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Performance and risk of green funds

Abstract

The ecological finance development led to the spread of some specific categories of ethical funds based on an environmental and ecological inclination. Green funds are mutual funds or other investment vehicles that invest in firms with a social consciousness or an environmental responsibility. The aim is to offer an overview of the green funds market through a comparison of their performance and risk. The research is developed through the collecting and re-elaborating of a data set of 257 green funds all over the world published on www.morningstar.com. The study, recorded by the sample of green funds, uses a multi-disciplinary approach and it was run on April 24, 2013, first, by calculation and comparison of performances and volatility measurements, then, by a cohort analysis to put in evidence the value of some parameters (annual return, risk, modern portfolio theory and portfolio geographical distribution) of the cohort of funds in the period of 1985-2012.

Keywords: ethical finance, green funds, performance, risk.
JEL Classification: G11, G20, G21.

Introduction

The investors' attention to an ethical finance has led to the development of instruments with a social, cultural and environmental inclination. Globally, not only the need to consider the ethics at the base of the economic and financial behaviors has increased, but also the need to combine the logic of profit with solidarity and social purposes (Adamo, 2009; Battini, 2000; Capriglione, 2004; Perna, 1998; Rothschild, 1993; Sen, 1986; Signori et al., 2005; Yunus, 2003).

Particularly, the interest in the spread of an ethical finance, that considers the economic development together with the social responsibility and, above all, the environmental respect, has led to the creation of a "dedicated" financial segment, or to the ecological finance.

Although in the past ethics and ecology were two separate concepts and man had to struggle, constantly, against nature and its elements, over the years, man has felt a strong responsibility for the environment because an imprudent use of available resources would endanger human needs and interests. It is true that "all things of the nature" have, from a moral point of view, as much value as a human being.

There isn't a definition of ecological finance, but, analyzing separately the two terms, we can deduce the meaning. While the finance refers to the financial resources transferred in the world, the ecology is interested in problems related to the environment and to factors that regulate the presence and distribution of "natural capital" in various territories.

The ecological finance can mean the "section" of finance that studies, on one hand, the guidelines and the financial strategies adopted to solve problems regarding the environment (such as air, water or solid waste, etc.), on the other hand, the financial measures that encourage investments for environmental protection (such as the health preservation through the use of clean and beneficial technologies, etc.).

The aim of the study is to offer an overview of the green funds market through a comparison of their performance and risk.

The research is developed through the collecting and re-elaborating of a data set of 257 green funds all over the world published on www.morningstar.com. The study, recorded by the sample of green funds, uses a multi-disciplinary approach and it was run on April 24, 2013, first, by calculation and comparison of performances and volatility measurements, then, by a cohort analysis to put in evidence the value of some parameters (annual return, risk, modern portfolio theory and portfolio geographical distribution) of the cohort of funds in the period of 1985-2012.

The results of the study show that the investors' attention to ecological finance has spread, especially in recent years, offering some reflections for the future development of the phenomenon.

1. Literature review

The ecological finance intends to create new mechanisms and tools to integrate into the traditional ones that are − in some cases − inadequate to satisfy the environmental protection. The availability of appropriate financial tools may become a key aspect of this new vision. There is the need to develop alternative financial reports, more responsible for the economy and society, better suited to the specific needs, and more flexible and adaptable to the actual context (Adamo et al., 2011).

The interest on sustainable development began in 1992 when, in Rio de Janeiro, there was the United Nations Conference on Environment and Development. Governments recognized the need to organize

international and national plans and policies again. All this is necessary to guarantee that the economic decisions have to take into account any environmental impact. Governments have to think over economic development and find ways to stop the destruction of irreplaceable natural resources and pollution of the planet (Brundtland, 1988).

Unfortunately, the results of the Conference were limited, because of lack of interest among the countries. Environmental and social problems may decrease both with the improvement of an environmental and civic education and with the consciousness that the solutions must be global not sectorial, and they regard the whole Earth and not simply a part of it. As a result, ecological sustainability is possible in a context of social development and economic growth and, therefore, the elimination of poverty becomes a key requirement for sustainable development (Borghesi and Vercelli, 2005; Bromley and Paavola, 2002). If today the most important environmental problems are global problems, there is no doubt, however, that poor people are more damaged than rich populations (Ronchi, 2000).

