UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

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Environmental funds

- A portfolio performance evaluation

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Arvid Raa 880412-5030
Peter Seftigen 800225-0838
Tutor: Charles Nadeau
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Abstract

Title

Environmental Funds – A portfolio performance evaluation

Authors:

Arvid Raa and Peter Seftigen

Supervisor:

Charles Nadeau

Purpose:

The purpose is to measure the performance of environmental funds in terms of absolute returns as well as risk adjusted returns against their respective indices. This is to determine whether environmental funds can be a good investment object for both institutional as well as private investors.

Conclusion:

It seems that a majority of the so called clean tech funds underperform the market by every measure performed in our research and cannot be recommended for single investments purposes. For those wanting to combine environmental benefits along with a financial investment, the non-profit funds combine environmental friendly companies as well as distributing some percentage of its capital to environmental organizations without underperforming the market by so much. However, if the current debt crisis is overbridged, then we see potential for rapid growth within this market segment, especially if the fund market gets more efficient and costs can be cut.

Keywords:

Environment, funds, Sharpe ratio, CAPM

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1. INTRODUCTION

1.1 Background

Funds can be an attractive alternative to an investor that wants to diversify his or her risk. Due to transaction costs it can be very expensive to diversify a portfolio through investing in stocks and bonds individually. This is especially the case if the capital available for investing is small. In addition, many private investors maybe believe themselves to lack the knowledge or the time to construct such a portfolio.

There are many types of funds available on the market today. The amount of Swedish capital invested in funds overall has more than doubled over the past ten years, making the total fund wealth in Sweden by the end of 2010 almost 2000 billion SEK (Fondbolagens förening, 2011). But it has not only expanded in terms of more capital invested. The fund market in Sweden has also grown measured in the number of funds available. The amount of mutual funds, bond funds, interest funds, hedge funds and combinations of these funds that was available to Swedish investors has grown from 1160 to 1553, an increase of 34 %, over the past six years (Fondbolagens förening, 2011). One of the branches of funds that have grown the most is sustainable funds. For instance, the amount of capital invested in sustainable investment objects grew by 60 % and by the end of 2010 amounted to 2900 billion SEK (Fondbolagens förening, 2011). However, a large sum of these investments was made by institutional investors, such as pension funds.

One term that is frequently used when describing these types of investments is *Socially Responsible Investing,* SRI. SRI is to this date the most well-known concept for describing investors who take into account how executives and managers in their respective potential investment objects take into account social, ethical and environmental factors into to the analysis. Thus it can be very hard to define a fund as being "sustainable" if one wants to evaluate comparable sustainable funds and their relationship between risk and return. A problem lies in the fact that a lot of the sustainable funds include oil producing companies. Additionally, Statoil tops the "Global 100"-list of sustainable companies. For some people, this might not be in line with what is considered to be environmentally sustainable. It is for this purpose we have chosen to further narrow down our thesis and focus on environmental funds. However, the environmental work done by these funds are not negligible and for the purposes of comparison, and from the background of previous work made on the subject, five sustainable funds are included in the performance evaluation.

Since the appearance of the film "An inconvenient truth" by Al Gore, which led to him being awarded the Nobel Peace Prize, an interest grew within the public towards lowering the co2 emissions (SvD, 2009). Within the finance sector, the institutional investors lean towards SRI-funds and have been doing so intensively for the past decade or so, while private savers in

Sweden are interested in new energy, so called clean-tech funds (Svenska Dagbladet, 2009). More about these funds in chapter 4.

1.2 Distinction between sustainable and environmental funds

As we've mentioned previously, to avoid inconsistencies between compared funds and the hard defined concept of SRI funds, we've chosen to focus on comparing funds which work towards limiting negative effects on the environment. To most part these are companies that produce clean, renewable energy such as solar, wind and water power, but it can also be manufacturers of cheap, fuel effective engines as well as waste-disposal systems. In some cases the contribution to the environment is through donating a few percentages of the fund wealth each year. For most of the funds, no account is taken to their work with ethics or staff conditions. For purposes of comparison we have also included five funds that can be considered as being sustainable but also have an outspoken goal of showing concern to the environment. This means that there are to some differences between the environmental funds, and therefore we've divided them into three categories (see chapter 4).

The division of funds into these three categories comes from a report initiated by Naturvårdsverket with the cooperation of Maths Lundgren, Stockholm University, and Sara Bronner, Nordic Port AB, "Nordiska Miljöfonder", Naturvårdsverket, 1999. However, since twelve years has passed since this report, we have chosen to include additional funds in our research and not simply use the same funds examined in this report. Within the categories, there will also be deviations but to make the comparison we've had to generalize these funds. The general idea behind most of the funds is to invest in companies that decrease the amount of greenhouse gases and other environmental issues.

1.3 Reasons to invest in environmental funds

From where does the interest in environmental come from in finance? Well, for starters, most of the funds in the sustainable branch, based on our screening of the environmental funds market, are to the most part equity funds. Since the stock market, such as Stockholm Stock Exchange Market, is a secondary market, this means that no matter how many stocks you buy on the market, you're not adding any additional capital to the company itself directly. The only way to do this is through equity issuances, which stand for only a small part of the stocks being bought on a daily basis. Thus, investing in environmental funds has no relationship with wanting to benefit the company through adding capital as one would donate money to charity. This is of course not the case when considering the non-profit funds, more about these later on. One could therefore argue that the benefits from environmental funds come thusly from indirect causes.

In this lies a dilemma. It can be imagined that investing in environmental funds is the same as buying ecologically grown food or an electric car and thusly subsidizing these industries. But as described previously, except for the non-profit funds, this is simply not the case. Instead, investors might argue that the reasons for investing in environmental funds try to

send a message that they, as investors, also care about ethics and the environment. If assumed that the public mass has an increased interest in the environment, this means that companies will be given public relations bonuses for their work in environmental issues, thus stimulating the companies to increase their work with environmental policies. Through increased positive response in for example media, this strengthens their trademarks and as a result, revenues can be increased. This is a strong point made in the report by Naturvårdsverket (Bronner; Lundgren, 1999). The assumed increased interest in environmental issues comes from an article in Svenska Dagbladet (2009), and a press statement made by the Swedish interest organization Swesif from October 28th 2010, indicating that interest in sustainable investments have grown by 60 % over two years. Additional global indicators of an increased interest in environmental issues are taken from the global organization "Renewable Energy Policy Network for the 21th century", REN21, and their report from 2011 on global investments in renewable energy that according to the report also have increased by 60 % to 211 billion dollars worldwide.

Another way for these funds to be profitable is that certain tax benefits are given to companies that meet certain environmental standards which of course increases the profits and the wealth to shareholders through eventual dividends. In this way, environmental funds can be beneficial to the society.

Additionally, investing in environmental funds provides, although a relatively small but still significant demand on companies within the environmental branches which naturally, since stock market prices are based on supply and demand, drive the stock upwards (Bronner; Lundgren, 1999).

Other reasons to invest environmentally might be to exclude environmental risks. Oil companies such as BP and Chevron have suffered hard blows due to environmentally hazardous spills and accidents (Svenska Dagbladet, 2001), (di.se, 2010). Although as previously stated, some oil companies may actually be included in ethical funds.

However, if environmental funds perform badly, this can create negative public relations effects. If investing in environmental funds is believed to underperform the market, then investors will stay away and the industry as a whole might lose credibility and might lose investors in both the primary and secondary market.

1.4 Purpose

From the background of increased interest in environmental funds, we would like to investigate whether these types of funds can outperform market indices in terms of risk adjusted returns. Environmental funds are in part used as a means of contributing to and subsidizing a sustainable society. However, can the environmental funds actually be of an advantage to the investor, and not only for societally beneficial purposes? Can environmental funds outperform our market indices?

To avoid effects of the current business cycle, we would have preferred a longer period of time for our comparison. Monthly data over ten years would have preferable since it would account for both strong as well as weak business cycles. However, being that most environmental funds available today in the Swedish market were started within the last five years, this was simply not possible. Because of the extreme market conditions that has maintained since the summer of 2008, we then have to modify our study to the following problem phrasing: Can environmental funds outperform market indices in volatile market conditions?

2. METHODOLOGY

2.1 Choice of subject and the method used

This thesis focuses on the performance of special kinds of mutual funds which all have the characteristic of having environmental criteria in their investments. Environmental funds can be considered as a part of what is known as SRI-funds. However, the concept of SRI, as already mentioned, is a very inconsistent form of categorizing funds and therefore the focus will lie on what will be called environmental funds.

The method of performance evaluation is as objective as possible in the sense that publicly available information about environmental-funds is gathered and analyzed with well-known finance key ratios and then presented in a perspicuous form for comparison reasons. Because of this the results in this report are valuable to regular investors in their decisions about fund choice.

There are two different kinds of research methods; the qualitative one vis-à-vis quantitative one. The qualitative method is the one based on different kinds of interviews, participation in observations and very invasive by nature (Bjereld, U et al 1999). This kind of method is often used in social studies. The quantitative method is the most appropriate for this kind of finance studies because the performance is measured in numbers. The data is collected on weekly basis for three recent years, between November 11th 2008 and November 15th 2011, in total 157 observations. There is awareness that recent years have been shadowed by turmoil in the markets so the results of this study could differ substantially from similar studies conducted over more stable periods in the economy. This study could be compared to similar studies of funds when the market was more stable, we will expand on this later on.

