is maximized. In order to calculate the ratio, the risk-free rate is used, which in this case is the 90 days Swedish Treasury Bill rate. This rate is converted to a weekly based rate according to the formula:

$$R_{fW} = \left(1 + R_{fA}\right)^{1/52} - 1$$

where R_{fW} is risk-free rate stated on a weekly basis, and R_{fA} is risk-free rate stated on an annual basis

The performance of the constructed portfolios is evaluated by comparing them to a benchmark. For the constructed stocks portfolio the benchmark is the SIXPRX, which shows the average development on the SSE's A- and O-lists. The SIXPRX includes dividend returns and is adjusted for the placement limitations that apply to equity funds. The benchmark for the constructed bonds portfolio consists of 50% OMRX T-bill and 50% OMRX T-bond. The OMRX T-bill is a reference index for the government's long-term loans, and the OMRX T-bond is a reference index for short-term fixed income securities. Both indices are issued by the Swedish National Debt Office.

In addition, a telephone interview was conducted with a portfolio manager at SEB, who is correctly responsible for managing the mixed portfolio. The purpose of the interview was to get a clearer idea about their investment process and criteria for selecting specific stocks and bonds and the asset allocation mix between them. Furthermore, we had excess to the offer made by SEB for the management of the foundations under the new policy, as well as the offers made by the other managers which have provided us with better understanding of their investment process.

To find out about investment management policies with similar objectives as the City of Göteborg, information on the websites of different cities in Sweden was researched, e-mails were sent to the responsible departments and eventually phone interviews were carried out. The main questions asked concerned the investment policy they used for managing their foundations' assets, the foundations' market value, the achieved capital and dividend/coupon return, and if the investment requirements and objectives were achieved, which would imply a good performance of the investment policy.

4. Analytical Framework

One of the main objectives of this paper is to evaluate the performance of the old and the new asset management policy in order to determine if the new policy would benefit the City of Göteborg. We further provide suggestions and recommendations how the policy can be improved. Under the old policy there were on average 5 portfolios managed by one manager each. The asset allocation guidelines that were established were that the placements in equity and fixed income securities could vary between 40-60%. The main difference in the new policy is that there are only 3 portfolios administered by asset managers, where the portfolios are clearly separated by the type of asset allocation. The pure stocks and pure bonds portfolio each amount to 30% of the foundations value. The mixed portfolio amounts to 40% of the foundations assets and the proportion of equity to fixed income securities in it can vary within 0-100%.

Due to the different asset allocation rules the portfolios' returns from the old and the new policy are not directly comparable. Therefore, we decided to evaluate the new asset management policy by constructing pure stocks, pure bonds and mixed portfolio based on historical data for a period of 5 years (2000-2004) and on the City's requirements under the new policy. By doing this we are able to compare the total results from all the portfolios under the old policy with the results that could be achieved if the new policy were in effect at that time period. Moreover, we would be able to compare the mixed portfolios' performance for both policies. In this section we describe the theoretical models and methodology we have used in constructing and evaluating the three portfolios under the guidelines of the new investment policy.

It should be noted that all portfolios were subject to the same ethical requirements, according to which it is not allowed to invest in equity or fixed income securities of companies whose main business is the production and/or sale of weapons, alcohol, tobacco, pornographic products or commercial game activities. Furthermore, only investments in companies that follow the requirements stated in the international conventions signed by Sweden are permitted.

4.1. Equity Portfolio Management

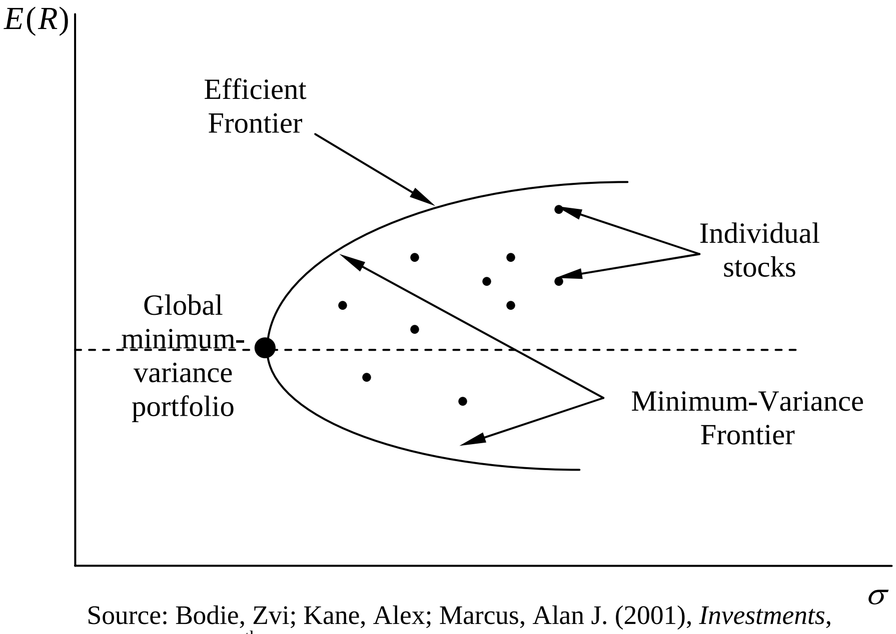
4.1.1. The Basics of Optimal Risky Portfolios

As discussed before, Markowitz (1952) was the one to lay the foundations of modern portfolio theory by introducing a mean-variance portfolio selection model. This model represents one of the most important parts of portfolio management, namely identifying the opportunity set of optimal portfolios constructed of different risky assets.

In constructing an optimal portfolio it is not only necessary to select individual stocks with the required risk-return characteristics. It is as well essential to consider the correlations among the investment opportunities in different stocks in order to determine their optimal weights. Generally, the risk-return opportunities available to the investor can be summarized by the minimum-variance frontier, which represents a graph of the lowest possible portfolio variance that can be achieved by holding a portfolio with given expected return (Bodie, Kane, Marcus, 2001). The minimum-variance frontier is presented in Figure 3, where the dots to the right of the minimum-variance frontier represent individual securities.[13] This implies that a portfolio consisting of a single stock is inefficient and diversifying the investment between different stocks will result in higher portfolio returns and lower standard deviations.

[13] When short selling is not allowed, it is possible for individual securities to lie on the frontier. In this case the security with the highest return lies on the frontier and investing everything in it is the only way to obtain that high of return. Since the security lies on the frontier, it would as well have the minimum variance for that level of return. However, if short selling is not allowed or not feasible then there can be portfolios with the same expected return as that of the particular security, but with lower variance. Such a portfolio is expected to have short positions in low-expected-return securities (Bodie, Kane, Marcus, 2001).

Figure 3. Minimum-Variance Frontier



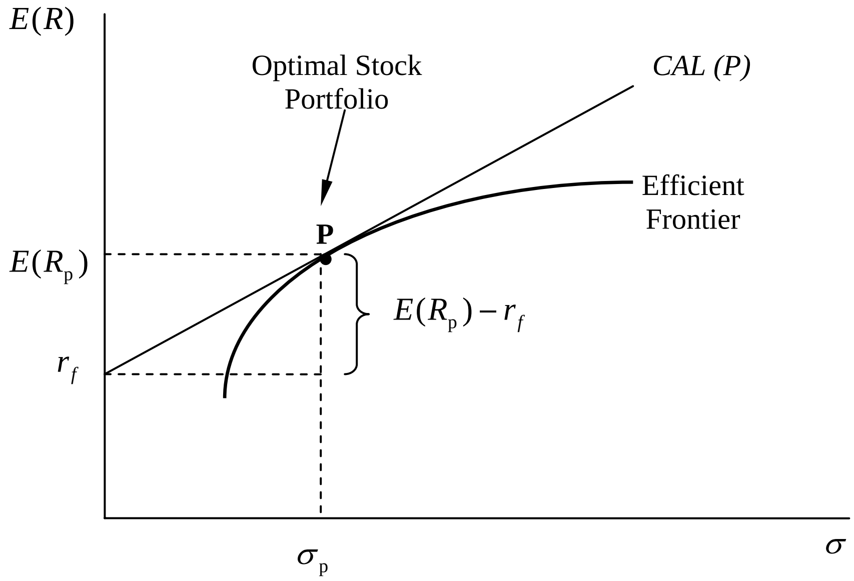
Source: Bodie, Zvi; Kane, Alex; Marcus, Alan J. (2001), *Investments*, 4th ed., Boston, Mass.: McGraw-Hill/Irwin

It can be easily noted that for every portfolio lying on the part of the minimum-variance frontier that is bellow the global minimum-variance portfolio, there is a portfolio with the same level of risk but higher expected return. Therefore, only the portfolios that are above the minimum-variance portfolio can be optimal portfolios and they form the efficient frontier.[14]

The capital allocation line (CAL) is a line with an intercept equal to the risk-free rate and summarises possible investment opportunity combinations in the risky stock portfolio and in short-term T-bills. The optimal portfolio will be the one that maximizes the slope of the CAL, which occurs at the point where the CAL is tangent to the efficient frontier (Figure 4). This is as well the CAL with the steepest slope, where the slope is equal to the expected excess return (over the risk free rate) divided by the standard deviation.

[14] For more details on opportunity set of securities (or risky assets in general), efficient frontiers and risk diversification, we recommend the reader to refer to Bodie, Kane, Marcus, *Investments*, 2001; Reilly, Brown, *Investment Analysis and Portfolio Management*, 2002; and Ross, Westerfield, Jaffe, *Corporate Finance*,2005. Here we give a very brief description of those notions only to introduce the reader to the basics behind the methodology we apply in constructing the portfolio. Most of the information in this section is based on the sources named above.

Figure 4. Optimal Portfolio



Source: Bodie, Zvi; Kane, Alex; Marcus, Alan J. (2001), *Investments,* 4th ed., Boston, Mass.: McGraw-Hill/Irwin

The slope of the CAL is called the return-to-variability ratio, but nowadays it is more widely known as the Sharpe's ratio, named after Sharpe who introduced this measure for portfolio performance evaluation (Sharpe, 1966). Mathematically the Sharpe's ratio can be expressed as:

$$S_p = \frac{E(R_p) - r_f}{\sigma_p}$$

Thus, under mean-variance portfolio theory, the objective is to maximize the slope of the CAL, equivalently to maximize the Sharpe's ratio. A manager who manages a portfolio actively would be expected to achieve a CAL that is steeper than the CAL achieved under passive portfolio management. It is worth noticing that a passive strategy involves investing in short-term T-bills and in a portfolio of stocks that mirrors a broad market index. Such kind of strategy can be represented by a specific CAL, the well-known capital market line (CML).

4.1.2. Portfolio Construction

In this section we describe in detail the main procedures and methodology we have followed in constructing the pure stock portfolio. To briefly summarize the process, first we choose stocks according to the set criteria, then their return characteristics are calculated (expected returns, variances, and covariances). Next the optimal stock portfolio is determined and the weights to be invested in each stock are computed. The set of stocks in the optimal portfolio and the weights in each stock (as of year t) are used as determinants for constructing the investment in the following year ($t+1$). Finally, the properties of the constructed portfolio (achieved capital gains, standard deviation, and dividend return) are calculated in order to be compared with the actual results from the old investment policy.

Step 1 Selection of the Sample of Stocks. The particular stocks to be included in the portfolio were selected according to the City's objectives and requirements specified in the new asset management policy, namely:

- *Investment Constraints.* Investments are only allowed to be made in stocks and equity indexes listed on the A- and O-lists of the SSE.
- *Return Objectives.* The primary return objective of the pure stocks portfolio is value growth. The implication here is that the City of Göteborg seeks to at least maintain the purchasing power of their investment, if not increase it. Since the minimum requirement is to hold the value of the foundations' assets intact, we chose the stocks with nominal annual rate of return at least higher than the inflation rate in each year.
- *Risk Tolerance.* It is not allowed to invest in each particular stock more than 10% of the total stock holdings. Moreover, no more than 20% of the stock holdings can be invested in the O-list, whereas the minimum that must be invested in the A-list is 80% of the total equity holdings. The portfolio should be diversified between stocks of companies in different industry branches.

It should be noted that due to the City's requirement about the percentages to be invested in the A- and O-list and due to the very large number of stocks that were selected, we made a simplifying assumption. We assumed that exactly 20% of the pure stocks portfolio will be invested in the O-list and exactly 80% in the A-list.[15] Thus we essentially constructed two optimal pure stock portfolios, one consisting of stocks listed on the A-list and one consisting of stocks listed on the O-list. Then the investment in those portfolios was weighted by 0.8 and 0.2 respectively to form the whole pure stock portfolio. The construction of the two portfolios, followed the same methodology, therefore here we present the general template of the model.

The model was built by using excel, therefore most of the calculations are performed with functions in Excel.[16] We provide the basic formulas behind all calculations in order to give deeper insight into the portfolio management process. Moreover, here we represent a very basic example with very few stocks only to illustrate the procedure. In fact the number of stocks included in the portfolio should be more than 10; this comes as a result from the City's requirement that investment in an individual stock should represent at most 10% of the total stock portfolio. Thus in case there are less than 10 stocks, it would be impossible to have only 10% invested in all of them.

Step 2 Descriptive Statistics. The average return and standard deviation of return for each stock are calculated by using the standard formulas, where $R_{i,w}$ represents the return for stock *i* in week *w* and the set of stocks contains *n* stocks.