Therefore, at the World Summit for Social Development, held on March 1995 in Copenhagen, Governments came to a new arrangement on the need to put people at the center of the development. The Social Summit was the biggest meeting ever held by world leaders at that time. It guaranteed to face the problem of poverty, the aim of full employment and the encouragement of social integration.

Today, Governments promote, develop and improve the economic and social development, without any territorial, ethnic and religious difference, supporting the principles of economic efficiency, sustainable social development, corporate social responsibility and social entrepreneurship (Aslaksen and Synnestvedt, 2003; Hart, 1997; Perez, 2004).

The increased interest in ecological finance has led to creation of some distinct categories of ethical funds, with ecologist and environmental inclination. Particularly, green funds are mutual funds or other investment vehicles that invest in firms with social consciousness or environmental responsibility (natural resources and healthcare). An example is represented by investment projects in the alternative energy sector which generate not only a dividend for the improvement of environmental standards, but they record a real advantage for their populations, even in the form of transfer of technological knowledge (Vigeo, 2009).

Green investments have received limited attention in the finance literature, except as part of the more general literature on SRI (Galema et al., 2008; Hamilton et al., 1993). Particularly, Statman (2000) supports the importance of the green investment as ethical investors trying to match their principles with their investment. Probably, they will invest most in environmental funds, regardless of the returns. In fact, "socially responsible investors want to do well, not merely do good" (Statman, 2000).

Most of the existing studies focus on analyzing environmental investment from a corporate finance perspective. For example, White (1995) compares environmental funds with both SRI investment and conventional investment in the United States and Germany. He finds out that US investors in environmental mutual funds earned inferior risk-adjusted returns vis-a-vis both the overall US market (proxied through the S&P500) and a counterpart index of US socially responsible firms (proxied through the Domini index). However, German green funds fared better, achieving risk-adjusted returns not significantly different from the overall German stock market. At the beginning of the century, Heinkel et al. (2001) maintains that more than 20% green investors are required to induce any polluting firms to reform, while Derwall et al. (2005) construct and evaluate two US equity portfolios that differed in eco-efficiency. Climent and Soriano (2011) examine the performance and risk sensitivities of the US green mutual funds vis-a-vis their conventional peers. They also analyze and compare this performance relative to other SRI mutual funds. In order to develop this analysis, they apply a CAPM-based methodology and find out that, in the period from 1987 to 2009, environmental funds had lower performance than conventional funds with similar characteristics. However, these results change if we focus only on a more recent sample period (2001-2009). In this case, green funds achieved adjusted returns not significantly different from the rest of SRI or conventional mutual funds.

Other studies focus on green stakeholders. There are four wide interest-sets that can influence an industry response towards environmental protection (Fineman and Clarke, 1996; Gladwin, 1993; McCloskey, 1990; Starik, 1995).

The first, is represented by bodies whose manifest mission is to care for the planet (e.g. Friends of the Earth, Greenpeace, Earth First).

The second area is regulatory. A regulator's interest is to apply environmental law to protect society from the environmental harm that can accrue from an unfettered industrial system. The third area comprises those who have an indirect interest in the industry environmental performance.

In the last one, we have internal stakeholders. These are corporate officers in industry whose role includes

environmental work, such as chief executive officers, environmental managers, public relations managers, as well as production, marketing and legal personnel.

The green funds have become more important especially in recent years, and particularly with financial crisis that has emphasized how ecology should not be only the prerogative of environmentalists, but it should be at the center of the attention by multinational firms, financial institutions and governments. The World Bank and some international private banks have supported several initiatives in the field of ecology and environment.

The World Bank is a global link of knowledge, learning and innovation for poverty reduction. The International Bank for Reconstruction and Development (IBRD), with more than 60 years experience in financing has developed substantial abilities in asset and liability management. The World Bank creates a lot of funds.

Together with the World Bank, some international private banks paid a great attention to sustainable finance. Indeed, numerous green funds were created to invest in companies that are interested in environmental problems[1].

Table 1 shows some funds tracked by Climate Funds Update (www.climatefundsupdate.org).

In Europe, the green funds market is becoming more and more mature. According to a Novethic (2012) study, the market is still buoyant.

Particularly, the study identified 194 green funds with an explicit focus on the environment strategy managed in 18 European countries. Nearly 1/3 of the sample funds were set up in 2007. The financial crisis gave a severe blow to green funds (Figure 1).