As mentioned before data is on the weekly basis meaning that we are dealing with time-series data. In the time-series analysis, the observations are arranged in a chronological time-order. Time series analysis is very common in evaluation over time such parameters as GDP-growth, inflation-rate, unemployment rate etc. There are certain types of criteria that must be fulfilled, for example stationary data is needed in order to make conclusions from time-series analysis. Later on, in more details these criteria's will be investigated.

2.2 Choice of the scientific method

In this paper we're conducting our research by using deductive method. This method can be divided into (Godfrey-Smith, 2003) :

1) Gather data (observations about something unknown, unexplained, or new)

2) Hypothesize an explanation for those observations.

3) Make predictions based on the theory of assumed hypothesis

4) Verify empirically the predicted observations

To summarize: the deductive method is the one that tests the adopted hypothesis on empirical data. If empirical data has large deviations from predicted values then the hypothesis is rejected.

In this work only part 1 and 2 are done, no predictions of the future is made. To make such predictions more time would be needed to observe future empirical values.

2.3 The realization

The inspiration and encouragement, together with our interest in the environmental issues, for this thesis was given by several seminars including one given by Andra AP-fonden which is the one of the biggest Swedish pension fund investors (Andra AP-fonden, 2011). Andra AP-fonden together with all the Swedish state controlled pension funds have had an outspoken long-term goal to include environmental as well as ethical values into their decision-making process for a decade. Also a lot of private pension funds, such as KPA Pension, have an outspoken goal of showing concern for ethical and environmental issues in their investments.

Further inspiration was taken from a previous study made in 2003, a bachelor thesis made by Mårten Jönsson and Per Larsson, "Svenska miljöfonders utveckling" (2003) at University of Lund, on the subject of comparing the performance of environmental funds. We had already decided the subject of our thesis when we found this study, but found it very interesting to be able to compare our results, nine years after this study was made.

The knowledge in finance, especially in evaluation measures such as Jensen alpha, Sharpe ratio was appropriate to take on such a task. The methods from econometrics are applied here, especially the regression analysis in order to evaluate out- or underperformance of funds by Jensen Alfa.

Three main sources of historical NAV-rates of different funds and of the risk-free rate are used, namely Datastream Database, Handelsbanken web source and Morningstar's homepage. The information from these sources is very reliable and is often used by researchers and students. The data collected from these sources is the time series of NAV-rate (Net Asset Value). NAV rate is calculated by dividing the total value of all the securities in its portfolio, less any liabilities, by the number of fund shares outstanding (Investopedia, 2011).

The change in NAV rates for a given fund is then used to calculate the rate of return for every fund by the formula (Bodie, 2011, p 129):

$$Rate\ of\ return = \frac{NAV_1 - NAV_0 + Income\ and\ capital\ gain\ distributions}{NAV_0} \quad (1)$$

In this thesis the income and capital gain distributions of the funds are omitted because of the time constraints to find this kind of information from the sources used.

In total, 19 funds are analyzed over the course of three years. Together these have funds very wide geographic investment range. For example SEB Etisk Sverigefond invests up to 90% in Swedish companies while SEB Etisk Globalfond mostly invests in North American companies. All these funds can be split and classified in accordance to the type of investments they make but what they all have in common is that these funds prefer to invest in environmentally healthy companies. This means funds that for example invest in companies that develop green technologies or renewable energy or funds that donate some percentage of its capital to the companies mentioned above.

The funds were divided into three categories. These categories were taken partly from the previous work done by Mårten Jönsson and Per Larsson (2003) but also from a study made by Naturvårdsverket in 1999 (Bronner; Lundgren, 1999).

However, since these are studies made about 10 years ago, we decided to search for additional funds available for our thesis. Morningstar seemed to be the biggest and most reliable source of data on environmental funds in Sweden. At Morningstar, environmental funds are divided into two categories: Environment technique funds / clean tech funds and environmental funds. One category is for funds that invest in new technology for the benefits of the environment, while the other is more focused on "normal" companies that are doing extensive work for minimizing their external effects on nature through their operations. To these two categories, we chose add one more, so called charity funds. Funds that can invest in all types of stocks and bonds but donate some percentage of the fund capital to a charitable cause each year, in this case environmental organizations.

As the categorizing on the Morningstar web page was a bit disorganized, we chose to screen each fund in order to see what the real emphasis of the funds as described by the portfolio managers were. In total, we found 24 environmental funds, from both categories, at Morningstar, but were immediately faced with a problem. 18 of these had been started within the last 3-5 years which meant that to be able to conduct our research, we had to limit our research to a three year period.

Next, we were faced with another problem. The data source suggested to us, Datastream, did not hold data for more than ten out of these funds. For the purpose of wanting to get a wider examination, we found additionally nine funds at the Handelsbanken web page. These were originally in daily data, so we had to transform them into weekly data to be able to compare them along with the data from Datastream, with different indices and conduct a proper performance evaluation.

We ended up with most funds being categorized into clean tech funds, which we were happy with since these are the funds most beneficial to the environment. The funds will be described later on in this thesis.

2.4 Data

The raw data for the funds, the primary data, in our paper was gathered from two sources. The first and main source is the computer software called Datastream which gathers data for not only funds, but stocks, indices, bonds and other types of financial instruments. However, for the purposes of our thesis it proved incapable to provide sufficient material and thus we have used a second source of data. For ten of the funds, data was collected from Handelsbanken's website, there in daily rates. These rates were edited to fit the weekly data gathered from Datasource. In cases where data has been missing for certain days, we've used the last noted rate available.

Secondary data regarding the funds such as geographical distribution, fees, fund strategy and largest holdings etc. was mainly gathered from the Morningstar webpage. Additional information has been brought from the funds' respective websites.

2.4.1 The risk free rate

The rates for the 90-day Swedish Treasury bond as well as the indices were provided by Datasource. These are converted from yearly rates into average weekly rates through the following equation:

$$\frac{\sum(\frac{Rate_t}{365}\times 7)}{N}$$

where *Rate* is the weekly notation of the yearly rate of the 90-day Swedish Treasury Bond at time *t. N* is the number of observations in our study, 157.

2.4.2 The global index, MSCI World

For the global funds, a global index is used. The MSCI World Index tracks the performance of 1600 of the biggest companies all over the world and tries to reflect the major tendencies from global markets (www.msci.com, 2011).

2.4.3 The Swedish Index, OMXS30

As a Swedish benchmark, we're using the Swedish OMXS30 Index. This is a good reflection of the Swedish market as a whole as it tracks 30 of the most highly traded stocks on Stockholm stock exchange market, which in great extension affects the rest of the Swedish market as a whole.

3. THEORY

3.1 The CAPM-model

The CAPM model is a model that attempts to predict assets expected return's regarding their volatility to some benchmark market index. CAPM have many assumptions that do not hold in real world, but the general idea behind the CAPM seems quite reasonable. One of the central assumptions is that the market portfolio is mean-variance efficient portfolio (Bodie, 2011). It means that for a risky asset which is on the *security market line* (SML) the reward to volatility ratio must be equal to the market's reward to volatility ratio. Equilibrium in CAPM-model can be expressed as (Bodie, 2011) :

$$\frac{Expected\ market\ risk\ premium}{market\ variance} = \frac{E(r_M) - r_f}{\sigma_M^2} = \frac{E(r_{fund}) - r_f}{Cov(r_{fund}, r_M)} \quad (2)$$

where $E(r_{fund})$ is the expected rate of return of the fund, r_f is the risk-free rate of a treasury bill, σ_M^2 is the historic variance of the returns of the market index (OMXS30 or MSCI World) $E(r_M)$ is the expected rate of return of the market index and $Cov(r_{fund}, r_M)$ is the historic covariance between returns of the fund and the market**.** The historic returns of the funds which are later used in (2) are calculated as:

$$r_{fund} = \frac{NAV_t - NAV_{t-1}}{NAV_{t-1}} \quad (3)$$

where $NAV_t$is the NAV-rate of the fund during time period t**,** this expression is the same as (1) but with the omission of income and capital gain distribution.

The average historic return is:

$$\overline{r_{fund}} = \frac{\sum r_{fund_i}}{N} \quad (4)$$

with r_{fund_i} as the i:th observation of the funds return and N is the total number of observations.

The formula (2) can be rearranged to give the expected value of the asset:

$$E(r_{fund}) = \overline{r}_f + \frac{Cov(r_{fund}, r_M)}{\sigma_M^2} * [\overline{E(r_M)} - \overline{r_f}] \quad (5)$$

where $\frac{Cov(r_{fund}, r_M)}{\sigma_M^2} = \beta_{fund}$ (6)

is the **beta** value of the given asset which measures the variance contribution of the given fund to the variance of the market portfolio (Bodie, 2011, p 315).

As one can see from (5) the expected return of the fund can be calculated only if the expected value of the market index $\mathrm{E(r_M)}$ is known. In this thesis $\mathrm{E(r_M)}$ is replaced by $\overline{\mathrm{E(r_M)}}$ which is sample average of the returns of the market index and $\bar{r}_f$ is the sample average of the risk-free rate. These two averages are calculated in the same way as the average historic return of the fund by eq.(4) but instead of NAV-rates the index level is used .

If the predicted expected value by CAPM eq.(5), $E(r_{fund})$, differs from the sample average then the asset is under- or over performing and is not lying on the security market line. It also means that *Jensen alfa* is not equal to zero which will be explained later on.