Table 2. Descriptive Statistics

	A	B	C
1	Name	Std. Dev.	Mean
2	Stock 1	σ_1	R_1
3	Stock 2	σ_2	R_2
4	Stock 3	σ_3	R_3
5	Stock 4	σ_4	R_4
6	Stock 5	σ_5	R_5

$$\overline{R_i} = \frac{\sum_{i=1}^{n} R_{i,w}}{n}$$

$$\sigma_i = \sqrt{\frac{\sum_{i=1}^{n}\left(R_{i,w} - \overline{R_i}\right)^2}{n}}$$

[15] The main problem in constructing only one portfolio with all stocks (both in A- and O-list), was that Excel can handle a limited amount of numbers that can be entered. A single spreadsheet has only 256 columns, whereas the stocks only in the O-list in certain years have exceeded 150.

[16] We built this model on the basis of a spreadsheet model represented in Bodie, Kane, Marcus, (2001), *Investments*, used to evaluate the impact of international diversification, where the Markowitz portfolio optimizing technique was utilized by using Excel and data on the stock indexes of seven countries over the period 1980-1993.

Step 3 Covariance and Correlation Matrixes. We used Excel for calculating the Correlation Matrix and then found the Covariance Matrix as shown in the table bellow.

$$\mathrm{Cov}(R_i, R_j) = \frac{\sum_{i,j=1}^{n} \left(R_{i,w} - \overline{R_i}\right)\left(R_{j,w} - \overline{R_j}\right)}{n^2} \qquad \mathrm{Corr}(R_i, R_j) = \frac{\mathrm{Cov}(R_i, R_j)}{\sigma_i \sigma_j}$$

Table 3. Correlation and Covariance Matrix

continues from Table 2

	A	B	C	D	E	F
9	Correlation Matrix					
10	Name	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5
11	Stock 1	1.000000	0.157452	0.267419	0.274076	0.293372
12	Stock 2	0.157452	1.000000	0.228606	0.212197	0.127426
13	Stock 3	0.267419	0.228606	1.000000	0.991022	0.737958
14	Stock 4	0.274076	0.212197	0.991022	1.000000	0.736265
15	Stock 5	0.293372	0.127426	0.737958	0.736265	1.000000
16						
17	Covariance Matrix					
18	Name	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5
19	Stock 1	B2*B2*B11	B3*B2*C11	B4*B2*D11	B5*B2*E11	B6*B2*F11
20	Stock 2	B2*B3*B12	B3*B3*C12	B4*B3*D12	B5*B3*E12	B6*B3*F12
21	Stock 3	B2*B4*B13	B3*B4*C13	B4*B4*D13	B5*B4*E13	B6*B4*F13
22	Stock 4	B2*B5*B14	B3*B5*C14	B4*B5*D14	B5*B5*E14	B6*B5*F14
23	Stock 5	B2*B6*B15	B3*B6*C15	B4*B6*D15	B5*B6*E15	B6*B6*F15

Step 4 Procedure. In order to build the efficient frontier we proceed with constructing Table 4, which basically represents calculation of the portfolio variance. Each sell contains the product of the weights of two stocks and their covariance. The sum of all those products results in the portfolio variance. The general formula for the portfolio variance is:

$$\sigma_{\mathrm{p}}^2 = \sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i,j=1}^{n} w_i w_j \mathrm{Cov}(R_i, R_j)$$

where w_i represents the proportion of the portfolio invested in stock *i*.

Thus far only the formulas for calculating the portfolio variance have been set, however, the optimal weights to invest in each stock need to be determined.[17] We first start by setting equal

[17] The formula for calculating the optimal weights in a portfolio with two securities is quite cumbersome:

$$w_1 = \frac{\left(\overline{R_1} - r_f\right)\sigma_2^2 - \left(\overline{R_2} - r_f\right)\mathrm{Cov}(R_1, R_2)}{\left(\overline{R_1} - r_f\right)\sigma_2^2 + \left(\overline{R_2} - r_f\right)\sigma_1^2 - \left(\overline{R_1} - r_f + \overline{R_2} - r_f\right)\mathrm{Cov}(R_1, R_2)} \quad \text{and} \quad w_2 = 1 - w_1$$

Thus Excel eases out the calculations significantly.

weights for all stocks and in this case each stock's weight would be $1/5 = 0.2$. Using these weights the portfolio variance and mean return are calculated. The formula for the portfolio mean return is $\overline{R_p} = \sum_{i=1}^{n} w_i \overline{R_i}$.

Table 4. Portfolio Variance and Mean Return

continues from Table 3

	A	B	C	D	E	F
25	Procedure					
26	Name	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5
27	Weights	A28	A29	A30	A31	A32
28	0.200000	B27*B19*A28	C27*C19*A28	D27*D19*A28	E27*E19*A28	F27*F19*A28
29	0.200000	B27*B20*A29	C27*C20*A29	D27*D20*A29	E27*E20*A29	F27*F20*A29
30	0.200000	B27*B21*A30	C27*C21*A30	D27*D21*A30	E27*E21*A30	F27*F21*A30
31	0.200000	B27*B22*A31	C27*C22*A31	D27*D22*A31	E27*E22*A31	F27*F22*A31
32	0.200000	B27*B23*A32	C27*C23*A32	D27*D23*A32	E27*E23*A32	F27*F23*A32
33	SUM(A28:A32)	SUM(B28:B32)	SUM(C28:C32)	SUM(D28:D32)	SUM(E28:E32)	SUM(F28:F32)
34	Portfolio Variance	SUM(B33:F33)				
35	Portfolio Std.Dev.	SQRT(B34)				
36	Portfolio Mean	A28*C2+A29*C3+A30*C4+A31*C5+A32*C6				

The Excel Solver is used in order to compute the points along the efficient frontier. In the Solver we set the objective function to minimize the variance of the portfolio (B34). Then the input range of the variables that need to be calculated is set. In our case, we want to calculate the optimal portfolio weights which minimize the portfolio variance. Thus the cells that we need the Solver to calculate are A28-A32. Finally, the necessary constraints should be entered. Those are that the sum of the weights should equal to 1, and each stock's weight should be no more than 10%. Moreover, we have assumed different short selling strategies for constructing the portfolio consisting of stocks on the A-list, and the portfolio consisting of stocks on the O-list. Due to the City's risk tolerance requirements, investing in the O-list is considered riskier and therefore no more than 20% of the total stock portfolio can be invested in the O-list. Therefore, we do not allow short selling in the investment in stocks listed on the O-list. Thus, the set constraints are:

$$\sum_{i=1}^{n} w_i = 1 \qquad \text{(A33 = 1)}$$

$$-0.1 \le w_i \le 0.1 \qquad \text{(for A-list portfolio)}$$

$$0 \le w_i \le 0.1 \qquad \text{(for O-list portfolio)}$$

The final constraint that has to be set is that the portfolio mean return (B36) equals a target mean return. In order to generate the entire efficient frontier, we keep changing the target mean return, usually setting it to values around the mean return attained by the equally-weighted portfolio. Every time that we set a different mean return value, the Solver recalculates the weights and the portfolio variance. When enough risk-return points have been generated, the efficient frontier can be built. Still the optimal portfolio remains to be determined. This is done by calculating the Sharpe's ratio, according to the formula mentioned before and as it is shown in Table 5.

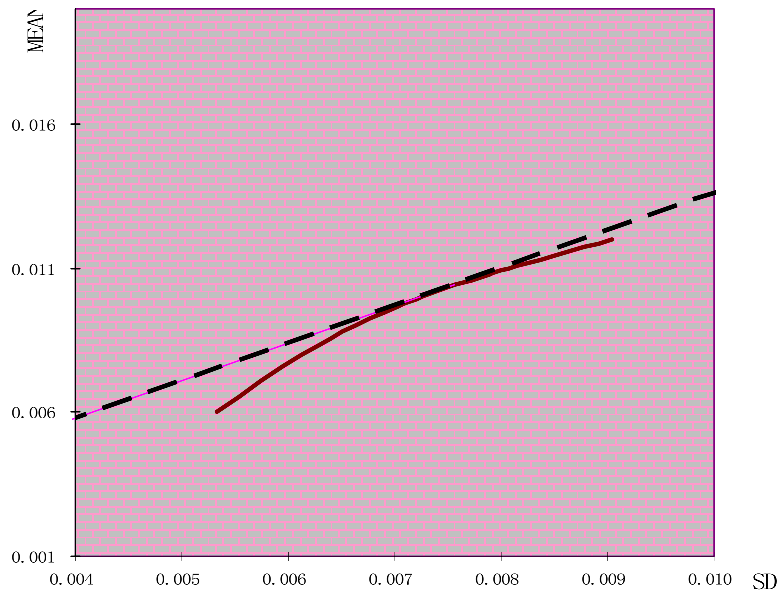
$$S_p = \left(\overline{R_p} - r_f\right) / \sigma_p$$

Table 5. Construction of the Efficient Frontier

	A	B	C	D	E
1	Risk Free Rate		0.000573		
2					
3	Portfolio Variance	Portfolio Std.Dev.	Portfolio Mean	Sharpe's Ratio	Sharpe's Ratio Calculation
4	0.000028	0.005331	0.006000	1.018099	(C4-C1)/B4
5	0.000037	0.006117	0.008000	1.214132	(C5-C1)/B5
6	0.000044	0.006635	0.009000	1.270183	(C6-C1)/B6
7	0.000051	0.007124	0.009800	1.295328	(C7-C1)/B7
8	0.000053	0.007263	0.010000	1.298000	(C8-C1)/B8
9	0.000055	0.007410	0.010200	1.299277	(C9-C1)/B9
10	0.000057	0.007564	0.010400	1.299278	(C10-C1)/B10
11	0.000060	0.007725	0.010600	1.298013	(C11-C1)/B11
12	0.000062	0.007894	0.010800	1.295594	(C12-C1)/B12
13	0.000065	0.008070	0.011000	1.292160	(C13-C1)/B13
14	0.000082	0.009046	0.012000	1.263261	(C14-C1)/B14
15				1.299278	MAX(D4:D14)

The optimal portfolio is the one that maximizes the Sharpe's ratio. After identifying the mean return for the optimal portfolio, we go back and recalculate the optimal weights by setting the portfolio mean return in the formula equal to the optimal portfolio mean return.

Figure 5. Efficient Frontier



Step 5 Investment Next Year. So far we have determined the stocks to invest in and the optimal portfolio weights seen as of the end of the particular year (*t*). We set an investment horizon of one year after which the same procedure of stock selection and optimal weights determination will be conducted. The investment strategy we employ is to use the stock selection and optimal weights determined in year *t* as inputs for building a portfolio in year $(t+1)$. Thus we are essentially adopting a price momentum strategy[18] by assuming that the past stock price trends will continue in the same direction. It is clear that historical data is not a good predictor for future stock price behavior. However, there have been a lot of studies and research supporting the idea that funds and securities with high return last year have higher-than-average expected return next year, but not in the years thereafter (Carhart, 1997). That is to say that historical returns are good enough predictors of future return, at least in the short-run. Therefore we consider it appropriate to employing the above described strategy. In a real world situation of course, a manager could rebalance the portfolio and the investments more often than once a year. In any case the same general principle that we describe here can be utilized.

[18] This notion was already mentioned in part 2.3 in relation with the Efficient Market Hypothesis.

An important aspect of the investment process is that we rebalance the calculated optimal weights. This is done since almost always stocks drop out of the lists, or new stocks are included. There are certain cases, when companies merge or go out of business. Then a given proportion of the assets wouldn't be invested, sometimes this proportions can be very large. Therefore, we rebalance the weights to take into consideration the proportions that were to be invested in the missing stocks. This is done as shown in Table 6, the proportion to be invested in the missing stock 2, is distributed to the other stocks according to their original weights. Thus the new weight for stock 1 for example becomes $w_1 / \left(\sum_{i=1}^{5} w_i - w_2 \right)$, which is just the original weight divided by the sum of all "alive" stocks, that is the sum of all stocks excluding the missing one. The new weights calculated in that way are multiplied by 0.2, for the O-list portfolio, and 0.8, for the A-list portfolio, to account for the restriction on the amount allowed to be invested in them.

Table 6. Rebalancing of Portfolio Weights

	A	BD	BE	BF	BG	BH
1	Name	Weights	New Weights	Formulas	Weights*0,2	Formulas
2	Stock 1	0.040	0.067	BD2/BD7	0.013	BE2*0.2
3	Stock 2	0.400				
4	Stock 3	0.280	0.467	BD4/BD7	0.093	BE4*0.2
5	Stock 4	0.100	0.167	BD5/BD7	0.033	BE5*0.2
6	Stock 5	0.180	0.300	BD6/BD7	0.060	BE6*0.2
7		0.600	1.000	SUM(BE2:BE6)	0.200	SUM(BF2:BF6)
8		SUM(BD2,BD4:BD6)				

After rebalancing the weights as described we calculate the weekly and annual capital gains, the weekly returns standard deviation and the dividend return, gained from the investment in year $(t+1)$. The weekly return is calculated as the weighted average of the weekly returns for each stock. The annual return for each stock is calculated using the stock prices of the last trading day of last year (t) and of the investment year $(t+1)$, that is:

$$AR_{t+1} = \frac{P_{t+1} - P_t}{P_t}$$

Then the annual returns across stocks are weighted with the already calculated weights and summed to get the annual return for the portfolio.