Table 1. Some climate funds

Category	Date operational
Adaptation Fund	2009
Amazon Fund	2009
Clean Technology Fund (CTF)	2008
Congo Basin Forest Fund	2008
Forest Carbon Partnership Facility (FCPF)	2007
Forest Investment Program (FIP)	2008
GEF Trust Fund – Climate Change Focal Area	2010
Global Climate Change Alliance	2008
Indonesia Climate Change Trust Fund	2010
Least Developed Countries Fund	2002
Pilot Program for Climate Resilience (PPCR)	2008
Prototype Carbon Fund (PCF)	1999
Scaling-Up Renewable Energy Program for Low Income Countries (SREP)	2009
Strategic Climate Fund (SCF)	2008
UK's International Climate Fund	2011

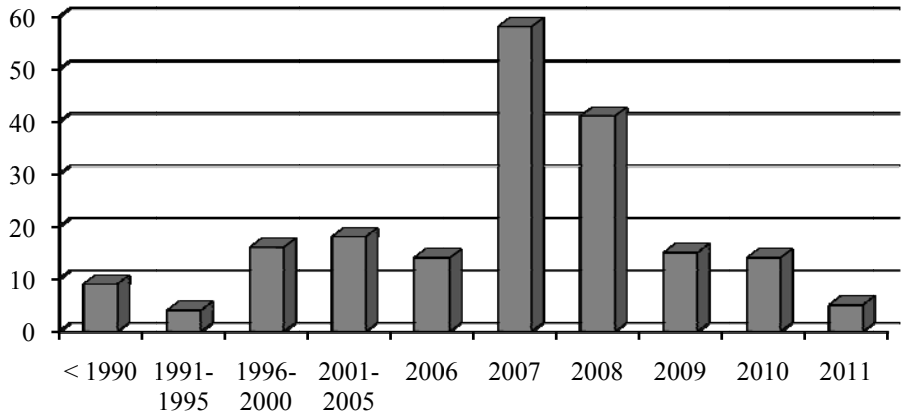

Fig. 1. Breakdown of green funds by inception date

[1] These companies use clean energy and offer products which don't damage the environment.

1/3 of the 194 funds are managed in 4 countries (France, Switzerland, the United Kingdom and Germany), with different trends. German environmental funds have fallen considerably (23 funds in 2011, down 34% since 2008), while Swiss products have developed (up 29%).

Figure 2 shows that the majority of 194 green funds are directed to environment (31.96%), to sustainable development (19.59%) and to climate (12.89%). Other funds invest in environmental performance (funds that do not emphasize on green businesses but select companies based on environmental criteria) (5.67%) and cleantech (businesses related to water, renewable energy or waste management) (6.70%).

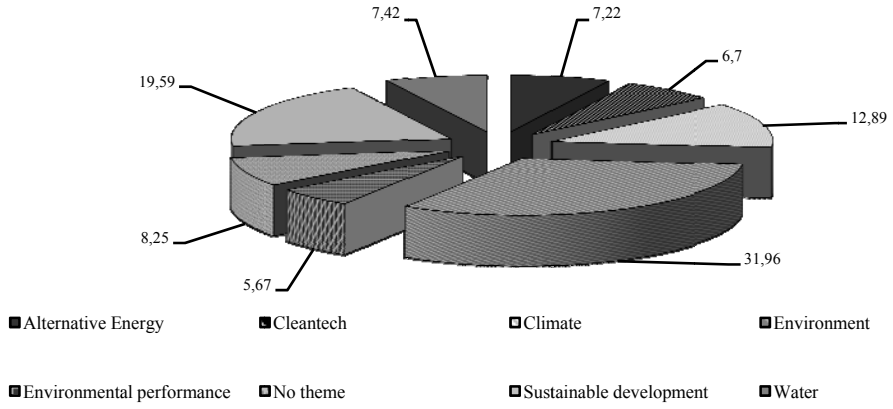

Fig. 2. Green funds by actual investments in Europe (value in percentage)

2. Data and methodology

The study of the green funds market has been carried out by the collecting and re-elaborating of a data set of green funds published on www.morningstar.com.