One of the difficulties with the CAPM model is to correctly specify market portfolio because it includes all risky assets that can be held by the investors. This is far more than an equity index (Bodie, 2011). In this thesis, two proxies have been used for market portfolio. This is because we are using both global and Swedish funds.

3.2 Traditional Measure of Risk, Standard deviation

Risk, or volatility, is measured primarily through the statistical tool standard deviation. This measure denotes by how much a value tends to deviate from the mean and is measured in percent. In other words it describes by how much the returns of an asset differ from its average. The basis for the standard deviation is the variance, where the standard deviation is nothing but the square root of the variance. The volatility is measured through calculations made in excel, however the following formula is used for calculating the variance of asset *i*:

$$Var(i) = \frac{\sum(a_{it}-\mu)^2}{N} \tag{7}$$

Where $a_{it}$is the return for asset *i* at time period *t* and μ is the average arithmetic return for asset *i*. The standard deviation is the square root of the variance thus:

$$\sigma_i = \sqrt{Var(i)} = \sqrt{\frac{\sum(a_{it}-\mu)^2}{N}} \tag{8}$$

3.3 Jensen's Alpha

Jensen Alfa is a measure of how much *excess return* a fund is generating which is not explained by the CAPM-model. Calculated as

$$\alpha_{fund} = \overline{r_{fund}} - [\bar{r}_f + \beta_{fund} * (\overline{E(r_M)} - \bar{r}_f)] \tag{9}$$

where β_{fund} is calculated by the formula (6) using one of the chosen market indices (MSCI or OMX) when covariance is calculated and variance of the market index , $\overline{E(r_M)}$ and $\bar{r}_f$ are average arithmetic historical returns of the chosen market index and of the risk-free rate.

The estimates of β_{fund}, $\overline{E(r_M)}$ and $\overline{r_f}$ are then inserted into the formula for **expected return-beta relationship** for CAPM, namely eq.(5). The estimate of $\overline{r_{fund}}$ calculated as the arithmetic average of the historical returns of the fund by eq (4). If Jensen alpha is positive then the fund has performed better on average than the compared index. It means that this fund historically has contained the right composition of the securities and the T-bills which together has made better return than the compared index.

3.4 Sharpe ratio

Sharpe ratio measures excess return of a fund in relation to the standard deviation of these returns. The ratio is expressed as the number of units extra return per one unit of standard deviation of the returns (Bodie, 2011, p 850). The standard formula is:

$$Sharpe\ ratio = \frac{\overline{r_{fund}} - \overline{r_f}}{\sigma_{fund}} \qquad (10)$$

where $\overline{r_{fund}}$ is the arithmetic average of the historical returns of the fund (same as in eq.4), $\overline{r_f}$ is the average of historical returns of the risk-free rate and σ_{fund} is the standard deviation of the fund's returns for the same time period. The ratio presupposes that $\overline{r_{fund}}$ is on average bigger than $\overline{r_f}$ in order to use this standard equation, otherwise a modified version of Sharpe ratio has to be used because the reliability of this measure decreases (Israelsen, 2004) but the modified version of the Sharpe ratio will not be used here.

3.5 Treynor ratio

The numerator of this ratio is same as of Sharpe ratio, the difference is just the denominator where beta-value, β_{fund}, of the given fund is used. The beta value is calculated by eq.(6). The ratio measures how the excess return of the fund is related to the fund's beta value or in other words to the systematic risk. Treynor ratio is complementary to Sharpe ratio. High values of both Sharpe- and Treynor ratio indicate that it is a big reward both for the fund's general volatility and fund's volatility in relation to market movements. The standard formula for Treynor ratio (Bodie, 2011, p 850) is:

$$Treynor\ ratio = \frac{\overline{r_{fund}} - \overline{r_f}}{\beta_{fund}} \qquad (11)$$

where β_{fund} is the beta of the measured fund calculated by eq.(6). When comparing the Treynor measure for different funds one has to be aware that the betas for these funds have been derived from the same market index. In this paper betas for different funds are calculated with respect to MSCI-index and the OMX-index, forming two groups depending on which index that has been used.

3.6 The regression to estimate Alpha and Beta

In this part the single index model is used with the regression to evaluate how much the expected values of Jensen alfas and betas from the CAPM model coincide with the actual realized values of alfas and betas (Bodie, 2011, p 322) for the same funds. The t-statistics was applied to estimate the parameters. Only one benchmark market index was used for each fund. How the market index was chosen for each fund will be explained later. The original regression equation has the following form:

$$r_{fund,t} - r_{f,t-1} = \alpha + \beta * [r_{m,t} - r_{f,t-1}] + e_t \qquad (12)$$

where the rate of return for a fund, $r_{fund,t}$, during time-observation t is calculated using eq.(3), the rate of return of the benchmark market index, $r_{m,t}$, is also calculated by eq.3 but instead of NAV-rate the index level is used for every time observation. The risk-free rate is used but for every regression sequence the risk-free rate for the previous period is used – this technique is common and is used by several researchers (Schröder, 2004). The random error term is denoted as e_t. The independent variable is $[r_{m,t} - r_{f,t-1}]$, the excess return of the market and the dependent variable is $[r_{fund,t} - r_{f,t-1}]$ which is the excess return of the fund. By the regression eq. (12) the alfa: α and the beta: β and the coefficient of determination, R^2, can be estimated. The coefficient of determination is how much of the variation of the dependent variable is explained by the regression model (Hill, 2012, p 136). The level of significance was chosen to 5 % and the corresponding probability value, or the p-value, was estimated for each regression both for alfa-values and beta-values. Using the p-value rule in this context implied that an estimated parameter was not significantly different from zero if the corresponding p-value was bigger than 5%. If the corresponding p-value was equal or less than 5% then the estimated parameter was significantly different from zero.

The same market proxies are used as in the first part. For funds with 50% of or more of it's capital invested in non-swedish companies the MSCI-world index that tracks stock performance around the world. The other index is OMXS30 index that tracks stock performance for Swedish companies was used for funds which invest 50% or more of it's capital in Swedish companies.

Usually, when making a regression, the original eq. (12) is not used but transformed into the logarithmic form in order to make dependent and independent variables more normally distributed (Hill, 2012, p 152). Using the approximation formula for natural logarithms (Hill, 2012, p 153), $ln(1+x) \approx x$, for small values of x, the left hand side of eq.(12) can be approximated by

$$r_{fund,t} - r_{f,t-1} \approx (ln\,(1 + r_{fund,t})) - (ln(1 + r_{f,t-1})) \qquad (13)$$

The same technique is applied to the right-hand side of the formula (12).

$$r_{m,t} - r_{f,t-1} \approx (ln\,(1 + r_{m,t})) - (ln(1 + r_{f,t-1})) \quad (14)$$

This transformation makes estimated Alpha's and Beta's more accurate (Schröder, 2004).

The standard errors in the logarithmic form of regression (12) are tested for the possibility of autocorrelation by the Breusch-Godfrey LM- test and if the autocorrelation is present then standard errors are corrected to the HAC-standard errors (Hill, 2011).

This method is used by several researchers (Schröder, 2004). The estimated betas and alphas are then compared to the ones calculated in the first part by the CAPM-model.

It shall not be a surprise if the estimated betas of the funds are equal or almost equal to those calculated by the CAPM-model. The detailed explanation can be found in literature (Bodie, 2011, p 322) and is based on that market returns are not correlated with random error terms e_t, meaning also that covariance is equal to zero: $Cov(r_{m,t}, e_t) = 0$

3.7 The regression to estimate the market timing of the fund

In this paper an additional regression was made with purpose to determine if a fund used *market timig* opportunity in order to increase the revenue of the fund. The regression and theory behind are taken from Henriksson (1984). The regression equation, which is time series data, has the following form

$$r_{fund} - r_f = \alpha + b(r_M - r_f) + c(r_M - r_f) * D + e_t \quad (15)$$

where D is a dummy variable equal to one if $r_M > r_f$ and zero otherwise. A fund exploits market timing opportunities if the estimated parameter,c, from the regression (15) is significantly positive with 5% significance level.

4. DESCRIPTIONOF THE FUNDS

4.1 Different types of funds

Sustainable funds – These funds are focusing on "normal" companies that through different measures are considered as following certain standards for environmental effects, as well as staff conditions and societal effects (Bronner; Lundgren, 1999). It can be done by including companies that extensively work towards limiting their effect on their environment. It can also be done by excluding companies that show negative effects on the environment. Many surveys are conducted in which companies are graded in their implementations of SRI standards. For the past six years, a Canadian magazine called "Corporate Knight" has produced a report called "Global 100" (Global 100, 2011), a report listing the 100 top global sustainable companies. In this report, concern is taken to waste, carbon, energy, water efficiency as well as diversification in the staff, safety routines and some additional factors (Global 100, 2011). These are the types of criteria that are taken into concern when managing a sustainable fund.

Non-profit funds – Non-profit funds are funds which aside from often having an outspoken goal of only including companies that fulfill certain environmental standards, also donate some percentage to environmental organizations each year, although in the case of SEB WWF funds, a requirement is a positive return for the current year (Bronner; Lundgren, 1999).

Clean tech funds – Clean tech funds are funds that to the most part invest in companies that work with limiting the effects on nature, made by the human hand. Such areas are recycling, solar, wind and water power, water purifying and waste disposal. (Bronner; Lundgren, 1999)

4.2 The funds

Here we will give a short presentation of each of the funds. Further information in detail is given in the appendix.