The dividend return is calculated by using the dividend yields accounted for the last trading day in the investment year ($t+1$). This is done by considering that if over the year the investment was kept in a particular stock, the dividend recorded at the last trading day represents in the best way the dividend payments the investor has received over the year. Thus those values of the dividend returns are weighted to calculate the dividends received from investing in the portfolio. It should be noted however, that due to the fact that we allow short selling for the stock portfolio in the A-list, some of the weights are in effect negative. However, it is unreasonable to have negative weights for the dividend returns since even if the manager is short selling, it is not him/her that pays the dividend to the buyer, it's is the stock's company. Therefore, we have set the negative weights equal to zero, thus calculating only the dividend we actually get from the investment.

As noted before, there were actually two stock portfolios constructed, one with stocks in the A-list and another one with stocks in the O-list. To put those two together, we simply add the results for the weekly, annual and dividend returns from the two portfolios. We can do that since the proportions to be invested in each of the portfolios have already been taken account of when calculating the rebalanced weights. The standard deviation of the whole stock portfolio is calculated by using the sum of the weekly returns for the A- and O-list portfolios. Thus we have determined the pool of stocks to be invested in and their optimal weights, we have performed the actual investment and calculated all necessary variables to represent the results from the investment and be able to compare those results with what was actually achieved under the City's old policy.

4.2. Fixed Income Portfolio Management

The general idea behind constructing the bond portfolio is similar to that of the pure stocks portfolio, that is we select the bonds according to the requirements and constraints set by the City. Since the risk level related with bonds in general is much lower than that of stocks, we won't put too much attention to minimizing the portfolio's variance. However, we stress on the importance of the duration level. Thus after defining the investment pool of bonds and optimal weights (as of year t), we construct a portfolio in which to invest in the following year ($t+1$) and calculate the return characteristics of that portfolio.

Step 1 Selection of the Sample of Bonds. The particular bonds to be included in the portfolio were selected according to the City's objectives and requirements specified in the new asset management policy, namely:

- *Investment Constraints.* Investments are only allowed to be made in fixed income securities listed on the Stockholm Fixed Income Market and nominated in Swedish kronor (SEK).
- *Return Objectives.* The pure bonds portfolio, like the pure stocks portfolio also aims at achieving value growth. Therefore, we selected the bonds with nominal annual rate of return at least higher than the inflation rate in each year.
- *Risk Tolerance.* The interest rate risk of fixed income securities is allowed to vary between 0-5 years, with an average duration of 2.5. Therefore, we selected bonds with duration lower than 5. Credit risk is limited by only investing in fixed income securities with a minimum credit rating of A-/K1 with Standard & Poors and A3/P1 with Moody's.
- *Liquidity.* Investments are only allowed in fixed income securities with high liquidity. The bid price should be available on request and full liquidity should be received no later than two banking days after sale.

Moreover, since the City has low risk tolerance, we find it appropriate to select only bonds of banks, financial institutions or similar lower default-risk fixed income securities. Thus we have excluded all corporate bonds.

Step 2 Portfolio Weights and Returns. We determine the weights for each bond according to the annual returns, since the primary objective of this portfolio is value growth. The formula that we use for calculating the weights is:

$$w_1 = \frac{AR_{1,t}}{\sum_{i=1}^{n} AR_{i,t}}$$

where $AR_{i,t}$ is the annual return for bond i in year t, and n is the number of bonds

Those weights are then applied to the investment in next year. Thus the annual return obtained from investing in those bonds in the following year is calculated by multiplying the appropriate weights with the annual return in year $(t+1)$ as shown in Table 7. The weekly return from the investment is obtained in a similar way, by weighting the weekly returns for each bond and summing them up. Based on the portfolio's weekly return, the standard deviation is also calculated.

Table 7. Bond Portfolio Weights and Returns

	A	B	C	D	E
1	Bonds	AR (year *t*)	Return Weighted	AR (year *t*+1)	AR (*t*+1) Calculation
2	Bond 1	0.06032	B2/SUM(B2:B6)	-0.05606	C2*D2
3	Bond 2	0.14060	B3/SUM(B2:B6)	0.04449	C3*D3
4	Bond 3	0.05350	B4/SUM(B2:B6)	0.01644	C4*D4
5	Bond 4	0.09472	B5/SUM(B2:B6)	0.00484	C5*D5
6	Bond 5	0.04532	B6/SUM(B2:B6)	-0.02841	C6*D6
7	Average	AVERAGE(B2:B6)		Portfolio AR 2001	SUM(E2:E6)

AR = Annual Return

Step 3 Duration and Coupon Returns.

There are different interpretations of the concept of duration. First, the duration is the slope of the price-yield curve at the bond's current yield to maturity (Fabozzi, 2004). The interpretation of duration by the one who originally developed it, Macaulay, was that the duration is computed as a weighted average of the time (in years) until each coupon or principal payment is received (Bodie, Kane, Marcus, 2001). Still another view is that view is that seems to be most intuitive is that the duration is the approximate percentage change in price as a result of 1% change in yield (Fabozzi, 2004). No matter which definition will be considered, duration is one of the most important concepts in fixed-income portfolio management. It can be shown that bond price volatility is proportional to the bond's duration. Therefore, the duration can be seen as a measure of interest rate sensitivity. The duration of a portfolio is simply the weighted average of the durations of the bonds included in the portfolio. The calculation is presented in Table 8, where the formula can be expressed as:

$$\text{Portfolio Duration} = \sum_{i=1}^{n} w_i D_i \qquad \text{where } D_i \text{ is the duration for bond } i$$

Table 8. Duration and Coupon Returns

	A	C	D	E	F	G
1	Bonds	Return Weighted	Duration (*t*+1)	Price in year *t*	Coupon rate	Coupon Returns (*t*+1)
2	Bond 1	0.15291	4.1966	100.045	5.25%	100*F2/E2
3	Bond 2	0.35644	2.6918	66.864	0.00%	100*F3/E3
4	Bond 3	0.13563	3.1025	111.045	4.00%	100*F4/E4
5	Bond 4	0.24013	0	111.948	4.00%	100*F5/E5
6	Bond 5	0.11490	4.0584	109.738	6.50%	100*F6/E6
7	Average		C2*D2+C3*D3+C4*D4+C5*D5+C6*D6			C2*G2+C3*G3+C4*G4+C5*G5+C6*G6

We calculate the portfolio's coupon returns for year $(t+1)$ as the weighted average of the coupon returns for each bond, which are calculated according to the formula:

$$CR_{i,t+1} = \frac{100 * CY_{i,t+1}}{P_t}$$

where $CR_{i,t+1}$ is the coupon return for bond *i* in year *t* + 1, *CY* is the coupon rate and *P* is the bond's price

Thus we have determined the pool of bonds to be invested in and their optimal weights, we have performed the actual investment and calculated all necessary variables to be able to compare those results with what was actually achieved under the City's old policy.

4.3. Mixed Portfolio Management

The mixed portfolio consists of bonds and stocks, where the proportion that can be invested in each asset class varies from 0-100%. The most important issue here is to determine how much should be invested in bonds and how much in stocks in order to satisfy the City's return needs and requirements. Similar techniques for selecting the stocks and bonds are used as the ones for the pure portfolios. Determining the optimal stock and bond portfolios within the mixed portfolio is also carried out in analogous way. There are slight but important differences, however, that are outlined in more detail below. After the pool of stocks and bonds to be invested in is determined, as well as the optimal weights for each security (as of year *t*), we go forward to determine what share of the total portfolio should be invested in each of the asset classes. Finally we calculate what would have been the return characteristics if this asset allocation mix was used in order to invest in the following year ($t+1$).

Step 1 Selection of the Sample of Bonds. The particular stocks and bonds to be included in the portfolio were selected according to the City's objectives and requirements specified in the new asset management policy, namely:

– *Investment Constraints.* The same investment constraints as those for the pure stocks and pure bonds portfolios apply.
– *Return Objectives.* The mixed portfolio does not focus on preserving the real value of the assets intact; rather it aims at achieving a particular level of dividend returns and coupon payments (5%). Therefore, we selected those stocks having nominal annual return higher than inflation[19] and dividend yield in the range of 3-7%. Bonds were chosen only according to the return criteria that their coupon payment rates are higher than 0%.
– *Risk Tolerance and Liquidity.* The risk and liquidity requirements remain the same as those for the pure portfolios.

[19] It should be noted that in years 2001-2002, due to the market crush after September 11th, 2001, there were relatively few stocks with nominal annual returns higher than inflation, therefore for those years we selected the stocks only according to the dividend return requirement. This applies only for those years and for the mixed portfolio.

Step 2 Determining the Optimal Stock Portfolio within the Mixed Portfolio. As discussed above, the main difference in constructing the optimal portfolio here is the way the stocks are selected. The methodology of optimizing the portfolio by creating an efficient frontier remains the same. After the optimal weight for each stock is determined, the average weekly return, the dividend proceeds and standard deviation of the portfolio are calculated. Based on these weights it is again invested in the following year and the return characteristics of the portfolio are calculated.

Step 3 Determining the Optimal Bond Portfolio within the Mixed Portfolio. The main difference in constructing the bond portfolio here is again the selection of the bonds. However, due to fact that the main objective is to obtain a given level of coupon payments, it is more appropriate to weight each bond according to the coupon rates, that is appoint a higher weight for a bond that received higher coupon. This calculation is illustrated in Table 9, where the formula that we use for calculating the weights is:

$$w_1 = \frac{CY_{1,t}}{\sum_{i=1}^{n} CY_{i,t}}$$

where $CY_{i,t}$ is the coupon rate for bond *i* in year *t*, and *n* is the number of bonds

Table 9. Bond Portfolio Weights

	A	C	D
52	Bonds	Coupon Rates	Coupon Weighted
53	Bond 1	6.00%	C53/C58
54	Bond 2	5.25%	C54/C58
55	Bond 3	5.50%	C55/C58
56	Bond 4	3.50%	C56/C58
57	Bond 5	5.00%	C57/C58
58	Sum	SUM(C53:C57)	

Those weights are then applied to the investment in next year. The same procedure as before is applied, by using the weights calculated in the way described above and the return characteristics of the portfolio are determined both in year *t*, and in year $t+1$, after the actual investment has occurred.

Step 4 Putting it all together. Thus we have constructed a new pure stocks and a new pure bonds portfolio, complying with the objectives and requirements of the mixed portfolio. The weekly returns for both portfolios as of year t are calculated as before, so are the standard deviation of the weekly returns (column K in Table 10), and the average of the weekly returns (H14 and I14). Then scenarios are constructed with different proportions to be invested in stocks and in bonds, and the portfolio weekly return and dividend or coupon payments are calculated for each scenario (column J and L respectively). The scenario with the optimal allocation between stocks and bonds is the one that maximizes the Sharpe's ratio (column M).

Table 10. Investment Scenarios

	G	H	I	J	K	L	M
1	Weights	Stocks	Bonds	Portfolio WR	Weekly Std Dev.	Dividends/Coupons	Sharpe's Ratio
2	Senario 1	1	1-H2	H14*H2+I14*I2	0.013844	H2*H16+I2*I16	(J2-L13)/K2
3	Senario 2	0.9	1-H3	H14*H3+I14*I3	0.012241	H3*H16+I3*I16	(J3-L13)/K3
4	Senario 3	0.8	1-H4	H14*H4+I14*I4	0.010661	H4*H16+I4*I16	(J4-L13)/K4
5	Senario 4	0.7	1-H5	H14*H5+I14*I5	0.009116	H5*H16+I5*I16	(J5-L13)/K5
6	Senario 5	0.6	1-H6	H14*H6+I14*I6	0.007626	H6*H16+I6*I16	(J6-L13)/K6
7	Senario 6	0.5	1-H7	H14*H7+I14*I7	0.006232	H7*H16+I7*I16	(J7-L13)/K7
8	Senario 7	0.4	1-H8	H14*H8+I14*I8	0.005013	H8*H16+I8*I16	(J8-L13)/K8
9	Senario 8	0.3	1-H9	H14*H9+I14*I9	0.004130	H9*H16+I9*I16	(J9-L13)/K9
10	Senario 9	0.2	1-H10	H14*H10+I14*I10	0.003822	H10*H16+I10*I16	(J10-L13)/K10
11	Senario 10	0.1	1-H11	H14*H11+I14*I11	0.004217	H11*H16+I11*I16	(J11-L13)/K11
12	Senario 11	0	1-H12	H14*H12+I14*I12	0.005155	H12*H16+I12*I16	(J12-L13)/K12
13		Stock Porfolio	Bond Portfolio		Risk-free rate	0.000573	MAX(M2:M12)
14	Average WR	0.007040	0.000072				
15	Std. Dev.	0.013844	0.005155		WR = weekly return		
16	Average DY	7.44%	5.30%		DY = dividend retrun/coupon payments		

After determining the optimal mix of stocks and bonds in the portfolio, this asset allocation is applied to the investment in year $t+1$ and the return characteristics of the investment are determined in the same way.

5. Empirical Study

In this section the old and new asset allocation policies are analyzed, the main differences between them are pointed out and the problems that have arisen are described. Further, the performance achieved under the old and new policies and the performance of the constructed portfolios are evaluated. Finally, the limitations of the study are outlined and some other cities' investment policies are analyzed in order to derive more ideas and suggestions that could be worth considering in the case of the City of Göteborg.