Particularly, the sample consists of 257 equity funds in different sectors (ecology, alternative energy, natural resources and healthcare). The bond funds, or the fund with a portfolio consisting largely of securities issued by government agencies, are not considered because the application of ethical criteria in the selection of securities which are issued by governments is particularly uncertain. In fact, the criteria defined by the countries are considered to be generic (such as the absence of oppressive regimes and the protection of human rights) and the differences in portfolio composition may lead to marginal results and, therefore, it isn't always easy to expect what kind of projects will be funded with the proceeds derived from the placing of the State debt.

The selected sample is made up mainly by the natural resources sector with 95 funds. The ecology sector follows with 68 funds, the healthcare sector with 64 funds and the alternative energy sector with 30 funds (Table 2).

Table 2. Green funds by sector

Category	Number
Ecology	68
Alternative energy	30
Natural resources	95
Healthcare	64
Total	257

Green funds show a good percentage compared with the total of equity funds (71.42%), representing about the 28.59% of the total universe (Table 3).

Table 3. Equity funds by sector

Category	Number	Percentage
Agriculture	28	3.11
Biotechnology	27	3.00
Comunications	23	2.56
Consumer good and services	85	9.45
Energy	75	8.34
Financial services	49	5.45
Industrial materials	25	2.78
Infrastructure	59	6.56
Other	130	14.46
Precious metals	30	3.34
Private equity	4	0.44
Tecnology	84	9.34
Utilities	10	1.11
Water	13	1.45
Total no-green funds	642	71.42
Total green funds	257	28.59
Total	749	100.00

The first characteristic of the sample regards the inception date (i.e. the date on when the fund was formed and has become available for sale to unit holders). Particularly, it shows an increase of green funds in the last years; they passed from 3 in the 1980s to 217 in the period of 2000-2010 (Table 4). In the period of 2011-2012 green funds were 26.

Besides, in the period of 2007-2008 the number of green funds issued was very high (111 funds). In fact, this period corresponds to a period in which the environment and, particularly, the global warming

have begun to influence economic policy, and therefore the investors. The environmental technologies begin to achieve economic results.

The second characteristic of the sample concerns the country of its domicile. Figure 3 shows a prevalence on the total of funds domiciled in Luxembourg (82.88%), France (6.23%), Ireland (4.27%) and the United Kingdom (3.50%). In contrast, Austria, Belgium, Italy, Sweden and Switzerland are less represented.

Table 4. Green funds by inception date

Period	Number
2012	4
2011	22
(2010-2000)	217
2010	23
2009	23
2008	53
2007	58
2006	16
2005	7
2004	8
2003	4
2002	6
2001	10
2000	9
1990s	11
1980s (from 1985)	3

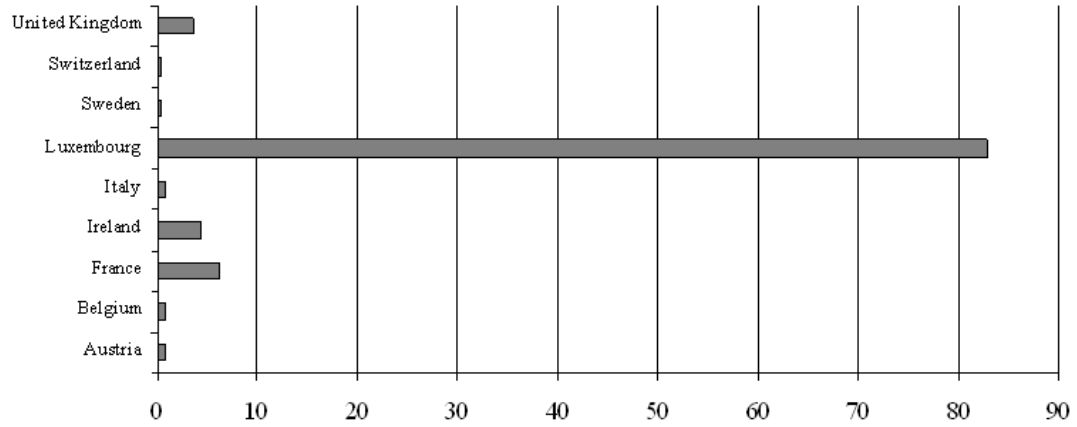

Fig. 3. Green funds by country of domicile (value in percentage)

Finally, a further characteristic is the Total Expenses Ratio (TER) which is the annual fee that all funds or ETFs charge their shareholders. It expresses the percentage of assets deducted each fiscal year for fund expenses, including distribution fees, management fees, administrative fees, operating costs, and all other asset-based costs incurred by the fund.