4.2.1 Sustainable funds

Öhman Nordisk Miljöfond **-** The fund invests in Nordic companies that the fund management company, it operates in an environmentally sustainable manner

SEB Etisk Globalfond - This mutual fund invests primarily in equity securities and equity securities in different industries and regions worldwide, and takes ethical considerations in the selection of investments

Dexia Sustainable World - The Fund invests globally in companies that are ethically, socially and environmentally responsible.

Swedbank Robur Talenten aktiefond - The fund is a broad equity fund that invests in Sweden and globally. The Fund will follow the Swedish Church's financial policy and thus has extensive sustainability and ethical criteria.

SEB Etisk Sverigefond - The fund invests mainly in large companies on the Swedish stock market. The fund follows ethical constraints based on the Global Ethical Standard, GES.

(Morningstar.se, [2011-12-06])

4.2.2 Non-profit funds

Banco Funds Ideell Miljö - The fund is a fund that invests in Swedish equities. The fund follows extensive sustainability and ethical criteria with emphasis on the environment. The fund is nonprofit and annually, an amount equal to one percent of the fund's value at the end of each financial year is distributed to affiliated non-profit organizations.

Skandia Världsnaturfond - The fund invests in Swedish equities and equity-related securities 2 percent of fund's assets are every year donated to the World Wildlife Fund.

SEB Östersjöfond/WWF - The fund is a broad Nordic equity fund investing primarily in large and medium-sized companies. The fund pays 1% of its assets in dividend to the Foundation World Wildlife Fund "WWF's" The Baltic Sea Project, given that the fund assets will increase by at least one percent in a year.

(Morningstar.se, [2011-12-06])

4.2.3 Clean Tech Funds

Nordea Klimatfond - Nordea Klimatfond invests globally in equities. The fund invests in companies that have the potential to provide returns by benefiting from more efficient use of world resources and development related to climate.

Swedbank Robur Effektiva Världen - An equity fund that invests globally in industries and companies through its products and / or services offer solutions related to sustainable use of natural resources, pollution, and increased social welfare

BNP Paribas L1 Green Future - BNP Paribas L1 Green Future is a global equity fund that invests in businesses that affect the environment positively

UBS Equity Fund Global Innovators B - The fund mainly invests in innovative enterprises in renewable energy, energy efficiency, transport, water and health and nutrition.

Edmond de Rothschild Ecosphere - The fund invests in companies that specialize in alternative energy sources or develop solutions to manage environmental impacts.

F&C Global Climate Opportunity A - The Fund invests globally in companies which have their primary area of activity in sectors related to climate issues, including alternative energy, waste management, materials development, forestry, agriculture and water.

Save Earth Fund - Save Earth Fund invests globally in renewable energy, environmental engineering and water management through the purchase of actively managed funds, ETFs and stocks

Blackrock GF New energy - The fund invests in companies operating in the market for alternative energy or energy technology.

Pictet Clean Energy - Mutual fund strategy for capital growth is to invest at least two-thirds of assets in equities issued by companies that contribute to reducing emissions of carbon dioxide

Sarasin New Power - The fund invests primarily in companies that have a far-sighted and innovative approach to the use of energy and whose commitment to sustainability also takes into consideration environmental and social aspects

Handelsbanken Ny Energi - The Fund is an actively managed equity fund whose objective is to achieve the highest value growth by investing in companies developing or using technologies and methods to limit global warming.

(Morningstar.se, [2011-12-06])

5. RESULTS

5.1 Returns and risk

See table 1. The highest return with no respect to the risk taken for the 157 week period is given from the Swedish market index. From the background of this, it seems natural that two out of the top three funds, when only considering returns, are heavily weighted towards the Swedish Market. The top three funds with highest returns are SEB Etisk Sverigefond, Banco Ideell Miljöfond and Skandia Världsnaturfonden with positive returns of 16,30 %, 16.24 % and 13.87 % per year respectively. It is noted that amongst the top four funds, none is a clean tech fund. Amongst the top three worst performing funds are Edmond de Rotschild Ecosphere A, Sarasin New Power and Swedbank Robur Effektiva Världen with a negative return of -6.04 %, -2.78 % and -2.31 % respectively. These are all global clean tech funds. In fact only 3 out of 19 funds outperformed its respective benchmark index. These funds are Swedbank Robur Talenten, Dexia Sustainable World and F & C Global Climate Change.

When concern is taken to only volatility i.e. the standard deviation, the lowest risk is provided from the global funds: Save Earth Fund, SEB Etisk Globalfond and Dexia Sustainable World with a volatility of respectively. What is common for these funds is that the funds can be said to have very diversified contents. The Save Earth Fund invests mainly in other global clean tech funds which means that although some of the funds may contain the same stocks to some part, its holdings is most likely very spread out which fits well to the low volatility. In addition, the largest percentage held in one single stock within SEB Etisk Globalfond and Dexia Sustainable World is are 1,4 % and 2,7 % out of total fund wealth respectively, which can be considered as very low. This goes in hand with the CAPM theory where the risk is said to decrease the more diversified a portfolio is. The global diversification strategy from the funds mentioned above does not only provide a diversification and elimination of idiosyncratic risk, it also provides a decrease of the regional systematic risk i.e. the effects of certain stocks markets.

The highest volatility is given by Banco Ideell Miljöfond, followed by Pictet Funds Clean Energy 1 and the Swedish market index. Banco Ideell Miljöfond can be assumed to have a high volatility since it is not very well diversified. It contains almost 10 % in H&M as well as Ericsson, Nordea and Volvo. This means that the fund is to almost 40 % dependent on these four equities, which of course has an effect on the volatility. This goes in line with the CAPM where the level of diversification i.e. the number of stocks and the regional as well as branch exposure determines the risk. Pictet Funds Clean Energy 1 and the Swedish Market index are somewhat more surprising to make the top three volatile returns. The Index is of course well diversified and according to the CAPM, it should provide a lower risk. Pictet Fund is a global fund investing mainly in equity and is also somewhat surprising to be among the most volatile funds as it has few equities and cannot be considered to be well diversified.

5.2 Sharpe measure

Sustainable Funds	Yearly returns	Standard deviation	**Sharpe Ratio**
Global Funds			
Dexia Sustainable World C Cal	10,17%	18,61%	**0,52**
Swedbank Robur Talenten	13,25%	19,57%	**0,68**
SEB Etisk Globalfond	6,58%	16,96%	**0,39**
MSCI World	9,82%	21,05%	**0,47**
Swedish Funds			
Öhman Nordisk Miljöfond	9,42%	20,40%	**0,46**
SEB Etisk Sverigefond	16,30%	21,94%	**0,74**
OMX	17,46%	24,92%	**0,70**
Non-profit Funds			
Skandia Världsnaturfonden	13,87%	24,29%	**0,57**
SEB WWF/Östersjöfond	9,74%	20,98%	**0,46**
Banco Ideell Miljöfond	16,24%	25,47%	**0,64**
OMX	17,46%	24,92%	**0,70**
Clean Tech Funds			
Edmond de Rotschild Ecosphere	-6,04%	23,62%	**-0,26**
Nordea Klimatfond	3,69%	22,98%	**0,16**
Sarasin New Power B	-2,78%	23,20%	**-0,12**
Pictet Clean Energy Fund 1	7,57%	25,31%	**0,30**
BNP Paribas L1 Green Future	5,20%	22,52%	**0,23**
UBS Global Innovators B	1,70%	20,48%	**0,08**
F & C Global Climate Opportunity	10,63%	19,44%	**0,55**
Save Earth Fund	4,90%	16,87%	**0,29**
Blackrock	3,83%	24,06%	**0,16**
Handelsbanken Ny Energi	9,63%	21,29%	**0,45**
Swedbank Robur Effektiva Världen	-2,31%	20,72%	**-0,11**
MSCI World	9,82%	21,05%	**0,47**

Table 1: Sharpe Ratios. Source: Handelsbanken webpage, Datastream. Green identifies funds outperforming indices, indices are shown in blue.

The Sharpe measure shows us the excess return divided by the funds' total risk measured by the standard deviation of its returns. This measure, in contrast to absolute returns, will give us the funds' reward to its variability. In other words, are the funds that are taking big risks getting it back in terms of returns?

As can be seen from the table 1, four out of 19 funds outperformed its indices. What can be added is that although the Sharpe ratio doesn't state by how much the reward to variability of a superior fund outperforms another, F&C Global Climate Opportunity as well as

Handelsbanken Ny Energi and SEB Etisk Sverigefond can all be considered to almost match the Sharpe ratio of their respective indices, although not outperforming them. It seems the funds are not getting a return that is in line with the level of risk it takes.

The Sharpe Ratio can be considered to be a good measure when a portfolio is well diversified. This applies to almost every fund, thus the Sharpe Ratio gives us a good indication of how well the funds perform.