5.1. Analysis and Comparison of the Policies

According to the Swedish Foundation Law (1996:1220), a foundation's assets have been set aside by donor(s) to be managed separately and permanently in order to serve a specific purpose (Wijkström, 2004). The foundations can be either managed by an autonomous board or through the board of another institution. In the case of the City of Göteborg, the City has been delegated the responsibility for the administration of 126 foundations and for the accomplishment of their predetermined purposes.

In Sweden a foundation's returns can be tax-exempt if it is either a charitable foundation or if it is included in the "Catalogue," which contains institutions like the Nobel Foundation that have special tax privileges (Wijkström, 2004). The foundations that the City of Göteborg manages are charitable foundations, implying that their purpose is considered as a public good. Moreover, in order to be tax-exempt, about 80% of the foundations' income (which is dividend returns and coupon payments) over a five-year period should be distributed to fulfill specific "qualified" purposes. By qualified purposes is meant health care, allowances to libraries, museums and for other cultural needs, merit scholarships, and support for the needy.

The City of Göteborg uses the services of financial institutions (managers) to administer the foundations' assets by applying discretionary management (the asset manager decides about changes in the portfolios' holdings when it seems most suitable and in line with the requirements of the investment policy). Due to different incurred problems and unsatisfied needs under the old asset management policy, the City of Göteborg introduced a new investment policy that has been in effect since August 15th, 2006. A comparison of the two policies is presented in Table 11.

Table 11. Comparison of the Old and New Polices

		Old Policy	New Policy
Objectives	Capital Returns	Minimum requirement – keep the capital intact over the years.	
	Dividend Returns	Generate about 3% annual dividend/coupon returns to fulfill the foundations' needs.[1]	
Constraints	Liquidity	Price available on the market and full liquidity can be received within FIVE banking days.	Price available on the market and full liquidity can be received within TWO banking days.
	Horizon[2]	Median	Short term, usually one year
	Regulations	Strictly follow the ethical rules for investing.	
	Taxes	Returns are not taxed as long as the foundations distribute 80% of their dividend/coupon returns over a five-year period.	
	Equity Securities Selection	Share holdings should be placed on the SSE's A- and O-lists, or alternatively shares that will be listed on one of the lists. A minimum of 80% of the equity holdings have to be invested in stocks on the A-list and a maximum of 20% in stocks on the OTC and O-list. The market value for an individual stock is not permitted to exceed 10% of the total equity holdings on the A-list and 5% on the OTC-/O-list. A maximum of 20% of the total equity holdings could be invested on foreign exchanges, half of which should be placed in Europe.	
	Fixed Income Securities Selection	Placement is allowed in individual fixed income securities if they are listed on the Swedish fixed income market or in fixed income funds that are under The Swedish Financial Supervisory Authority. The interest rate risk in fixed income securities is permitted to vary between 0-5 years with an average duration of 2.5 years.	
Asset Mangers	Portfolios	Five asset managers on average, each of whom manages one portfolio.	Three asset managers, managing a pure stock portfolio, a fixed income portfolio, and a mixed portfolio.
	Asset Allocation	All mangers are required to invest 40-60% of the assets in stocks and the rest in fixed income securities.	Assets in the mixed portfolio can be invested from 0-100% in stocks, and the rest in fixed income securities.
	Compensation	Managers are paid by the percentage of the market value of the portfolio they manage as of the end of each year.	Managers are paid by a fixed amount each year. For the mixed portfolio manager, a 5% dividend or coupon return has to be reached.

1. The dividend/coupon returns are measured as a proportion of the market value for the foundations.
2. In the old policy, the foundations are assigned to different managers and usually the managers for particular foundations do not change over the long run. Therefore, the investment horizon can be considered to be longer than one year. However, in the new policy, the foundations' assets are pooled together and allocated between the managers according to the guidelines in the policy, that is 30% of the value of the assets as of the beginning of the year are invested in the stock portfolio, 30% in the bonds portfolio, and 40% in the mixed portfolio. Thus, the investment horizon is only one year.

There are several aspects in the old investment policy that haven't worked out well and have been a ground for changing the policy. First, since the investment guidelines for all managers were the same under the old policy, they could easily be compared with one another. This induced them to pay more attention to the performance of the other managers rather than to concentrate on their own performance.

Second, the foundations were assigned to specific managers, without large changes over the years. The dividend/coupon returns for each foundation would thus depend on the particular manager's skills. There was no criterion explicitly stated by the City on the choice of manager to be appointed to each specific foundation, which might have caused a conflict of the foundations' interests.

Third, the mangers' compensations in the old policy were determined as a percentage of the market value of the portfolio they managed as of the year-end, which largely motivated the managers to aim for higher capital gains rather than dividend/coupon returns.

Forth, each manager had his/her own evaluation methods and used different benchmark indices based on their particular investment strategy. Therefore the mangers results would depend on their particular investment strategy and benchmark. This made it more difficult for the City to follow their performance.

Fifth, all managers were requested to invest both in stocks and bonds, with a 40-60 percent allocation, which in reality could cause certain internal problems. Since the managers are usually financial institutions, like banks, the equity and fixed income investments are usually separately managed in different departments inside the bank. Therefore, the asset allocation decision between equity and fixed income securities involves how to separate the portfolio between departments rather than focusing on acquiring the best risk-adjusted returns. This internal management problem can seriously affect the risk level and portfolio performance. Nevertheless, all these potential problems can be best illustrated through the results from the empirical analysis.

5.2. Performance Evaluation

In this section we evaluate the performance of the old and new policies and of the portfolios we have constructed in order to bring up the problems that have occurred or potential problems that can occur in the future and to provide investment recommendations to solve the problems and achieve better results according to the requirements and needs of the City of Göteborg.

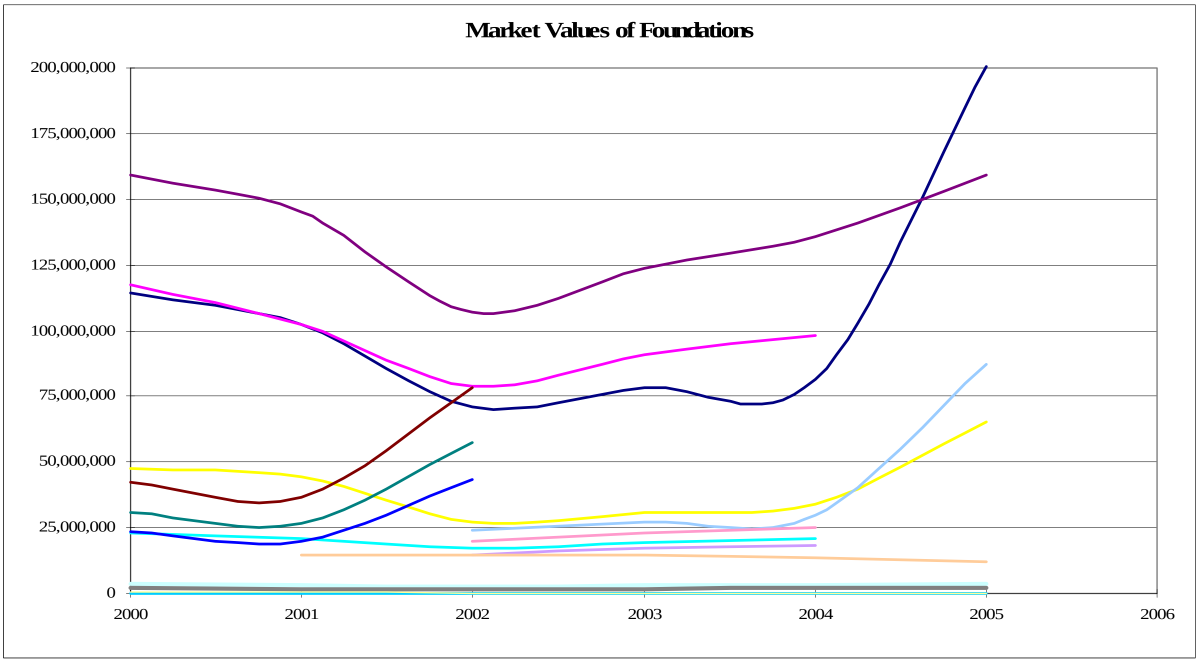
5.2.1. Old Policy Performance

A lot of studies and research have been directed to evaluating the performance of asset managers, such as the mutual, pension or hedge funds performance evaluation methods. Those techniques have been developed to not include many biased concepts, such as the assumption of the normal distributions of stock returns, or the “survivors” data selection bias. However, the key objective in our study is to evaluate if the policy can generate the best possible results according the particular foundations’ needs. These needs are the specific level of dividend/coupon returns and keeping the real value of the capital intact. Therefore, we focus on the total return as well as the dividend/coupon returns, instead of the risk-adjusted ones. The old policy performance evaluation is based on the sample period 2001-2005.

The market values of the different foundations are presented in Figure 6[20]. The values vary substantially across the foundations, due to the different sizes of the foundations. This makes it impossible to compare the market value for the different foundations. As mentioned above each manger is assigned one or more particular foundations, for example, Nordea was managing the assets for two large foundations, “Div don 3” and “Div Skolfonder,” while Enter was managing the assets for five small foundations. The declines in the market values of the foundations are mainly due to the distribution of funds for meeting the foundations’ objectives.

[20] For a more detailed version of the same figure, refer to Appendix I.

Figure 6. Market Values of the Foundations[21]



Since each manger was managing the assets of a different number and size of foundations, the total value of the managers' portfolios would vary. Because of the uneven size of the foundations, it is hard to find any obvious relationship or explanation about how the management of the foundations had been allocated to different managers. Moreover, because the total real capital returns are declining in these five years, the minimum management objective to keep the capital intact is not well met for these foundations (Table 12).

Table 12. Market Value per Manager

Market Value (SEK)	All Foundations	Nordea	SEB	ABN	Carnegie	Enter
2001 Jan	564,220,577	232,122,457	70,389,753	159,478,179	96,060,188	6,170,000
2001 Dec	502,935,501	204,681,858	64,890,763	145,036,379	82,888,501	20,017,702
2002 Dec	557,725,760	149,750,895	44,801,686	107,005,462	178,948,689	77,219,028
2003 Dec	430,202,416	169,520,000	50,133,088	123,982,328	0	86,567,000
2004 Dec	462,719,415	179,955,729	54,958,800	135,883,798	0	91,921,088
2005 Dec	530,098,183	200,348,381	65,485,327	159,505,797	0	104,758,678

[21] All the foundations we include in the analysis are the ones following the objectives mentioned before. We do not include the two foundations "Div don 1" and "Göteborgs-Operans Byggnadsfond." The first one is managed as a long-term contract and the second allows the use of capital gains for the purposes of the foundation.

The dividend returns for each manager are summarized in Table 13. They have been calculated based on the estimation:

$DY_t = \frac{Div_t}{MV_{t-1}}$ where DY_t denotes the dividend returns, Div_t equals the dividends received in year *t*, and MV_{t-1} is the market value at the end of year $t-1$.[23]

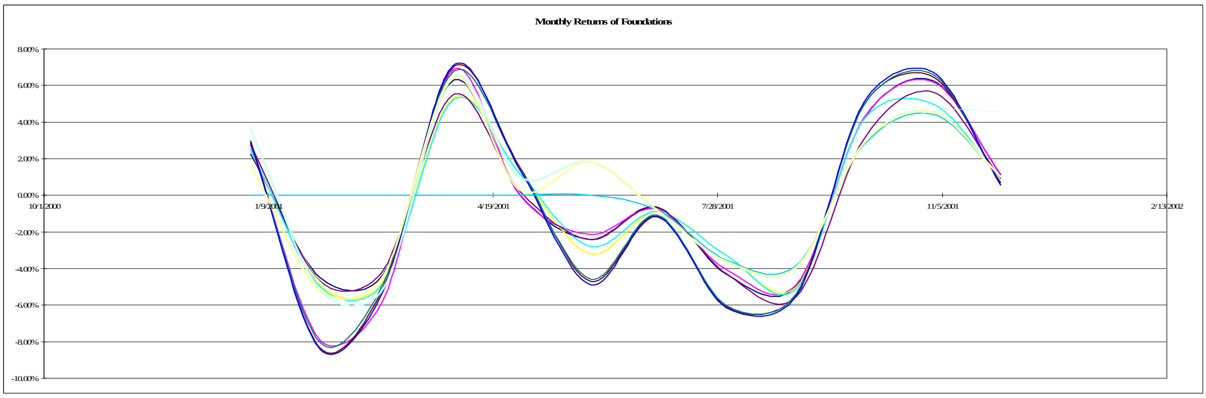
We find that the total dividends for the foundations are above the 3% requirement in only three out of five years.

Table 13. Dividend Returns per Asset Manager

Dividend Returns	All Foundations	Nordea	SEB	ABN	Carnegie	Enter
2001	3.08%	3.13%	3.75%	3.02%	2.66%	1.40%
2002	2.33%	2.52%	3.04%	2.39%	1.41%	1.46%
2003	2.52%	4.19%	3.83%	3.75%	n/a	2.62%
2004	3.03%	3.35%	3.60%	2.80%	n/a	2.38%
2005	3.11%	3.22%	3.28%	3.13%	n/a	2.80%

The dividend returns appear to have a size effect among the asset managers. When looking at Nordea's portfolio, which is the largest one, we notice that they also have the largest dividend returns. In addition, in year 2003 after Enter became responsible for three foundations that were previously managed by Carnegie, their reported dividend return started to increase.