Table 5 shows some descriptive statistics referring to the TER. Particularly, all the funds sectors have an average value of TER similar and equal to 1.9%. However, the skew value is significant; it identifies a distribution that cannot be separated with a vertical axis into two equal mirror images. A positive indicator value, as in the case of the ecology funds sector, indicates a skewness distribution extending towards more positive values, while a negative indicator value, as in the case of the other funds sectors, shows a distribution with a skewness extending toward more negative values.

Table 5. Descriptive statistics on TER of green funds

	Ecology	Alternative energy	Natural resources	Healthcare
Average	1.89	1.94	1.90	1.88
Min	0.40	0.07	0.06	0.06
Max	4.61	3.33	3.62	3.06
Mode	2.36	1.88	1.94	1.92
1th quartile	1.40	1.30	1.19	1.21
2nd quartile	1.91	1.98	1.94	1.94
3nd quartile	2.36	2.55	2.52	2.32
Skew	0.92	-0.32	-0.05	-0.43

From the methodological point of view, the study is conducted by calculation and comparison of performance and risk recorded by the sample of green funds.

First, the study offers a panorama of the performance and the determination of volatility measurements (Standard Deviation and Sharpe Ratio) of the sample. The performance shows how an investment has grown or fallen over a set period of time. Investors may compare the performance of funds with similar investment strategies. The Standard Deviation of fund returns measures how much fund total returns have fluctuated in the past. The Standard Deviation is expressed in percentage terms, just like the

returns. The Sharpe Ratio is calculated by using Standard Deviation and excess return to determine reward for unit of risk.

Secondarily, the study is developed through a cohort analysis to put in evidence the value of some parameters of the cohort of funds in the period 1985-2012. These parameters are the annual return (the performance of the fund over calendar year periods), the volatility measurements (Standard Deviation and Sharpe Ratio), the portfolio geographical distribution (the practice of diversifying an investment portfolio across different geographic regions so as to reduce the overall risk and improve returns on the portfolio) and the modern portfolio theory.

With regard to these last parameters, they consist of three indicators. The *R*-squared is a percentage measure of fund movements that can be accounted for by changes in its benchmark index. The *R*-squared of 100 indicates that all movements of the fund are perfectly correlated with its benchmark. On the contrary, a low *R*-squared indicates that small movements of the fund can be explained by movements in its benchmark index. Beta is a measure of the volatility, or systematic risk, of a fund or a portfolio in comparison with the market as a whole. The *R*-squared can be used to ascertain the significance of a particular Beta. Generally, a higher *R*-squared will indicate a more reliable Beta. If the *R*-squared is lower, then, Beta is less relevant than the performance of the funds. Alpha takes the volatility (price risk) of a fund and compares its risk-adjusted performance with a benchmark index. Alpha is also known as the residual return.

3. Descriptive analysis

Total returns on April 24, 2013, which are recorded by the various categories of equity green funds, are described in Table 6. They are almost all positive except for the natural resources sector (-7.83%). The healthcare sector is the only one with the highest performance, equal to 17.76%.

Table 6. Trailing returns of green funds

Category	Performance, %			
	YTD	1Yr	3Yr	5Yr
Ecology	8.33	14.27	1.75	-2.16
Alternative energy	7.42	5.56	-5.41	-9.03
Natural resources	-7.83	-10.11	-4.73	-5.82
Healthcare	17.76	27.81	13.93	12.04

Besides, the current performance is not influenced by the past ones, but it depends on the discontinuous performance of the financial market and on the performance characteristics of the investment manager, which are also irregular. In fact, considering a period of three years, the performance is negative for two sectors, probably, because of the recent crisis of the financial markets. The sector most affected is that of the alternative energy (-5.41%), followed by the natural resources sector (-4.73%).

Considering the performance of the last five years, however, the best return is that of the healthcare sector (12.04%), while the worst return is that of the alternative energy sector (-9.03%).