5.3 Treynor measure

Sustainable Funds	Yearly returns	Beta	**Treynor Ratio**
Global Funds			
Dexia Sustainable World C Cal	10,17%	0,28	**0,35**
Swedbank Robur Talenten	13,25%	0,37	**0,36**
SEB Etisk Globalfond	6,58%	0,24	**0,27**
MSCI World	9,82%	1,00	**0,10**
Swedish Funds			
Öhman Nordisk Miljöfond	9,42%	0,19	**0,48**
SEB Etisk Sverigefond	16,30%	0,58	**0,28**
OMX	17,46%	1,00	**0,17**
Non-profit Funds			
Skandia Världsnaturfonden	13,87%	0,30	**0,47**
SEB WWF/Östersjöfond	9,74%	0,26	**0,37**
Banco Ideell Miljöfond	16,24%	0,28	**0,58**
OMX	17,46%	1,00	**0,17**
Clean Tech Funds			
Edmond de Rotschild Ecosphere	-6,04%	0,41	**-0,15**
Nordea Klimatfond	3,69%	0,26	**0,14**
Sarasin New Power B	-2,78%	0,41	**-0,07**
Pictet Clean Energy Fund 1	7,57%	0,15	**0,50**
BNP Paribas L1 Green Future	5,20%	-0,11	**-0,46**
UBS Global Innovators B	1,70%	0,32	**0,05**
F & C Global Climate Opportunity	10,63%	0,31	**0,34**
Save Earth Fund	4,90%	0,13	**0,38**
Blackrock	3,83%	0,50	**0,08**
Handelsbanken Ny Energi	9,63%	0,54	**0,18**
Swedbank Robur Effektiva Världen	-2,31%	0,52	**-0,04**
MSCI World	9,82%	1,00	**0,10**

Table 2: Treynor Ratios. Source: Handelsbanken webpage, Datastream. Green identifies best of subgroup performance, indices are shown in blue.

The Treynor measure shows the excess return divided by its Beta risk, in other words its systematic risk. For the 157 periods we've noted quite low betas overall, ranging from as low as -0.114 to 0.58 with a total Beta average for the 19 funds of 0.325.

The highest ratio is given from Banco Ideell Miljöfond, Skandia Världsnaturfond and Öhman Nordisk Miljöfond with 0.50, 0.40 and 0.37 respectively. The lowest are given from BNP Paribas L1 Green Future, Edmond de Rotschild Ecosphere A and Sarasin New Power B, with ratios of -0.25, -0.21 and -0.21 respectively.

Within the non-profit funds and the sustainability funds, all the funds outperformed their indices. Within the clean tech funds category, 4 out of 11 funds outperformed their indices.

In total, 12 out of 19 funds outperformed their indices when calculating the Treynor Ratio.

5.4 Jensen's Alpha

Sustainable Funds	Yearly returns	Beta	**Jensen's Alpha**
Global Funds			
Dexia Sustainable World C Cal	10,17%	0,28	**4,03%**
Swedbank Robur Talenten	13,25%	0,37	**8,26%**
SEB Etisk Globalfond	6,58%	0,24	**0,76%**
MSCI World	9,82%	1,00	
Swedish Funds			
Öhman Nordisk Miljöfond	9,42%	0,19	**2,15%**
SEB Etisk Sverigefond	16,30%	0,58	**3,32%**
OMX	17,46%	1,00	
Non-profit Funds			
Skandia Världsnaturfonden	13,87%	0,30	**5,49%**
SEB WWF/Östersjöfond	9,74%	0,26	**1,69%**
Banco Ideell Miljöfond	16,24%	0,28	**7,53%**
OMX	17,46%	1,00	
Clean Tech Funds			
Edmond de Rotschild Ecosphere	-6,04%	0,41	**-14,44%**
Nordea Klimatfond	3,69%	0,26	**-2,29%**
Sarasin New Power B	-2,78%	0,41	**-10,69%**
Pictet Clean Energy Fund 1	7,57%	0,15	**0,98%**
BNP Paribas L1 Green Future	5,20%	-0,11	**2,17%**
UBS Global Innovators B	1,70%	0,32	**-5,89%**
F & C Global Climate Opportunity	10,63%	0,31	**3,19%**
Save Earth Fund	4,90%	0,13	**1,13%**
Blackrock	3,83%	0,50	**-4,87%**
Handelsbanken Ny Energi	9,63%	0,54	**1,03%**
Swedbank Robur Effektiva Världen	-2,31%	0,52	**-9,93%**
MSCI World	9,82%	1,00	

Table 3: Jensen's Alpha. Source: Handelsbanken webpage, Datastream. Green shows undervalued funds, red show overvalued funds.

The Jensen's Alpha shows that a majority of our funds are actually underpriced. For the sustainable and non-profit funds, all funds seem to be performing better than projected by the CAPM from its systematic risk. For the clean tech funds, 6 out of 11 show negative Alpha values, a slight majority. In total, 13 out of 19 funds are underpriced by the Jensen's Alpha measure.

5.5 The regression results

5.5.1 The alpha values of funds

The results of the regression by the single index model are displayed with appendix 2. The intercept of the regression can be compared to the Jensen's alpha in the CAPM-model. The regression has been used for all 19 funds. The significance level of 5% has been used. In the column of the regression results, the funds have been ranked in the descending order with respect to the value of the intercept. In the third column from the left a corresponding Jensen's alpha from the CAPM-model has been displayed with the ranking number within the parenthesis. In the column of the regression estimates the p-values have been presented within the parenthesis for all 19 funds. The p-values are displayed below each intercept estimate. The column to the right displays the coefficient of determination from the regression. The ranks are denoted within the parenthesis with the bold style.

As one can see all this p-values are bigger than the significance level of 5% (0,05 in the decimal form). This means the acceptance that the correct value of intercept estimate is zero for all 19 funds provided that the probability distributions of intercept values follow the t-distribution.

The most positive estimate of intercept is for Swedbank Robur Talenten which equals to 7,68 % in the annual basis and uses MSCI word index as the benchmark with only 15,94% of the variation of the fund returns explained by the model. The most negative is for Edmond de Rotchild Ecosphere which also uses MSCI world index as benchmark with 14,3% of the variation of the fund returns explained by the model.

Comparing the intercepts from the regression with the results of Jensen's alpha obtained by the CAPM-model one can see that there are differences among them although not big. The ranking of funds follow similar patterns for these two approaches. For example, Edmond de Rotchild Ecosphere ended up on the last place both in the single index model and in the CAPM-model. But Swedbank Robur Talenten had the highest intercept in the regression which don't coincide with the fund which obtained highest Jensen's alpha in the CAPM-model, namely Banco Ideell Mijöfond with the Jensen's alpha of 9,23% in the annual form. Only 8 of 19 funds coincide with the ranking order comparing the intercept from the regression and the Jensen's Alfa from the CAPM model.

5.5.2 The beta values of funds and estimation of market timing

Appendix 3 is constructed in the same way as the previous one. This chart displays the estimates of beta-values obtained by the applying regression in the single index model. These values are displayed in the second column from the left, followed by corresponding values from the CAPM-model. There are also p-values displayed in the percentage form in the regression column below each estimate of the beta-value for every fund. The significance level is chosen to 5%. The p-values for most of the funds are below 5% meaning that we can reject the hypothesis that the true value of beta is equal to zero. Only for the three funds the p-value is above 5% , the highest of these is for BNP Paribas L1 Green Future which have a p-value of 36,90% and a negative estimate of the beta-value of -0,11. Given a very low coefficient of determination for BNP Paribas L1 Green Future namely 0,97% it is not surprisingly that the p-value is so high meaning that the variation of the returns from the MSCI world index have practically no influence and explanation power for the variation of returns of the this fund. As one can see there is an overall tendency that the higher beta-values correspond to the higher coefficients of determination. The ranks coincide for 16 of 19 funds if these are compared for regression and CAPM-model. The conclusion is that beta-values coincide much better between single index model and CAPM-model in comparison to how Jensen alpha coincide between these two models.

At last Henriksson and Merton model was applied to all 19 funds. As before the OMX30 benchmark index was applied to the 5 funds which invested more than 50 % of its investment capital into the Swedish assets and for the rest of the funds MSCI world index was used. The results showed that funds exhibited modest market timing abilities. In fact 3 funds of 19 showed significant values of the market timing coefficient but this coefficient was for all 3 funds negative. The most significant negative market timing coefficient was detected for BNP Paribas L1 Green Future with a corresponding value of -0, 9197971. For the rest of the funds the market timing coefficient was insignificant with 5% significance level. However, no more focus will be directed towards the market timing as it was performed as an econometric experiment with little possibility of being relevant to our funds as they have only a small percentage in the money market and cannot be assumed to try to stay out of the market in bad market conditions. One could however interpret the results as a verification of the data being correct. The fact that no fund show significant positive market timing coefficient, makes the case that our data seem valid. It might have been worrying to find results that claimed that the funds were in fact trying to time the market.

5.6 Fees

Sustainable Funds	Yearly returns	Standard deviation	**Fees**
Global Funds			
Dexia Sustainable World C Cal	10,17%	18,61%	**1,50%**
Swedbank Robur Talenten	13,25%	19,57%	**0,50%**
SEB Etisk Globalfond	6,58%	16,96%	**1,50%**
MSCI World	9,82%	21,05%	
Swedish Funds			
Öhman Nordisk Miljöfond	9,42%	20,40%	**1,70%**
SEB Etisk Sverigefond	16,30%	21,94%	**1,30%**
OMX	17,46%	24,92%	
Non-profit Funds			
Skandia Världsnaturfonden	13,87%	24,29%	**1,40%**
SEB WWF/Östersjöfond	9,74%	20,98%	**1,50%**
Banco Ideell Miljöfond	16,24%	25,47%	**1,70%**
OMX	17,46%	24,92%	
Clean Tech Funds			
Edmond de Rotschild Ecosphere	-6,04%	23,62%	**2,00%**
Nordea Klimatfond	3,69%	22,98%	**1,50%**
Sarasin New Power B	-2,78%	23,20%	**1,75%**
Pictet Clean Energy Fund 1	7,57%	25,31%	**2,30%**
BNP Paribas L1 Green Future	5,20%	22,52%	**1,75%**
UBS Global Innovators B	1,70%	20,48%	**2,04%**
F & C Global Climate Opportunity	10,63%	19,44%	**2,00%**
Save Earth Fund	4,90%	16,87%	**1,00%**
Blackrock	3,83%	24,06%	**1,75%**
Handelsbanken Ny Energi	9,63%	21,29%	**1,50%**
Swedbank Robur Effektiva Världen	-2,31%	20,72%	**1,10%**
MSCI World	9,82%	21,05%	

Table 4: Administration fees. Source: Morningstar webpage. Top five cheapest funds are displayed in green, top five most expensive funds are shown in red.