Figure 7. Monthly Returns of the Foundations



[22] The reason that the market value from year $t-1$ is used, rather than from year *t*, is that during year *t* part of the foundations dividends/coupon payments are handed out and used for the foundations' purposes and needs. Therefore, any changes in the market value throughout the year wouldn't objectively represent the funds' value development. Thus it is most reasonable and accurate to use the market value as of the beginning of the year, equivalently the end of year $t-1$.

Figure 7[23] compares the total monthly returns for all foundations. Obviously, the returns are very close to each other, where most of them present great volatility. The foundation Göteborgs Kommun (Gåvodepån) is an exception, which results from the 100% investment in fixed income securities. Therefore, it is important to compare the asset allocation decisions between each manager. Based on Appendix III, the asset allocation for each manager seems to be similar over the years, and most of the managers invest more in equity securities than in fixed income securities. Furthermore, Enter appears to invest more in fixed income securities, which is due to the same foundation Göteborgs Kommun (Gåvodepån) having all its assets invested in fixed income securities. As the literature that we reviewed in the previous sections suggests, an optimal target asset allocation does not exist due to the various objectives set by the different asset managers.

The performance of the old investment policy can be summarized as follows:

- Five asset managers were assigned 1 to 5 individual foundations each, with large difference in their total asset values. Nordea managed the two largest foundations, while Enter managed five small ones. There was a change in the management of three foundations from Carnegie to Enter during 2002.

- The monthly returns show large fluctuations during the five-year period, particularly during 2002, when the market values also experience a significant decline. However, this can be due to the market crush after September 11th, 2001.

- The asset allocation decision shows a preference for investing in equity securities rather than fixed income securities for most managers and foundations.

- According to the objectives of keeping the capital intact and generating enough dividend returns, the foundations' performance from the old policy did not fulfill the needs in the chosen sample period.

[23] For more detailed version of the same figure, refer to Appendix II.

5.2.2. Current Policy Performance

Since the new asset allocation policy was introduced on the 15th August, 2006, there is only scarce data from the three and a half months in which it has been operating. As mentioned before, in the new investment policy the foundations' assets are to be managed by three asset managers each responsible for one portfolio. The pure equity and fixed income portfolios represent 30% of the foundations' assets each, and the mixed portfolio is 40%.

The pure equity portfolio is managed by Nordea. The portfolios' assets are invested in a specific fund, which places investments in Swedish stocks and stock-related instruments listed on SSE and mainly in large companies with international direction.[24] Nordea seems to be the only manager that puts into practice the new guidelines by investing 99.98% in equity securities and applying the predetermined index to be used for the portfolio, which is the SIX Portfolio Return Index.

Enter is responsible for managing the fixed income portfolio and SEB for the mixed portfolio. In the few months in which the new policy has been operating, it can be noticed that both banks haven't evidently changed the asset allocation mix of their investments, neither have they incorporated the new index to be used when analyzing the portfolios' performance. This, however, is a more or less expected result according to Stellan Larsson, one of the SEB's responsible managers for the mixed portfolio. He clarified that for such large amounts of investments it would take time before the main changes from the new policy are effectively put into action and therefore before this is done, there is no practical use to employ the new index in the analysis as well.

Thus there are no reasonable grounds to evaluate the managers' performance under the new asset allocation policy, since not all of them have employed the new requirements yet. Even if they did immediately put the new guidelines into practice, as Nordea did, the evaluation of their performance over such a short period as 3.5 months wouldn't lead to any significantly important and persistent conclusions.

[24] This information is obtained from the City of Göteborg's Financial Department internal documents. Having in mind the confidentiality of that information, we have referred to only slight amount of the information in order to give further insights into the investment management under the new policy.

5.2.3. Constructed Portfolios' Performance

Based on the new policy, we constructed three portfolios using historical data from 2001-2005. Appendix IV summaries the portfolios' performances where the investment in each portfolio is rebalanced annually. Clearly, the pure stock portfolio reports the highest weekly returns with the largest weekly standard deviation, while the pure bond portfolio shows the safest returns. And for the first four years, the dividend/coupon returns are higher for the mixed portfolio than for both pure portfolios. Moreover, the capital returns in all years are positive and higher than the inflation rate, which indicates that the constructed portfolios succeed in keeping the capital intact for all foundations. The performance for the portfolios is consistent with the risk-return trade-off scheme, which implies that a higher return will be associated with a higher standard deviation. With the dividend target considered in the portfolio construction, the mixed portfolio reports the highest dividend return among the three portfolios along with a lower variance from 2001 to 2004.

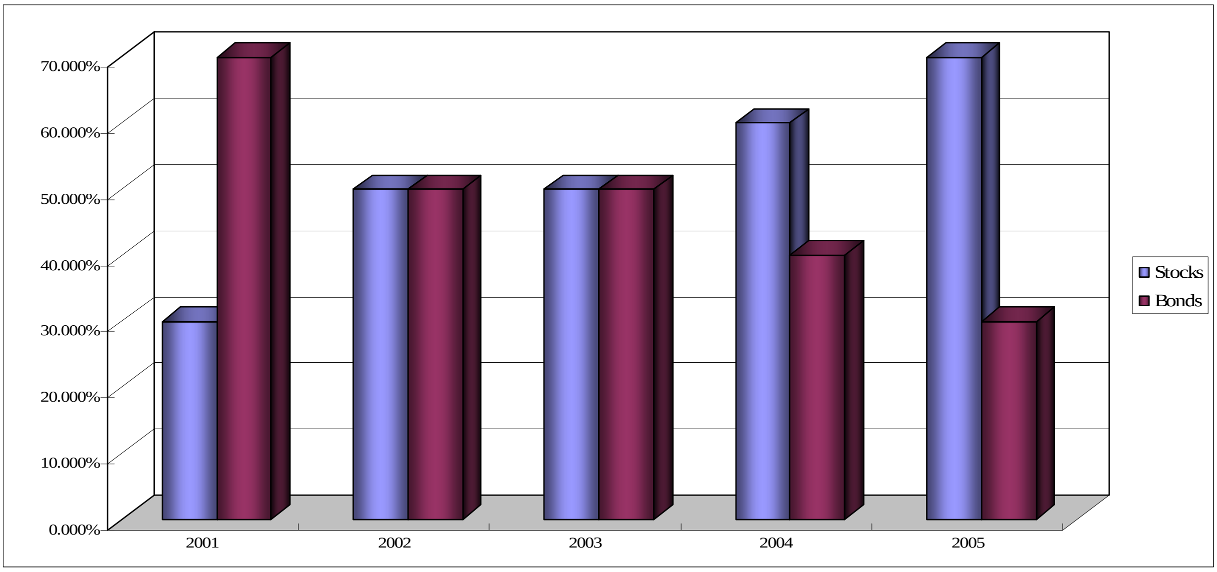
The comparison of the constructed portfolios and the portfolios in the old policy presents a direct evidence for the evaluation of the new and old policies.

Table 14. Comparison of the Constructed Portfolios with the Old Policy's Portfolios

	Total Returns		Dividend Returns		Annual SD	
	Our Portfolio	Old Policy	Our Portfolio	Old Policy	Our Portfolio	Old Policy
2001	6.68%	-3.66%	4.30%	3.08%	6.80%	15.07%
2002	17.39%	-16.10%	5.22%	2.33%	9.49%	13.26%
2003	17.60%	15.65%	4.53%	2.52%	5.38%	8.86%
2004	14.39%	10.05%	4.37%	3.03%	3.53%	4.81%
2005	20.69%	11.32%	4.41%	3.11%	4.09%	3.50%

The constructed portfolios report higher total return than the portfolios in the old policy, which in some years even shows negative total returns. At the same time the annual standard deviations for the constructed portfolios are lower than in the old policy. When comparing the dividend return for the portfolios we see that the constructed portfolios show higher dividend returns in all the years being compared.

Figure 8. Asset Allocation in the Mixed Portfolio



In the mixed portfolio, the asset allocation decision is made on the basis of the Sharpe's ratio, implied by the historical data. The asset allocation in the constructed mixed portfolios varies a lot between the years. Compared to the old policy we notice that the constructed mixed portfolio will invest more in bonds in the first three years. The constructed portfolios' asset allocation also shows that the variation between bonds and stocks will be more than the limitation in the old policy, for some of the years. This shows that by having a more flexible asset allocation policy new market conditions can be taken into consideration and new investment opportunities can be benefited of.

One of the main differences in managing the mixed portfolio under the new policy is that the manager has as a specific requirement to achieve a certain amount of dividends/coupon payments, for which he/she is paid a fixed fee. To compare if the new policy with a dividend target will give the foundations a better solution than the one without a dividend target we compare our constructed portfolios with and without dividend target (refer to Appendix V). When comparing the pure stock portfolios, it can be seen that in the first three years the portfolios with dividend target have higher weekly returns, as well as a higher standard deviation. However, in 2003 the standard deviation is lower while the return is higher. For all years except the last year (2005), the dividend return is also higher for the portfolios with the dividend target. Due to the fact that both the dividend returns and the weekly returns are higher for the first three years the total returns will be higher as well with the dividend target.

Nevertheless, an interesting result appears in the years 2001-2003 for the two pure stock portfolios. For the portfolio with dividend target, the selection procedure of the stocks is based on the above inflation returns and 3-7% average dividend yield in the pre-invest year, which is quite similar to the dividend strategy mentioned in the literature part. Since the portfolio without dividend is built on the assumption of momentum behavior of stock returns, the comparison between the two stocks portfolios can to some extend be used to assess the two strategies. During the first three years, the stock portfolio with dividend target not only reports higher dividend returns but also shows higher capital returns, which is consistent with one group of previous researches, suggesting that stocks with higher historical dividend yield perform better than the ones with lower dividend yield. However, the results documented in the relative literature are conflicting and the "positive" correlation between stock returns and dividend yields is highly controversial even after decades of research. As the Appendix V presents, in last two years, the "dividend strategy" doesn't generate better results when considering both dividend and capital returns.

When comparing the two bonds portfolios, the weekly return is higher, while the coupon return and duration are lower for the portfolio without a dividend target. The reason for this can be that the dividend target portfolio is coupon weighted, while the other portfolio is return weighted.

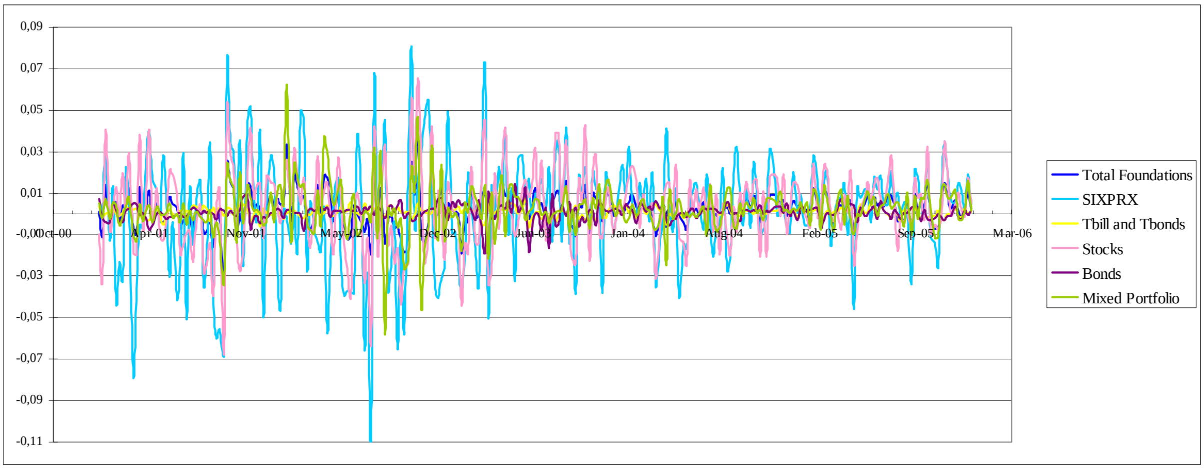
Looking at the mixed portfolios, we see that the weekly returns in some years are higher and in some years lower for the dividend target portfolios. An explanation for this is that the mixed portfolio is composed of both the bonds and stocks portfolio. The weights in the mixed portfolio are based on the Sharpe's ratio. As for the pure stock portfolios, both the dividend/coupon returns, and the total returns are higher in the first three years for the dividend target portfolios.

To evaluate the performance of the constructed portfolios over the five-year period relative to the chosen benchmarks, we present the descriptive statistics for all 261 weekly returns[25] for the portfolios and employ some classic performance measures, like CAPM, Sharpe's Ratio, and relative comparisons. Figure 9 includes the movements of the weekly returns of all constructed portfolios and the benchmarks selected. According to the new investment policy

[25] Each year has 52 weeks, except year 2003, in which there are 53 weeks.

the benchmark for the pure stocks portfolio is SIXPX, for the pure bonds portfolio the benchmark is calculated as 50% OMRX T-bond + 50% OMRX T-bill, and for the mixed portfolio the benchmark is 50%SIXPX + 50% bonds portfolio benchmark[26].