The Standard Deviation (3Yr) for all sectors is equal in average to 15%. This means that the returns of funds do not have major variations respect to the average performance of the relative sector, therefore, the investors risk, to achieve different returns from those expected, is lower. With regard to individual sectors, the natural resources sector is the only one that has the higher volatility (18.58%). Indeed, this sector has a Standard Deviation that oscillates between a minimum value equal to 13.31% and a maximum value equal to 23.53%. The Standard Deviation, lower than the healthcare sector (10.65%), suggests that most of the funds in this sector has a low volatility of returns (between 7.62% and 13.19%). The other two sectors show a similar volatility: for the ecology sector, the Standard Deviation is equal to 13.35% (it varies between a minimum value of 10.28% and a maximum value of 17.51%); for the alternative energy sector, the Standard Deviation is equal to 13.50% (it varies between a minimum value of 11.32% and a maximum value of 17.29%) (Table 7).

The Sharpe Ratio has positive values only for the healthcare sector (1.18) and for the ecology sector (0.16). The funds of these sectors have been able to achieve, on average, a higher return than a risk free asset. On the contrary, the alternative energy sector (-0.36) and the natural resources sector (-0.08) have achieved a lower return than a risk free asset (Table 7).

Table 7. Volatility measurements of green funds

Category	3Yr – Standard Deviation, %	Sharpe Ratio
Ecology	13.35	0.16
Alternative energy	13.50	-0.36
Natural resources	18.58	-0.08
Healthcare	10.65	1.18

It is possible to show the Morningstar risk. This helps you to evaluate the variations of monthly returns of the fund respect to the relative Morningstar category (Figure 4). The greater is the variation, the larger is the risk score. Only some funds, related to ecology and natural resources sectors, show a high risk, most of the funds of the sample have a variation in the monthly returns similar to Morningstar category.

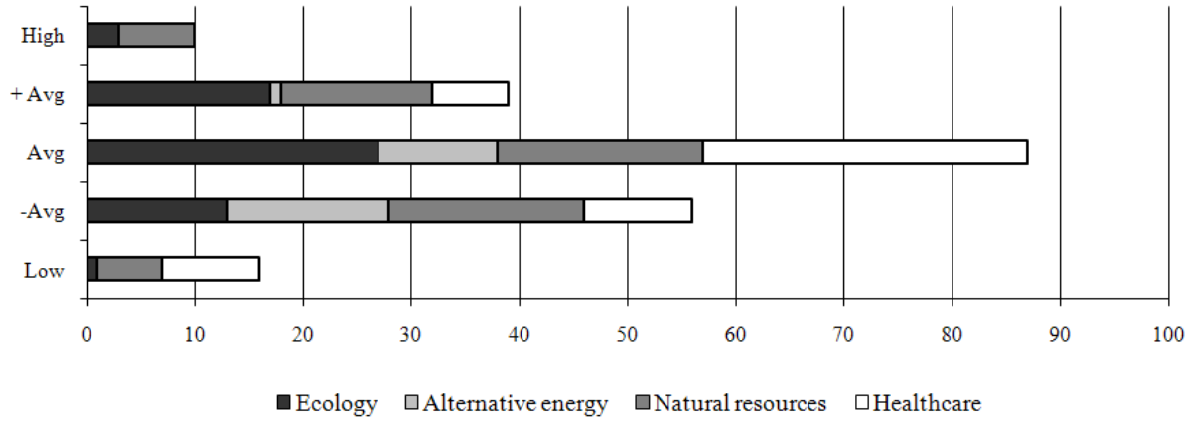

Fig. 4. Morningstar risk

Table 8 shows some green funds by inception date and performance on April 24, 2013. Particularly, the Equity Pharma Eurizon Easy Fund LTE Z (19.54%), the UBS (Lux) Equity Fund − Health Care (USD) P-acc (19.17%) and the ING (L) Invest Health Care X EUR Acc (18.64%) have the best performance, while the Allianz Global Metals and Mining AT EUR with -20.79%, the BlackRock Global Funds − World Mining B2 USD with -19.64% and the Credit Suisse SICAV (Lux) Commodity Instruments B with -5.01% have the lowest performance. All the other funds, record a positive performance of the last year.