For the sustainable funds the average administration fee is 1.3 % per year of the invested capital. For the non-profit funds the average is 1.533 % and for the clean tech funds you will, on average, have to pay 1.70 % of your invested capital for the services received. All fees are regardless of the performance of the funds.

In this table, the funds are sorted by absolute returns, from highest to lowest. We can see from the table that two of the most expensive funds are among the bottom four performing funds. Top five cheapest funds are shown in green while top five most expensive funds are shown in red. There is a clear tendency towards the cheaper funds performing better in absolute returns and vice versa.

6. ANALYSIS

It might be accurate to assume that there will be a cost of investing environmentally. For instance, previous research made by Per Larsson and Mårten Jönsson at the University of Lund in 2003 indicated in comparable studies that this is feasible. In this study, in a three year period between 99-11-01 and 02-10-31 six out of ten funds environmental funds underperformed the market, measured both by pure returns and the Sharpe ratio. Additionally, seven out of ten funds showed inferior Treynor ratios as well as negative expected Jensen's Alpha values estimated by CAPM-model. In the same research, additional, longer periods were investigated with similar results. From the background of these results, we imagined that there would be a cost attached to investing environmentally.

However, it seems from the results from our research, based on their performance during the conditions the financial markets have experience for recent years, that investing in environmental funds would be a very bad decision. The fact that as many as 16 out of 19 funds underperform their indices in terms of pure returns, and 15 out of 19 in terms of the risk-adjusted measure called Sharpe Ratio shows that something out of the extraordinary has taken place for these funds for the past three years.

Although financial markets has shown exceptional unpredictability and volatility over recent years, it is important to underline that the Swedish market index for the past 157 weeks has a total return of 52,75% and the global MCSI World Index experienced an increase of 29,67 %. During these circumstances it is surprising to find four out of eleven global clean tech funds showing negative returns.

A possible explanation for these results might be the effects on policy makers due to the effects the financial crisis. According to a study made by SIFO, the interest for environmental issues increased in Sweden after the release of Al Gore's film "An Inconvenient Truth" (Callius, 2011). Following this increase, the Swedes interest decreased in the aftermath of the financial crisis (SvD, 2011). The environmental politics also suffered a downfall where politicians seem to choose between the economy and the environment (Mellin, 2011) and the branches suffered losses, a decrease by 12 % between 2008 and 2009 within the clean teach sector in Sweden (Swentec, 2011). The explanation would then be that with the Kyoto Protocol to prove its biggest effects between 2008 and 2012 (Grubb, 2003), expectations from investors were high on the environmental funds, especially the clean tech companies. With governments eager to encourage and maybe to some part subsidize environmental friendly and clean tech companies, this might have seemed to be a good long term investment by the later years of the 2000 decennia, pushing the prices on these equities upwards. With the financial and debt crisis taking up more and more of politicians' as well as business leaders' time and money, and less for expensive investments, the market's logical

reaction would be to lower its expectations on these companies, effectively yielding low rates of return for the funds in our research.

Table 5: Global Clean Energy index performance

Possible evidence of this can be claimed from one of the WilderHill Clean Energy Index, which outperformed global indices up until the middle of 2008 where the two trends crossed. After the massive drop during the fall of 2008, the global trend was regaining in a path towards the levels of early 2008 while the clean tech index continued downwards. This also explains the low covariance with indices we've seen for a lot of funds. It may also be one of the explanations to why so low beta-values were estimated by the single-index model for all 19 funds. In fact, this model estimated the highest beta-value as low as 0,58 and the highest coefficient of determination equal to 44,14% for SEB Etisk Sverigefond when OMX index was used. These numbers show that funds studied have a relative low market systematic risk if OMX or MSCI-index is taken as a proxy for market. The conclusion can be made that environmental funds have low market systematic risk but the funds studied may still have big fund-specific risks because of massive drops of environmental indices such as WilderHill Clean Energy Index which reflects specifically how environmental fund industry developed over time.

Further proof of the effects of the financial crises is endorsed by information given by the Save Earth Fund webpage, stating that politicians neglecting environmental issues can have a negative effect on the performance on the fund.

Additionally, a further problem for the environmental funds is the relatively high administration fees. The average administration fee for equity funds in Sweden is 1,4 % per year (Fondbolagens förening, 2011). 13 out of 19 funds examined cost 1,5 % or more, making them more expensive than the Swedish average. The clean tech funds are the most expensive, an average fee of 1,70 %. This of course has an effect on the returns of the funds. The best performing fund, Swedbank Robur Talenten, has a yearly fee of 0,50 % compared to the most expensive fund, Pictet clean energy fund which administration fee amounts to 2,30 %, almost five times as high. This means that the underlying stocks would have to perform

almost two percentage units better for the clean tech fund in order to match the Robur Talenten fund.

It is also relevant to discuss the fund market as a whole, and its capacity to match the market performances. According to JP Morgan European Chief Executive, the European fund market is inefficient because it simply has too many funds (di.se, 2011), 35000 in total compared to the American market which has a mere 7000, a fifth of the European market supply of funds. This makes the funds on average smaller with less fund capital, forcing managers to charge higher fees and in turn making the returns lower. This of course has no effect on our comparison since fees are excluded from NAV rates. This would however to some part further strengthen the funds' inability to match the market indices, although this is of the case no matter if the fund has an environmental policy or not.

Some positive results are shown from the Treynor ratios, where 12 out of 19 funds succeed in outperforming the market. An especially well performance was provided by the Swedish funds together with the global sustainable funds. However, it's worth mentioning that the Betas for the funds are surprisingly low. This might have to do with lacking data for a few funds where instead of, for instance NAV rates for Tuesday, rates from the previous Friday is used. This affects the covariance with the market indices, which in turn affects the Betas. This is however always a problem within funds which contains global equities with different stock exchanges and different trading hours. On the other hand, low extreme beta values can always be expected in volatile times. These funds might thus be considered as good for diversification purposes, if for instance an investor wants to decrease its exposure to the market, these funds seem to provide a good alternative for off putting market exposure.

Another obvious reason for the low beta values is that funds that invest in a specific branch might not be considered as well diversified as it is exposed to a certain industry. For well diversified portfolios, the Treynor and Sharpe Ratio should offer the same result as the unsystematic risk is diversified away. The fact that the two differ greatly would show proof that some of the funds are not so well diversified.

Further proof of this can be given from the results of our measurement of our Jensen's Alphas. Here, 13 out 19 funds showed predicted positive Alpha values which mean that according to the CAPM, they are in fact underpriced. This is because their return is greater than what would be expected from their respective betas. Again it must be stressed that by applying single index model the estimated realized alfas showed no statistically significant values with 5% significance level therefore the positive predicted alfas by CAPM may be questioned.

It seems that if the CAPM is correct, implying an efficient market in equilibrium, investing environmentally might be a good investment. However it is important to underline that

these funds are not to hold as a portfolio by itself but can be added to an already diversified portfolio.

7. SUMMARY AND CONCLUSIONS

It seems there is a paradox existing within environmental investing. While the primary market is expanding and environmentally orientated companies are getting more common, our financial evidence points to the fact that their returns largely underperform the market.

Amongst the funds examined, the best performing funds are the Sustainable funds, which overperform the indices by all measures except the Sharpe Ratio. However their actual environmental niche can be questioned.

If the assumptions of the CAPM are valid, environmental funds slightly outperforms the indices. However, in more traditional measures such as mean return and the Sharpe ratio, it seems that the environmental funds greatly underperform the market. In total, the clean tech funds greatly underperform their index.

This can be because of a number of reasons. A few possible reasons mentioned are relatively high fees for these types of funds and the inefficiency of the European fund market. Further reason is an overpricing on the entire environmental-oriented market based on left out political will. This would point to the fact that as a single investment, these environmental funds have been a bad alternative. However, as a means of diversification they can actually be a good alternative. Their low correlation with the market could be a possible means for an investor looking to decrease its market exposure.

If the current debt crisis is overcome, and political will for environmental change is once again retaken, we see potential for these funds to grow rapidly.

8. SUGGESTIONS FOR FURTHER RESEARCH

This research was made in the aftermath of a financial crisis, in the currents of a debt crisis. Suggestions for further research would be to basically make the same research in five years to see how the funds would perform under different market conditions.

Also, once made available, it would be preferable to compare these types of funds over a longer time period.

Finally, for a research with more time and perhaps more invasive data sources, more indices would be used for a fair comparison of fund performance against the market index.

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APPENDIX 1

Sustainable funds

Öhman Nordisk Miljöfond

The fund invests in Nordic companies that the fund management company, it operates in an environmentally sustainable manner and that the long-term conditions for good growth. The environmental assessment carried out in collaboration with the GES Investment Services.