Figure 9. Constructed Portfolios and Selected Benchmarks



Since the movements of the portfolios' returns do not become quite obvious from Figure 9, we have included a comparison of the performance of each portfolio relative to its benchmark in Appendix VI. Moreover, since it is not objective enough to judge any results by the appearance of graphs, we have calculated the descriptive statistics, performed paired statistical tests and calculated some performance measures in order to obtain unbiased and accurate interpretations of the results.

Table 15. Descriptive Statistics of All Portfolios

	N	Minimum	Maximum	Mean	Std. Dev.	Sharpe's Ratio
Stocks	261	-0.067416	0.065163	0.003121	0.019502	0.131243
Bonds	261	-0.018730	0.014203	0.000783	0.003983	
Mixed	261	-0.058065	0.062316	0.002262	0.011638	0.146151
Total	261	-0.033041	0.037410	0.002076	0.008618	0.175765
SIXPRX	261	-0.109798	0.080245	0.000791	0.027073	0.008494
OMRX T-Bill	261	-0.000453	0.002596	0.000634	0.000341	
OMRX T-Bond	261	-0.013203	0.014071	0.001139	0.004447	

[26] It should be noted that the same benchmark as the one for the mixed portfolio is used for the portfolio of total foundations' assets, that is 50%SIXPX + 50%(50%T-Bills + 50%T-Bonds).

As the statistics in Table 15 show the average return for the portfolios is higher than the relative benchmarks. The Sharpe's Ratio shows better performance for all constructed portfolios compared to the SIXPRX index performance. Moreover, Table 16 measures the excess returns of the constructed portfolios relative to the benchmarks.[27]

Table 16. Paired Sample Test

		Paired Differences			t-Test	p-Value
		Mean	Std. Dev.	Std. Error Mean		
Pair 1	Stocks - SIXPRX	0.002330	0.022482	0.001392	1.674030	0.095327
Pair 2	Bonds - TBills&TBonds	-0.000103	0.002656	0.000164	-0.629431	0.529620
Pair 3	Mixed - SIXPRX/TBills&Tbonds	0.001423	0.015332	0.000949	1.499624	0.134925
Pair 4	Total - SIXPRX/Tbills&TBonds	0.001237	0.011774	0.000729	1.697458	0.090807

As Table 16 presents, all constructed portfolios report positive excess returns[28] relative to the selected benchmarks except the bonds portfolio. However, the result of the t-Tests and p-Values is not significant, which indicates that the excess returns are limited.

Based on the traditional calculation of Jensen's Alpha[29], the portfolios are compared with their benchmark performances and the p-Values show the significance of the reported measures. As Table 17 shows, the Total Portfolio has the best risk-return trade-off (highest Sharpe's ratio), while the Stocks Portfolio has the highest excess return relative to SIXPRX (Jensen's Alpha). All the excess returns reported are significant ones.

Table 17. Performance Measures

Performance Measures	Sharpe's Ratio	Jensen's Alpha	p-Value
Stocks Portfolio	0.131243	0.002464	0.013364
Mixed Portfolio	0.146151	0.002204	0.001871
Total Portfolio	0.175765	0.001427	0.002636

In short, the constructed portfolios under new policy clearly report better results than the old policy during the same sample period for both the dividend/coupon and capital returns. Moreover, the constructed portfolios have been proven to achieve higher risk-adjusted returns.

[27] Appendix VII describes in more detail how a paired sample test is performed.
[28] Excess returns are measured as the average of the paired differences between the portfolios' returns and the returns on their particular benchmarks.
[29] For a detailed explanation of the calculation of Jensen's Alpha, refer to Appendix VIII.

5.3. Limitations of the Study

First, the assumption of no transaction cost during the rebalancing is not practical. Therefore, our reported returns and dividend incomes should be slightly higher than the reality.

Second, we assume that the companies only pay out dividends once year at the last week, which is not the case for most companies. The bias caused by this simplification is not significant when it comes to the weekly capital returns, but the dividend returns might be lower then reported. However, since the dividend returns from the constructed portfolios is much higher than the requirement, some decreases will not change the fact of a better performance for the constructed portfolios.

Third, the bias of estimating the total return, which is the sum of weekly returns and the annual dividends in our study, might result from under/over-estimation of capital returns. Moreover, because of the estimation from the old policy portfolio is monthly based, the comparison of constructed and old portfolios will be biased in some level.

5.4. Other Cities' Policies

Foundations with similar management and purpose as the ones managed by the City of Göteborg can be found in major cities in Sweden. Here we present several cities with well-designed asset management policies.

5.4.1. Stockholm

The City of Stockholm has been delegated the responsibility for managing 203 foundations, most of which don't have a board of directors. In contrast to the City of Göteborg, the City of Stockholm does not use the services of financial institutions for the investment management of the foundations' assets. The Financial Department of the City of Stockholm is solely responsible for the management of the foundations; however, financial advice from a bank or other financial institution can be used under certain circumstances.[30] The asset management for the foundations is regulated by the rules stated in each foundations policy. If it is not otherwise stated in the foundations' policies, the foundations' assets are aloud to be pooled together and have a common asset management. This is applied for 196 of the foundations managed by the City of Stockholm.

In general the investments should aim at achieving the long-term investment goals and include investments in equity securities, fixed income securities and liquid funds (cash). The usual structure of a portfolio comprises of 5% liquid funds, 45% fixed income securities, 50% equity securities (of which 40% is invested in foreign markets) and 5% of other investments. From this allocation a deviation of +/– 10% is allowed except for the liquid funds which can deviate only within +/– 5%. The portfolio is rebalanced three times a year. The City of Stockholm is cooperating with two banks, Swedbank and HQ, with whom thoughts and ideas about future investment actions are discussed. The investment in Swedish stocks is compared with a benchmark index of the type SIXRX and the foreign stock investment with the benchmark index MSCI.

[30] Most of the information in this section was provided by Camilla Broo, working at the Financial Department of the City of Stockholm.

For the fixed income investments there are restrictions on how much is allowed to be invested, which depends on the issuers' credit rating. 100% is allowed to be invested in fixed income securities issued by the Swedish government or if the issuer has at least a credit rating of AA-. However, a maximum of 20% is to be invested in individual assets. For issuers with a credit rating of at least BBB-, an investment of 25% is allowed, with a maximum of 5% invested in an individual asset.

In the end of 2004 the total value of the capital for all the foundations was 714.4 MSEK, from which 30.5 MSEK were allowed to be handed out in order to fulfil the foundations' purposes. However during 2004 only 21 MSEK were actually handed out to 1883 people. During this autumn the City of Stockholm has evaluated their asset management and tried to find a more effective way to handle their portfolio. Today the asset management is characterised by stock selection; however, in the future they believe that their asset management will be more like an indexed management.

When compared to the City of Göteborg's new investment policy, both cities allow the assets for the foundations to be pooled together and have a common asset management. City of Stockholm's Financial Department is managing the foundations' assets rather than using the services of financial institutions to take care of the management as is the case with the City of Göteborg. Stockholm also has a stricter asset management policy than the City of Göteborg's old investment policy. However, it seems like Stockholm has more than enough capital to hand out, while one of the problems with the City of Göteborg's old policy was that not enough dividend returns are raised in order to satisfy the foundations' objectives. To find the reason for this a deeper analysis is needed.

5.4.2. Norrköping

Norrköping's municipality manages 65 MSEK donations, which are separated into two portfolios assigned to two asset managers. The objectives of the foundations' investment management are the same as in the case of the City of Göteborg, which include the intact long-term capital and high enough annual dividend incomes requirements. To match the needs of specialized foundation management, a similar investment policy is employed. To diversify the investment risk of foundations, the policy restricts the asset allocation to 54% in Swedish stocks and 40% in Swedish fixed income securities. Moreover, similar to Göteborg, the policy includes the details in stocks and bonds selections, also the risk level of currency or credit risks. However, the main difference in the policies of the two cities is that apart from interest revenues, dividends from stocks and possible rent revenues, up to 25% of the re-investment result (capital gains) can be used to complement the foundations' needs.

Clearly, the asset allocation is considered as a crucial decision in the investment management strategies. Also, due to the charity purpose of the foundations, the ethical rules of investment are strict for both cities.

5.4.3. Royal Institute of Technology (KTH)

KTH is managing the assets for around 100 foundations. The services of two asset managers (Öhman Capital Management and Nordbanken Portfolio Management AB) are used, which manage an equal amount of the foundations' assets. The new investment policy that has been operating since the 1st May, 2004, states that the investments should be long-term with the main goal of achieving an even and ongoing return. The primary goal for the asset management is a dividends/coupons return of 12 MSEK or at least a 3.5% dividends/coupons return on the managed assets, while the secondary goal is to keep the capital intact over time. The investment limitations are described in Table 18, with a maximum of 10% to be invested in an individual security.

Table 18. KTH's Asset Allocation

	Min (%)	Normal (%)	Max (%)
Swedish equity securities	22	37	52
Global equity securities	0	15	30
Fixed income securities	33	48	63

The similarities with the City of Göteborg's foundations' management are that both use the services of asset managers in handling the foundations' assets and both have a goal of keeping the capital intact. However, KTH's policy restrictions concerning the asset allocation are even stricter than the City of Göteborg's old investment policy.

6. Conclusions and Recommendations

Based on the designed comparison methods of the old and new policies of the City of Göteborg and the research on similar asset allocation policies in other cities, we have reached several important conclusions. First, the old policy presents several problems during the sample periods. The dividends needs for the foundations are not fulfilled and the capital appears to be decreasing. Due to the management rules, the asset for the foundations is not equally separated between the managers. So the result for each foundation depends on the skills of the asset manager handling their assets. This will not be a problem in the new policy since all assets are pooled together and divided equally between the managers. Each foundation will then receive dividends according to their weight.

Second, the constructed portfolios clearly perform better than the asset managers in the old policy both when it comes to dividend and capital returns. With the new policy rules, the investment objective of keeping the capital intact and a certain dividend return is separately assigned to different portfolios. The pure stocks and bonds portfolios are focusing on capital returns while the mixed portfolio has a dividend target. Another problem with the old policy was that the managers were compared to each other. This can be noticed when looking at the monthly returns for the foundations, where the monthly return closely follows each other. At the same time the managers in the old policy was paid by a percentage of the market value in the end of the year, so rather than focusing on dividend return they will focus on capital return. The separation of the portfolios into pure bond and stock portfolios as well as a mixed portfolio can solve the problem of comparison. The problem of focusing on capital return rather than a higher dividend return might be solved by paying the managers a fixed fee rather than a percentage of the market value.

Third, the few months' performance from the three asset managers under the new policy from this August does not appear much different in investment decisions, especially for the mixed portfolio, which raises concerns about whether the manager takes full advantage of the flexible asset allocation under the new policy. However, according to the manager at SEB who manages the mixed portfolio, it will take time before the asset allocation will change and the focus on a higher dividend return will be in place. Looking at the constructed portfolios the more flexible asset allocation can be beneficial for higher dividend returns.

Forth, the comparison between portfolios with and without dividend target shows that in three out of five years in the sample period, the constructed portfolios with dividend target have both higher dividend and capital returns than the ones without dividend target. However, the last two years suggest exactly the opposite. This is consistent with the contradictory results in earlier researches on the relationship between dividends and capital gains.

To sum up, this study presents an alternative way of evaluating investment policies, suggesting a similar result on the importance of asset allocation decisions as previous studies in this area. As for the City of Goteborg, the new policy is expected to benefit the special needs of the foundations better than the old one. Besides that, the dividend target in the mixed portfolio can be practical in reaching certain amount of dividend/coupon returns every year. Moreover, based on our research on the other cities' policies with similar foundations' management, some cities decide to use a part of the excess capital gains besides the dividends after keeping the purchasing power of the assets. It can be suggested that the City of Goteborg should reconsider this investment constraint and allow for the use of a small part of the excess capital returns if in the future higher capital returns are achieved under the new policy. Due to the limited time of the execution of the new policy, the asset managers' investment styles seem to remain the same. Therefore, further close observations on managers' adjustments to the new policy should be continued in future asset management.