Table 8. Trailing returns of some green funds

Category	Date	Performance %			
		YTD	1Yr	3Yr	5Yr
Ecology					
Jupiter Ecology Inc	1989	8.79	12.40	5.73	1.79
Öhman Nordisk Miljöfond Inc	1998	8.39	18.86	6.01	2.71
BNP Paribas L1 Green Tigers Classic C Cap	2008	5.17	13.26	-1.07	-
Pictet-Environmental Megatrend Selection-R EUR	2011	8.95	13.46	-	-
Alternative energy					
BlackRock Global Funds – New Energy Fund A2	2001	9.83	9.83	-5.14	-10.90
Julius Baer Multistock – Energy Transition Fund EUR B	2008	4.91	0.47	-5.86	-
Pictet-Clean Energy-I dy EUR	2011	9.22	7.81	-	-
Natural resources					
BlackRock Global Funds – World Mining B2 USD	1997	-19.64	-25.95	-12.09	-11.72
Credit Suisse SICAV (Lux) Commodity Instruments B	2008	-5.01	-6.60	-1.99	-3.98
Allianz Global Metals and Mining AT EUR	2011	-20.79	-26.08	-	-
Healthcare					
UBS (Lux) Equity Fund – Health Care (USD) P-acc	1998	19.17	26.22	10.70	10.03
Eurizon EasyFund Equity Pharma LTE Z	2008	19.54	30.93	16.29	13.01
ING (L) Invest Health Care X EUR Acc	2011	18.64	29.73	-	-

Table 9 shows the annual returns of some green funds respect to the benchmark. It is commonly used to compare the performance of a mutual fund using some financial indicators[1]. Funds have been chosen with reference to individual sectors considering, even, the funds with the best performance and the funds with the worst performance recorded on April 24, 2013.

Table 9. Trailing returns of some green funds respect to benchmark

Category	Date	Performance, %			
		YTD	1Yr	3Yr	5Yr
Ecology					
MAM Terra Nova	2000	16.96	27.98	6.39	0.21
MSCI World NR USD		*5.74*	*9.95*	*-2.89*	*-4.58*
Russell OpenWorld Global Climate Change NV P	2009	-6.41	-3.83	-	-
MSCI World NR USD		-6.41	14.64	-	-

[1] The most popular benchmarks are represented by the major stock market indexes, such as the Mibtel, the MSCI Europe Index or the Dow Jones Industrials.

Table 9 (cont.). Trailing returns of some green funds respect to benchmark

Category	Date	Performance %			
		YTD	1Yr	3Yr	5Yr
Alternative energy					
BlackRock Global Funds New Energy Fund X2 Acc	2009	10.52	12.1	-3.22	-
S&P Global Clean Energy TR USD		*-9.54*	*8.17*	*17.98*	-
Sarasin New Power Fund B	2007	3.20	-0.29	-9.34	-15.23
S&P Global Clean Energy TR USD		*-15.88*	*-3.96*	*12.90*	*12.07*
Natural resources					
Pictet-Timber-I EUR	2008	13.18	35.63	9.28	-
S&P Global Natural Resources TR USD		14.14	33.25	9.60	-
JPM Glbl Mining B EUR Acc	2011	-20.12	-29.36	-	-
S&P Global Natural Resources TR USD		-7.19	15.16	-	-
Healthcare					
JPMorgan Funds – Global Healthcare C (acc) – USD	2009	24.50	35.57	21.40	15.40
MSCI World/Health Care NR USD		6.06	7.60	5.93	4.03
Pictet-Generics-R USD	2004	9.19	18.94	5.48	10.51
MSCI World/Health Care NR USD		*-9.90*	*-12.07*	*-12.02*	*-3.23*

Finally, we point out differences of average returns of green funds in relation to the portfolio composition. For each green fund of the sample, we examine the geographical repartition considering that, the funds are distinguished and depend on the area in which the assets are mainly invested. Particularly, the green funds, that invest mainly in Europe − ex Euro and in the United States, have the highest returns equal, respectively, to 8.39% and 3.08% (Table 10). On the contrary, the green funds, that invest mainly in Canada and in the United Kingdom, have negative returns equal, respectively, to -14.78% and -19.12%. In addition, the green funds, that invest mainly in Europe − ex Euro, have a return 1Yr equal to 18.86% (2.71% return 5Yr), against the green funds, that invest mainly in the United Kingdom, have a return 1Yr equal to -23.84% (-10.35% return 5Yr). With regard to the volatility measurements, the situation is almost similar: the green funds, that invest mainly in Emerging Asia, Canada and the United Kingdom, have a negative Sharpe Ratio value.