Fund company		Öhman Fonder	
Region		57 % Sweden, 43 % Europe	
Distribution		100 % eq.	
Fees		1,70%	
Branches	%	**Largest possession**	%
Industry	32,6	Novo Nordisk A/S	7,7
Financial service	16,4	Hennes & Mauritz AB	6,9
Health	11,3	Ericsson Telephone C..	5
Consumer	9,1	Volvo Corporation	4,8
Tech	8,5	TeliaSonera AB	4,5

SEB etisk globalfond

This mutual fund invests primarily in equity securities and equity securities in different industries and regions worldwide, and takes ethical considerations in the selection of investments. The fund follows ethical constraints based on the Global Ethical Standard (GES), which is based on international standards of human rights, labor, environment, bribery, corruption and weapons. It also refrains from investing in companies whose main business is weapons, alcohol, tobacco, gambling and pornography. A company is excluded if more than 5 percent of its turnover derived from activities in these industries.

Fund company		SEB Inv. Mgmt AB	
Region		Global	
Distribution		100 % eq.	
Fees		1,50%	
Branches	%	**Largest possession**	%
Financial service	16,6	Apple, Inc.	1,4
Industry	15,4	Nestle SA	1,3
Power	11	International Busine..	1,3
Consumer cyclical	10,8	The Procter & Gamble..	1,2
Consumer Stable	8,9	Pfizer Inc	1,1

Dexia Sustainable world

The Fund invests globally in companies that are ethically, socially and environmentally responsible. The Fund's investments are not limited to any single industry or to any single geographic region.

Fund company		Dexia Asset Mgmt	
Region		Global	
Distribution		100 % eq.	
Fees		1,50%	
Branches	%	**Largest possession**	%
Financial service	17,4	PepsiCo Inc	2,7
Industry	12,8	Tyco International L..	2,3
Power	10,7	MasterCard Incorpora..	2
Consumer Stable	10,2	Exxon Mobil Corporat..	1,8
Health	10,1	Autodesk, Inc.	1,8

Swedbank Robur Talenten aktiefond

The fund is a broad equity fund that invests in Sweden and globally. The Fund will follow the Swedish Church's financial policy and thus has extensive sustainability and ethical criteria. That means light of corporate sustainability (environmental, human rights, labor rights and business ethics), association with the violations of human rights standards and the environment and access to sensitive items (weapons, armaments, alcohol, tobacco, gambling and pornography).

Fund company		Swedbank Robur Fonder AB	
Region		Global	
Distribution		98 % eq. 2 % interest	
Fees		0,50%	
Branches	%	**Largest possession**	%
Industry	24,61	Hennes & Mauritz AB	5,00
Financial Service	18,34	Ericsson Telephone Company	3,69
Consumer cyclical	12,03	Nordea Bank AB	3,60
Other	45,02	TeliaSonera AB	3,11
		Volvo Corporation	3,03

SEB Etisk Sverigefond

The fund invests mainly in large companies on the Swedish stock market. The fund follows ethical constraints based on the Global Ethical Standard, GES, based on international standards of human rights, labor, environment, bribery and corruption. Fund refrain from investing in companies whose main business is weapons, alcohol, tobacco, gambling and pornography. A company is excluded if more than 5% of turnover derived from the aforementioned sectors. The fund is able to use derivatives.

Fund company		SEB Asset Mgmt	
Region		90 % Sweden, 10 % Europe	
Distribution		99 % eq. 1 % interest	
Fees		1,30%	
Branches	%	**Largest possession**	%
Industry	29,30	Hennes & Mauritz AB	10,00
Financial Service	22,30	Ericsson Telephone C..	9,00
Consumer Cyclical	12,10	Nordea Bank AB	7,60
Communication services	10,60	TeliaSonera AB	6,10
Tech	9,1	Volvo Corporation	5,60

Charity funds:

Banco Funds ideell Miljö

The fund is a fund that invests in Swedish equities. The fund follows extensive sustainability and ethical criteria with emphasis on the environment. The investments shall be made in companies that are expected to be winners in a future sustainable society. The fund is nonprofit and annually, an amount equal to one percent of the fund's value at the end of each financial year is distributed to affiliated non-profit organizations.

Fund company		Swedbank Robur AB	
Region		86 % Sweden, 14 % Europe	
Distribution		98 % eq. 2 % interest	
Fees		1,70%	
Branches	%	**Largest possession**	%
Industry	37,50	Hennes & Mauritz AB	10,40
Consumer cyclical	16,70	Nordea Bank AB	9,60
Financial service	14,20	Ericsson Telephone C..	9,10
Tech	10,10	Volvo Corporation	7,90
Health	8	AstraZeneca PLC	4,90

Skandia Världsnaturfond

The fund invests in Swedish equities and equity-related securities, as well as in noted Swedish depository receipts for foreign shares. Normally, the fund is fully invested in stocks and keeps only a small liquidity for transactions. 2 percent of fund's assets are every year donated to the World Wildlife Fund.

Fund company		Skandia Fonder AB	
Region		91 % Sweden, 9 % Europe	
Distribution		97 % eq. 3 % interest	
Fees		1,40%	
Branches	%	**Largest possession**	%
Industry	25,20	Hennes & Mauritz AB	8,90
Financial service	18,80	TeliaSonera AB	8,70
Consumer cyclical	16,60	Ericsson Telephone C..	8,70
Tech	14,10	Nordea Bank AB	8,60
Communications services	11,8	Skandia Småbolag Sve..	7,80

SEB Östersjöfond/WWF

The fund is a broad Nordic equity fund investing primarily in large and medium-sized companies. The Fund is non-profit orientation and follows the WWF ethical guidelines, which means that the maximum 5% of turnover may be from alcohol, weapons, tobacco, petroleum and automotive industries. The fund pays 1% of its assets in dividend to the Foundation World Wildlife Fund "WWF's" The Baltic Sea Project, given that the fund assets will increase by at least one percent in a year.

Fund company		SEB Inv. Mgmt. AB	
Region		53 % Sweden, 47 % Europe	
Distribution		97 % eq. 3 % interest	
Fees		1,50%	
Branches	%	**Largest possession**	%
Industry	27,90	Novo Nordisk A/S	6,20
Financial service	18,30	Hennes & Mauritz AB	5,30
Tech	13,20	Ericsson Telephone C..	4,80
Consumer cyclical	12,50	Nordea Bank AB	3,60
Health	11,4	Swedbank AB	3,30

Clean Tech Funds

Nordea Klimatfond

Nordea Climate Fund invests globally in equities. The fund invests in companies that have the potential to provide returns by benefiting from more efficient use of world resources and development related to climate.

Fund company		Nordea Fonder AB	
Region		Global	
Distribution		99 % eq. 1 % interest	
Fees		1,50%	
Branches	%	**Largest possession**	%
Industry	56,60	LKQ Corporation	4,40
Raw materials	13,60	Linde AG	4,30
Tech	13,20	Quanta Services, Inc..	3,80
Consumer cyclical	6,20	Continental AG	3,30
Power	4,4	Nalco Holding Co	3,20

Swedbank Robur Effektiva Världen

An equity fund that invests globally in industries and companies through its products and / or services offer solutions related to sustainable use of natural resources, pollution, and increased social welfare. The Fund invests globally from six different themes: energy, materials, land and water, climate, atmosphere and air, biodiversity, and social welfare.

Fund company		Swedbank SA	
Region		Global	
Distribution		92 % eq. 2 % interest	
Fees		1,10%	
Branches	%	**Largest possession**	%
Industry	54,70	Aspen Pharmacare Hol..	8,60
Consumer Stable	11,30	Sweco AB	8,00
Health	10,40	Cereplast, Inc.	5,60
Consumer cyclical	8,70	AgriMarine Holdings ..	5,50
Municipal	8,1	GEA Group Aktiengese..	5,20

BNP Paribas L1 Green Future

BNP Paribas L1 Green Future is a global equity fund that invests in businesses that affect the environment positively. The fund is concentrated on three key environmental areas: Clean Energy, Water and Waste.

Fund company		BNP Paribas Inv. Partn. Lux	
Region		Global	
Distribution		100 % eq.	
Fees		1,75%	
Branches	%	**Largest possession**	%
Industry	53,80	GEA Group Aktiengese..	4,00
Raw materials	13,80	Yingde Gases Group C..	3,40
Tech	11,40	Nalco Holding Compan..	3,40
Municipal	9,70	ABB, Ltd.	3,40
Consumer cyclical	6,2	Regal-Beloit Corpora..	3,10

UBS Equity Fund Global Innovators B

The fund mainly invests in innovative enterprises in renewable energy, energy efficiency, transport, water and health and nutrition.

Fund company		UBS eq. Fund Global Innov. B	
Region		Global	
Distribution		97 % eq. 3% bond	
Fees		2,04%	
Branches	%	**Largest possession**	%
Industry	29,80	American Water Works..	3,20
Municipal	20,50	Thermo Fisher Scient..	3,10
Health	15,60	Ecolab, Inc.	3,00
Raw materials	12,30	Teva Pharmaceutical ..	3,00
Tech	11,2	Osaka Gas Co., Ltd.	2,90

Edmond de Rothschild Ecosphere

The fund invests in companies that specialize in alternative energy sources or develop solutions to manage environmental impacts. Geographically it invests mainly within the EU and Switzerland, Iceland and Norway, but also Asia and North America.