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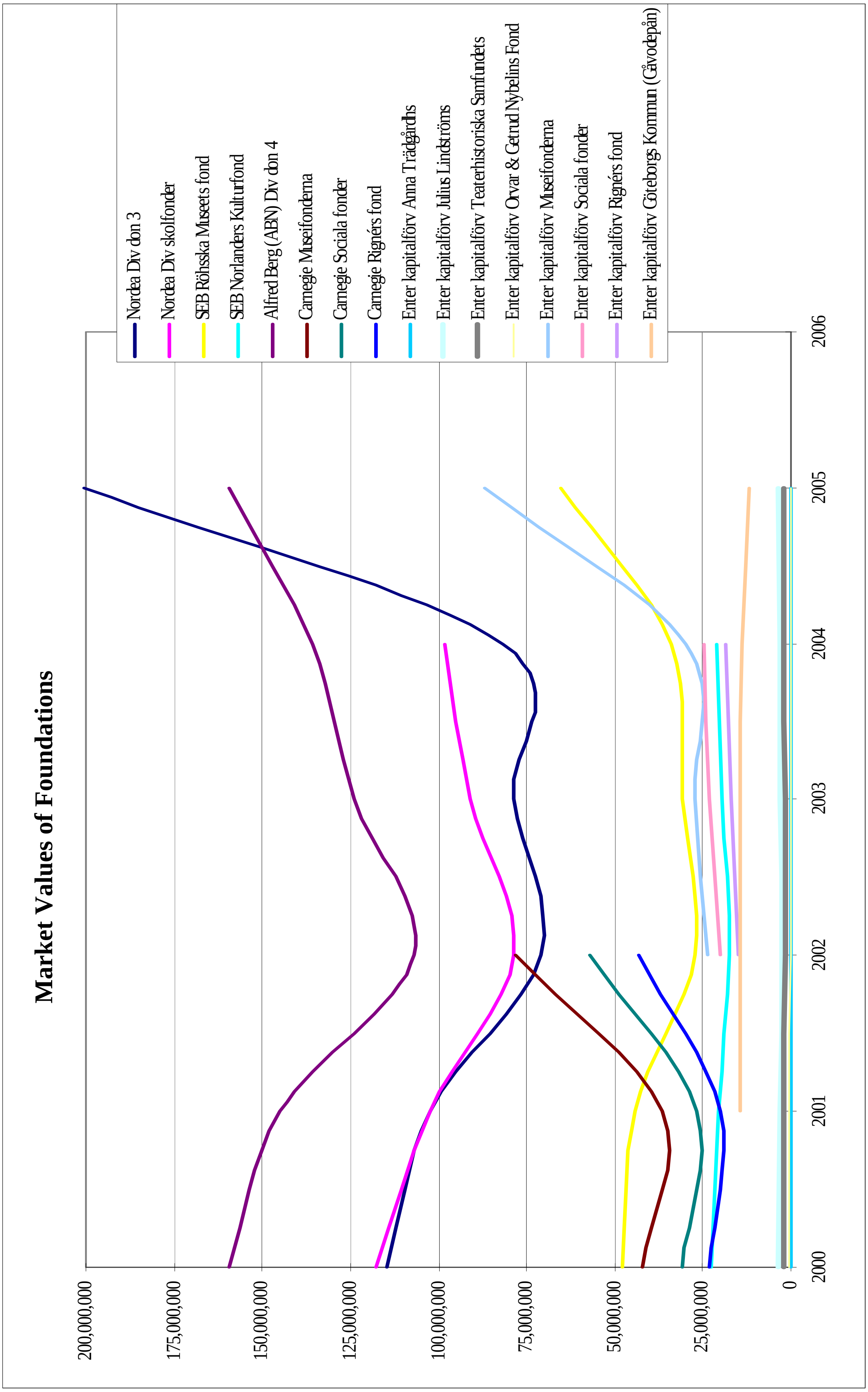
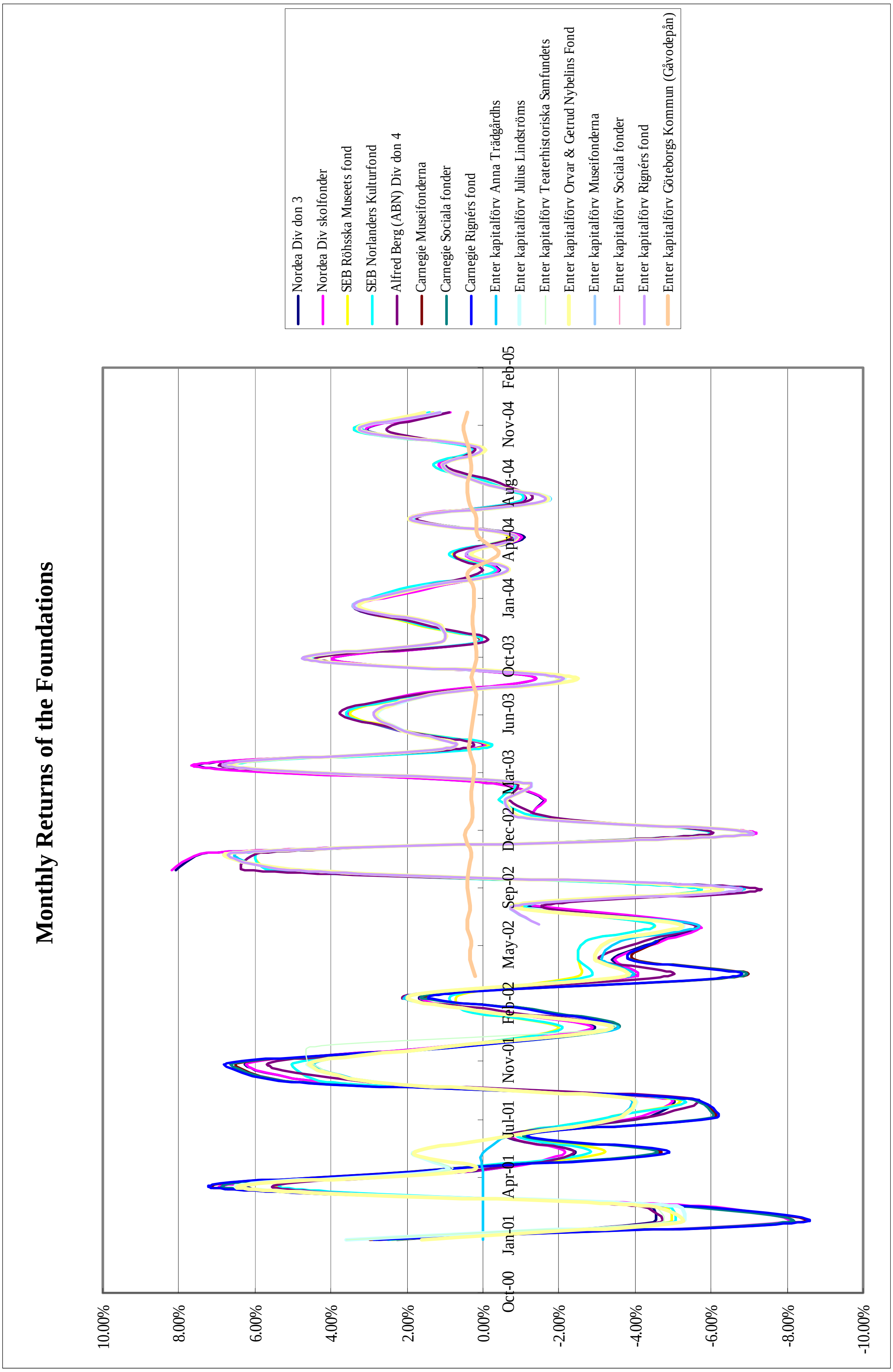
Appendices

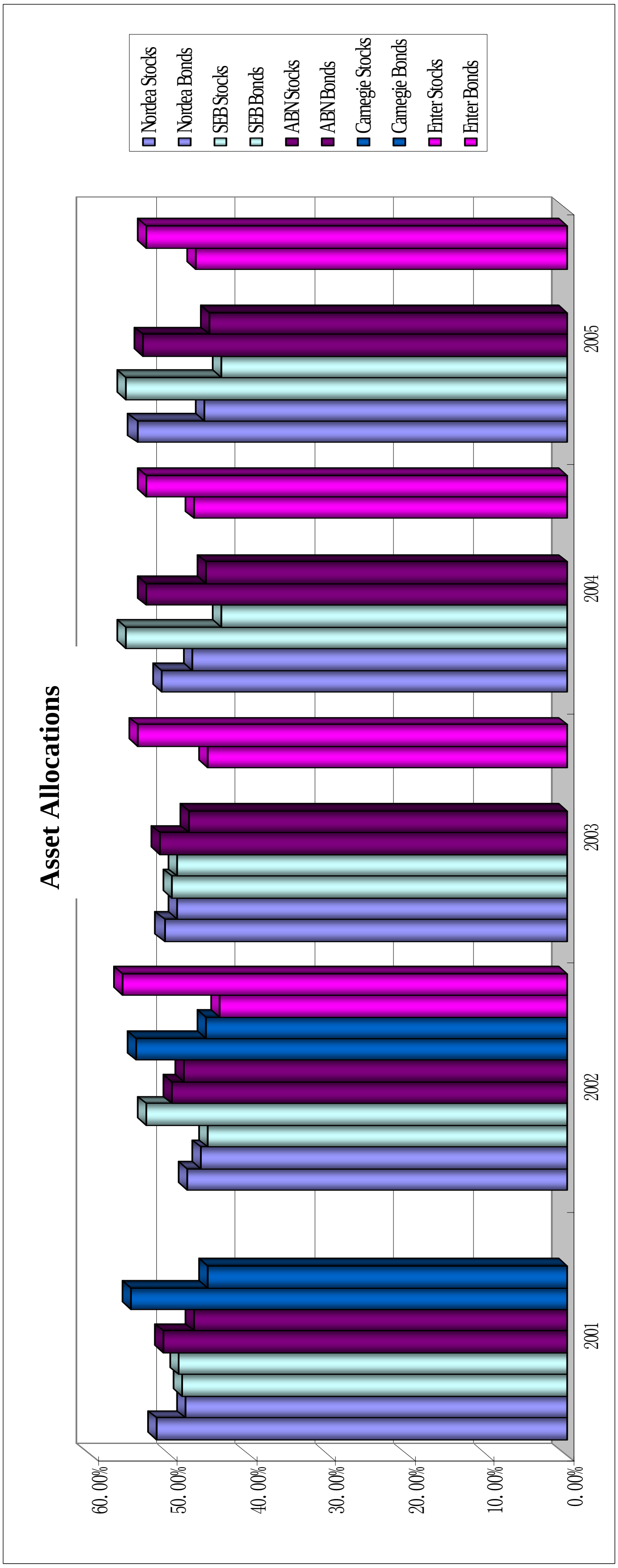
Appendix I Market Values of the Foundations



Appendix II Monthly Returns of the Foundations



Appendix III Asset Allocations of the Five Managers



Appendix IV Constructed Portfolios' Performance

Portfolios 2001	Pure Stock Portfolio	Pure Bond Portfolio	Mixed Portfolio	Total Foundations
Average WR	0.110%	0.000%	0.032%	0.046%
Weekly SD	2.309%	0.344%	0.898%	0.943%
Annual DY/CY	4.441%	3.492%	4.805%	4.302%
Duration in Bonds		1.2518	2.4194	
Totall Annual Return[31]	10.180%	3.474%	6.448%	6.675%
Portfolios in 2002	Pure Stock Portfolio	Pure Bond Portfolio	Mixed Portfolio	Total Foundations
Average WR	0.125%	0.146%	0.3818%	0.2340%
Weekly SD	2.511%	0.261%	2.0785%	1.3161%
Annual DY/CY	5.646%	1.468%	7.7267%	5.2249%
Duration in Bonds		1.9209	2.4519	
Totall Annual Return	12.131%	9.076%	27.579%	17.3938%
Portfolios in 2003	Pure Stock Portfolio	Pure Bond Portfolio	Mixed Portfolio	Total Foundations
Average WR	0.439%	0.057%	0.256%	0.251%
Weekly SD	2.075%	0.671%	0.838%	0.746%
Annual DY/CY	4.057%	3.124%	5.931%	4.526%
Duration in Bonds		1.8424	2.3907	
Totall Annual Return	26.878%	6.112%	19.261%	17.601%
Portfolios in 2004	Pure Stock Portfolio	Pure Bond Portfolio	Mixed Portfolio	Total Foundations
Average WR	0.338%	0.133%	0.128%	0.193%
Weekly SD	1.344%	0.266%	0.660%	0.490%
Annual DY/CY	5.549%	1.205%	5.867%	4.373%
Duration in Bonds		2.0017	2.3258	
Totall Annual Return	23.104%	8.140%	12.540%	14.389%
Portfolios in 2005	Pure Stock Portfolio	Pure Bond Portfolio	Mixed Portfolio	Total Foundations
Average WR	0.548%	0.054%	0.331%	0.313%
Weekly SD	1.204%	0.291%	0.730%	0.568%
Annual DY/CY	6.121%	2.487%	4.568%	4.410%
Duration in Bonds		1.7275	1.8715	
Totall Annual Return	34.630%	5.275%	21.787%	20.686%

Notes:
WR = Weekly Return
SD = Standard Deviation
DY/CY = dividend return/coupon payments

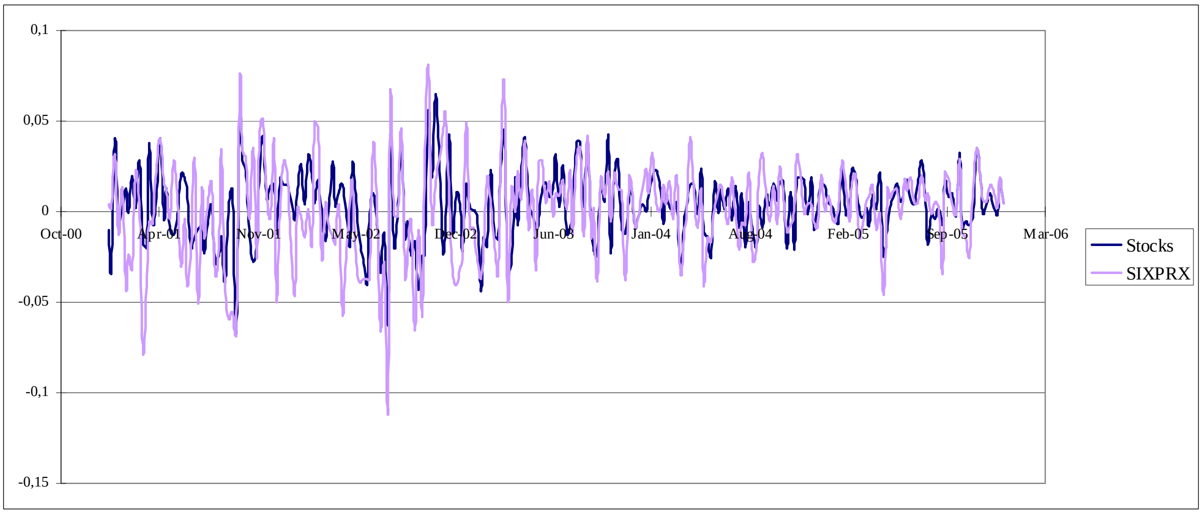
[31] Total Annual Return here is estimated as the sum of 52 weekly returns and the annual dividend returns.