Fund company		Ed. de Rotschild As. Mgmt	
Region		Global	
Distribution		97 % eq. 3% bond	
Fees		2,00%	
Branches	%	**Largest possession**	%
Industry	48,00	ABB, Ltd.	6,20
Tech	19,8	Saint-Gobain	4,40
Raw materials	16,50	Siemens AG	3,60
Municipal	11,90	Groupe Eurotunnel SA	3,40
Consumer cyclical	3,8	EDP Renovaveis SA	3,30

F&C Global Climate Opportunity A

The Fund invests globally in companies which have their primary area of activity in sectors related to climate issues, including alternative energy, waste management, materials development, forestry, agriculture and water.

Fund company		F&C Management Limited	
Region		Global	
Distribution		96 % eq. 4% bond	
Fees		2,00%	
Branches	%	**Largest possession**	%
Industry	34,90	IHS, Inc. A	3,50
Tech	14,6	BG Group PLC	3,00
Raw materials	13,60	IntercontinentalExch..	3,00
Municipal	12,70	United Utilities Gro..	2,80
Consumer cyclical	11,5	Norfolk Southern Cor..	2,70

Save Earth fund

Save Earth Fund invests globally in renewable energy, environmental engineering and water management through the purchase of actively managed funds, ETFs and stocks. The geographic exposure is mainly Asia, Europe and North America and the fund usually holds more than 50% of assets in renewables and environmental technologies.

Fund company		CB Asset Management AB	
Region		Global	
Distribution		100% funds	
Fees		1,00%	
Branches	%	**Largest possession**	%
Industry	44,50	Sarasin Sustainable ..	17,20
Tech	17,1	Quest Cleantech C	17,20
Municipal	16,70	Pictet-Water-Pdy EUR	14,00
Raw materials	10,90	SAM Smart Materials ..	11,50
Consumer cyclical	3,7	First State As Pac S..	11,00

Blackrock GF New energy

The fund invests in companies operating in the market for alternative energy or energy technology. In particular, the fund focuses on companies in the sectors of renewable energy, fuel for vehicles, energy storage, and technologies that improve the use of energy.

Fund company		Blackrock SA	
Region		Global	
Distribution		97 % eq. 3% bond	
Fees		1,75%	
Branches	%	**Largest possession**	%
Municipal	30,00	Novozymes	5,40
Industry	28,3	Quanta Services, Inc..	5,30
Raw materials	17,90	Johnson Controls Inc	5,20
Power	7,60	Schneider Electric	5,20
Consumer cyclical	6,7	ITC Holdings Corp	4,90

Pictet clean energy

Mutual fund strategy for capital growth is to invest at least two-thirds of assets in equities issued by companies that contribute to reducing emissions of carbon dioxide (for example by encouraging production and use of clean energy). The investment area is not limited to any particular part of the world.

Fund company		Pictet Funds SA	
Region		Global	
Distribution		97 % eq. 3% bond	
Fees		2,30%	
Branches	%	**Largest possession**	%
Municipal	40,80	ITC Holdings Corp	3,90
Power	17,8	Cia Energetica De Mi..	3,70
Tech	16,50	Schneider Electric	3,30
Industry	14,40	BG Group PLC	3,30
Raw materials	7,2	EDP Renovaveis SA	3,20

Sarasin New Power

The fund invests primarily in companies that have a far-sighted and innovative approach to the use of energy and whose commitment to sustainability also takes into consideration environmental and social aspects. Special attention is paid to companies active in renewable energies such as wind, water, biofuels, solar and geothermal power.

Fund company		Sarasin Inv. Funds	
Region		Global	
Distribution		97 % eq. 3% bond	
Fees		1,75%	
Branches	%	**Largest possession**	%
Industry	28,80	Calpine Corp	5,30
Power	27,1	Enbridge, Inc.	4,70
Municipal	18,40	Air Liquide	4,40
Raw materials	12,00	Repower	3,50
Tech	9,7	The AES Corporation	3,40

Handelsbanken Ny Energi

The Fund is an actively managed equity fund whose objective is to achieve the highest value growth by investing in companies developing or using technologies and methods to limit global warming.

Fund company		Handelsbanken Fonder AB	
Region		Global	
Distribution		90 % eq. 10% bond	
Fees		1,50%	
Branches	%	**Largest possession**	%
Industry	61,10	United Technologies ..	6,20
Municipal	15,7	Atlas Copco	4,90
Tech	12,30	Alfa Laval AB	4,30
Raw materials	9,70	Fortum Oyj	4,00
Consumer Stable	1,2	Fluor Corporation	3,70

APPENDIX 2

	Jensen's Alfa (Regression)	Jensen's Alfa (CAPM)	R^2
Swedbank Robur Talenten (MSCI)	7,68% **(1)** (30,7%)	8,76% (2)	**15,94%**
Banco Ideel Miljöfond (OMX)	7,19% **(2)** (46,1%)	9,23% (1)	**9,6%**
Skandia Världsnaturfonden (OMX)	5,62% **(3)** (56,8%)	6,89% (3)	**7,68%**
Dexia Sustainable World (MSCI)	4,44% **(4)** (59,5%)	5,53% (4)	**10,60%**
SEB Etisk Sverigefond (OMX)	4,02% **(5)** (54,6%)	4,62% (6)	**44,14%**
F & C Global Climate Opportunity (MSCI)	3,84% **(6)** (64,8%)	5,19% (5)	**11,79%**
Öhman Nordisk Miljöfond (OMX)	2,30% **(7)** (81,7%)	3,85% (8)	**6,03%**
SEB WWF/Östersjöfond (OMX)	1,71% **(8)** (85,4%)	3,19% (10)	**10,34%**
Handelsbanken Ny Energi (MSCI)	1,48% **(9)** (86,4%)	2,53% (11)	**29,22%**
SEB Etisk Globalfond (MSCI)	1,29% **(10)** (86,2%)	2,26% (12)	**9,65%**
BNP Paribas L1 Green Future (MSCI)	1,14% **(11)** (92,8%)	3,92% (7)	**0,97%**
Save Earth Fund (MSCI)	0,94% **(12)** (91,0%)	2,13% (13)	**2,79%**
Pictet Clean Energy Fund 1 (MSCI)	0,44% **(13)** (97,1%)	3,28% (9)	**1,87%**
Nordea Klimatfond (MSCI)	**-**2,75% **(14)** (78,4%)	**-**0,79% (14)	**5,68%**
Blackrock (MSCI)	-5,02% **(15)** (65,1%)	-3,12% (15)	**19,54%**
UBS Global Innovators B (MSCI)	-5,23% **(16)** (61,0%)	-3,85% (16)	**12,30%**
Swedbank Robur Effektiva Världen (MSCI)	-9,92% **(17)** (30,8%)	-8,83% (17)	**29,13%**
Sarasin New Power B (MSCI)	-10,30% **(18)** (31,2%)	-8,94% (18)	**14,87%**
Edmond de Rotchild Ecosphere (MSCI)	-13,41% **(19)** (21,0%)	-12,44% (19)	**14,3%**

APPENDIX 3

	Beta value (Regression)	Beta value (CAPM)	R^2
SEB Etisk Sverigefond (OMX)	0,58 **(1)** (0,0%)	0,58 (1)	**44,14%**
Handelsbanken Ny Energi (MSCI)	0,54 **(2)** (0,0%)	0,54 (2)	**29,22%**
Swedbank Robur Effektiva Världen (MSCI)	0,53 **(3)** (0,0%)	0,52 (3)	**29,13%**
Blackrock (MSCI)	0,51 **(4)** (0,0%)	0,50 (4)	**19,54%**
Sarasin New Power B (MSCI)	0,43 **(5)** (0,0%)	0,41 (5)	**14,87%**
Edmond de Rotchild Ecosphere (MSCI)	0,43 **(6)** (0,0%)	0,41 (6)	**14,3%**
Swedbank Robur Talenten (MSCI)	0,37 **(7)** (0,5%)	0,37 (7)	**15,94%**
UBS Global Innovators B (MSCI)	0,34 **(8)** (0,0%)	0,32 (8)	**12,30%**
F & C Global Climate Opportunity (MSCI)	0,32 **(9)** (0,0%)	0,31 (9)	**11,79%**
Banco Ideell Miljöfond (OMX)	0,31 **(10)** (0,0%)	0,28 (11)	**9,6%**
Dexia Sustainable World (MSCI)	0,29 **(11)** (0,0%)	0,28 (12)	**10,60%**
Skandia Världsnaturfonden (OMX)	0,28 **(12)** (0,0%)	0,30 (10)	**7,68%**
SEB WWF/Östersjöfond (OMX)	0,27 **(13)** (1,8%)	0,26 (13)	**10,34%**
Nordea Klimatfond (MSCI)	0,26 **(14)** (0,0%)	0,26 (14)	**5,68%**
SEB Etisk Globalfond (MSCI)	0,25 **(15)** (0,6%)	0,24 (15)	**9,65%**
Öhman Nordisk Miljöfond (OMX)	0,20 **(16)** (5,5%)	0,19 (16)	**6,03%**
Pictet Clean Energy Fund 1 (MSCI)	0,16 **(17)** (6,7%)	0,15 (17)	**1,87%**
Save Earth Fund (MSCI)	0,14 **(18)** (3,0%)	0,13 (18)	**2,79%**
BNP Paribas L1 Green Future (MSCI)	-0,11 **(19)** (36,90%)	-0,11 (19)	**0,97%**