Appendix V Constructed Portfolios with and without Dividend Target

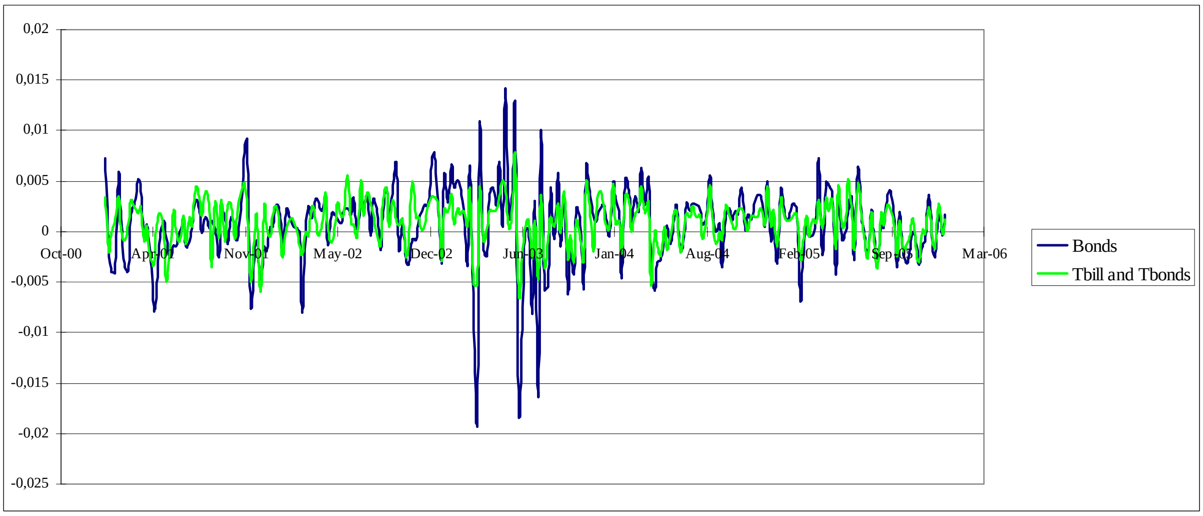
	2001		2002		2003		2004		2005	
Pure Stocks Portfolio	Without DT	With DT	Without DT	With DT	Without DT	With DT	Without DT	With DT	Without DT	With DT
Average WR	0.11%	0.16%	0.12%	0.68%	0.44%	0.51%	0.34%	0.19%	0.55%	0.48%
Weekly SD	2.31%	3.07%	2.51%	4.15%	2.08%	1.80%	1.34%	1.06%	1.20%	1.05%
Annual DY/CY	4.44%	4.75%	5.65%	10.31%	4.06%	6.53%	5.55%	6.25%	6.12%	4.32%
Capital + Dividend Returns	10.18%	12.88%	12.13%	45.50%	26.88%	33.21%	23.10%	15.91%	34.63%	29.45%
Pure Bonds Portfolio										
Average WR	0.00%	-0.03%	0.15%	0.09%	0.057%	0.001%	0.13%	0.04%	0.05%	-0.02%
Weekly SD	0.34%	0.37%	0.26%	0.30%	0.671%	0.313%	0.27%	0.28%	0.29%	0.21%
Annual DY/CY	3.49%	4.97%	1.47%	5.15%	3.124%	5.334%	1.20%	5.30%	2.49%	5.15%
Durations	1.2518	2.4194	1.9209	2.4519	1.8424	2.3907	2.0017	2.3258	1.7275	1.8715
Capital + Dividend Returns	3.47%	3.69%	9.22%	9.66%	6.17%	5.407%	8.27%	7.48%	5.33%	3.91%
Mixed Portfolio										
Average WR	0.04%	0.03%	0.14%	0.38%	0.248%	0.257%	0.26%	0.13%	0.40%	0.33%
Annual DY/CY	3.87%	4.90%	3.56%	7.73%	3.590%	5.931%	3.81%	5.87%	5.03%	4.57%
Durations	1.2518	2.4194	1.9209	2.4519	1.8424	2.3907	2.0017	2.3258	1.7275	1.8715
Capital + Dividend Returns	6.16%	6.38%	10.60%	27.58%	16.495%	19.308%	17.12%	12.54%	25.82%	21.79%

Appendix VI Constructed Portfolios and Selected Benchmarks

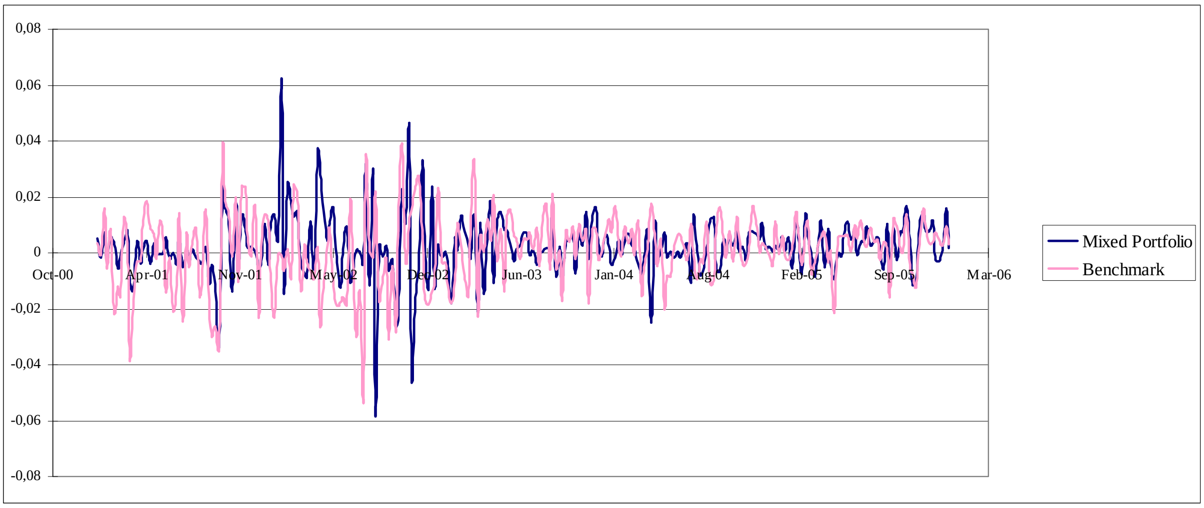
Stocks Portfolio and the SIXPRX Benchmark



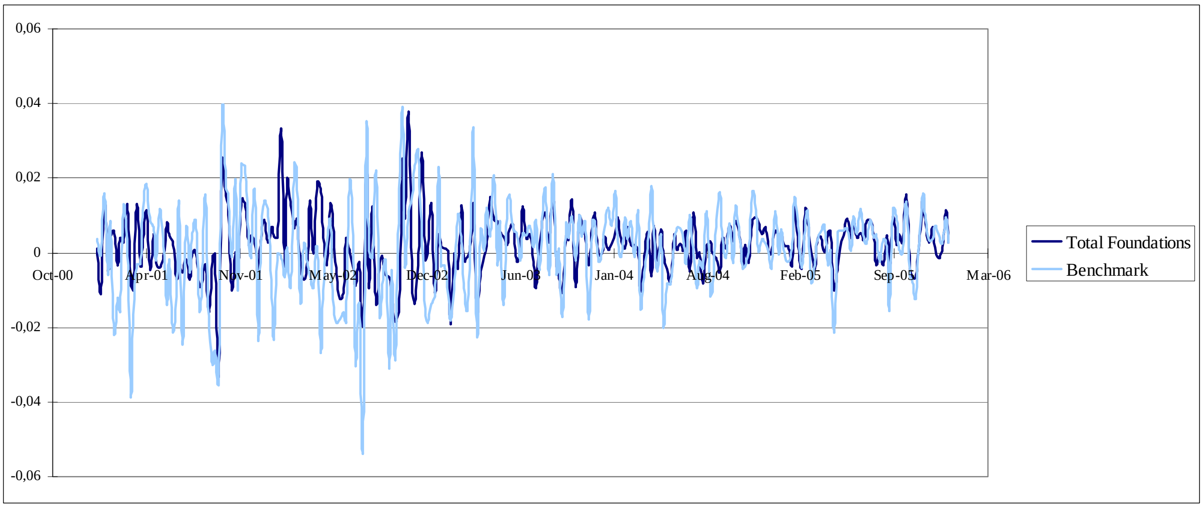
Bonds Portfolio and the T-Bills, T-Bonds Benchmark



Mixed Portfolio and its Benchmark



Total Foundations' Portfolio and its Benchmark



Appendix VII Paired Comparisons Test

In order to test whether there is a significant difference in the means of two populations we apply a t-Test.[32] The test requires that the samples are independent and that they are taken from normally distributed populations. We cannot make such assumptions in this case since we cannot assure that the observations in the two samples are independent. In that case a paired comparisons test can be used. The paired differences are calculated as the difference between the portfolio's return and its benchmark's return over the same time periods. Then it is tested whether the average difference between the weekly returns is significantly different from zero, based on the standard error of the average difference estimated from the sample data. The general form of a two-tailed test for any hypothesized mean difference is:

$$H_0 : \mu_d = \mu_{dz} \qquad \text{versus} \qquad H_A : \mu_d \neq \mu_{dz}$$

where μ_d = mean of the population of paired differences

μ_{dz} = hypothesized mean of paired differences (in our case $\mu_{dz} = 0$)

The *t*-statistic for the paired comparisons test with *n* – 1 degrees of freedom, can be computed as:

$$t = \frac{\bar{d} - \mu_{dz}}{s_{\bar{d}}}$$

where n = number of paired observations

$\bar{d}$ = sample mean difference, calculated as $\bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$

d_i = difference between the *i*th pair of observation

$s_{\bar{d}}$ = standard error of the mean difference calculated as $s_{\bar{d}} = s_d / \sqrt{n}$

s_d = sample standard deviation calculated as $s_d = \left(\sum_{i=1}^{n} \left(d_i - \bar{d} \right)^2 / (n-1) \right)^{1/2}$

[32] The concepts presented in this section are based on DeFusco, McLeavey, Pinto, Runkle, *Quantitative Methods for Investment Analysis*, 2004.

Next the critical *t*-value is determined from the statistical tables and compared to the test statistic already calculated. Since we are considering a quite large number of observations, the degrees of freedom are $df = \infty$. Thus, the two-tailed critical *t*-values for a 5 percent level of significance is 1.960 ($p = 0.05$), for a 10 percent level of significance is 1.645 ($p = 0.1$) and for 1 percent level of significance is 2.576 ($p = 0.01$).

If the computed test statistic is greater than the critical *t*-value, the null hypothesis of no difference is rejected, implying that there is a statistically significant difference in the mean returns of the two populations. The decision rule can be expressed in general as:

Reject H_0 if *t*-statistic < – critical value, or *t*-statistic > critical value

In our analysis we use evaluate the hypothesis tests based on 5% significance level, so the decision rule can be restates as: reject the null hypothesis if the *t*-value is more than 1.960 or the *p*-value is less than 0.05, implying that the difference in returns is significant.

Appendix VIII Jensen's Alpha

Portfolio managers with skills to forecast market trends or select undervalued securities, would earn higher risk premiums than the ones implied by the CAPM (Reilly, Brown, 2002). Therefore, in order to measure a fund's performance, an intercept should be included that measures any positive or negative differences from the model, where positive difference would indicate superior, and negative difference – inferior performance. It was Sharpe (1963) that first addressed this by introducing the single-index model ($R_p = \alpha_p + \beta_p R_M + e_p$). Jensen (1968) developed further the notion, by introducing the Jensen's measure of portfolio performance which evaluates the average return on the portfolio over and above the predicted by the CAPM, given the portfolio's beta and average market return:

$$R_p - R_f = \alpha_p + \beta_p (R_M - R_f) + e_p$$

where R_p is the return on the portfolio and R_M is the return on the market portfolio

The implication of this model is that if the securities in the portfolio are fairly priced, then $\alpha_p = 0$ and e_p is the diversifiable risk. However, if the securities in the portfolio are mispriced, α_p no longer equals zero and represents the expected abnormal return (Bodie, Kane, Marcus, 2001). Jensen's Alpha can be calculated as:

$$\alpha_p = R_p - [R_f + \beta_p (R_M - R_f)]$$

Thus the portfolio's alpha value indicates how much of the portfolio's rate of return is due to the manager's skills to achieve above average risk-adjusted returns, by good market timing and/or suitable security selection.