Table 10. Trailing returns and volatility measurements of green funds by world regions

World regions	Performance %				3Yr – Standard Deviation, %	Sharpe Ratio
	YTD	1Yr	3Yr	5Yr		
Asia – Emerging	5.27	3.34	-4.64	-3.87	14.91	-0.21
Canada	-14.78	-21.38	-11.80	-8.09	22.47	-0.45
Eurozone	5.45	12.42	3.92	-0.72	13.10	0.38
Europe – ex Euro	8.39	18.86	6.01	2.71	17.48	0.42
United Kingdom	-19.12	-23.84	-10.70	-10.35	21.71	-0.44
United States	8.03	11.75	3.73	1.34	13.32	0.37

4. Age-cohort analysis

The study is developed through a cohort analysis to put in evidence some parameters (annual return, risk, portfolio geographical distribution and modern portfolio theory) of the cohort of green funds in the period of 1985-2012.

The 257 green funds of the sample were grouped into six cohorts with five years extent, except for the last one that is shorter. Each cohort was analyzed pointing out the trend of some parameters registered in the different periods. The age-cohort of the green funds is represented in Figure 5.

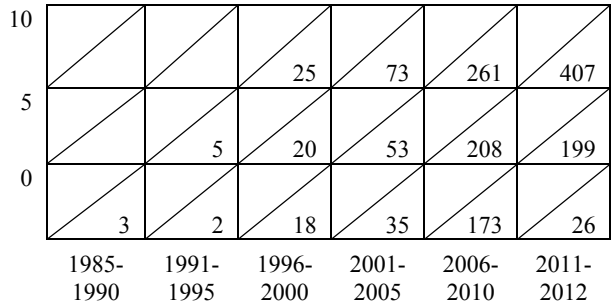

Fig. 5. Age-cohort of green funds

The first generation includes funds born between 1985 and 1990, that are equal to 3 in the first year of life, to 5 after five years and to 25 after ten years. The second generation is based on 2 funds in the first year, too. However, it became more considerable through the years with 20 funds after five years and 73 funds after ten years. The third and fourth generation present, in the first year, respectively 18 and 35 funds. The fifth generation includes the funds born between 2006 and 2010, that are equal to 173 in the first year of life, and to 199 after five years.

From the analysis of annual returns of each cohort, we can observe as, all cohorts have a similar trend from 2008 to 2012 (Figure 6).

The first five generations had positive annual returns in 2009, 2010 and 2012, and negative values in 2008 and 2011. Particularly, higher values were registered in 2009 from the fourth (56.83%) and the fifth generation (38.94%). These generations in 2008 show negative values, respectively equal to -46.51% and -42.81%. In the last year, all generations show positive annual returns, even if with different values.

In terms of volatility measurements of cohorts of green funds, two aspects are evident:

1. The fourth generation has the most value of the Standard Deviation equal to 16.74%. This value is not excessively high suggesting that most of green funds have a low volatility of returns.
2. The second and the third generation show a good value of the Sharpe Ratio respectively 1.23 and 1.25, while the last generation shows a value close to zero (0.01) (Figure 7).

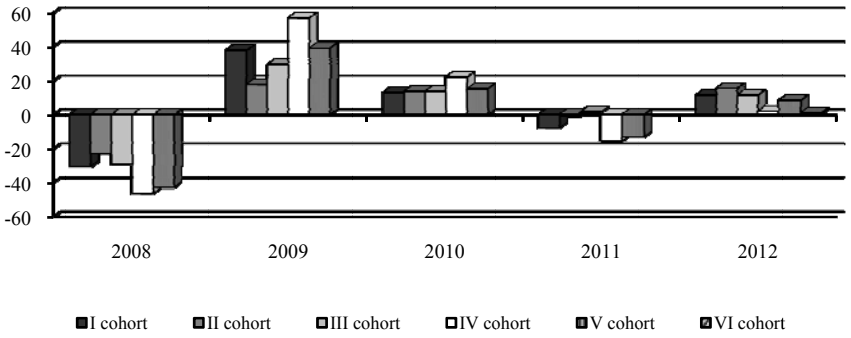

Fig. 6. Annual returns of cohorts of green funds (value in percentage)

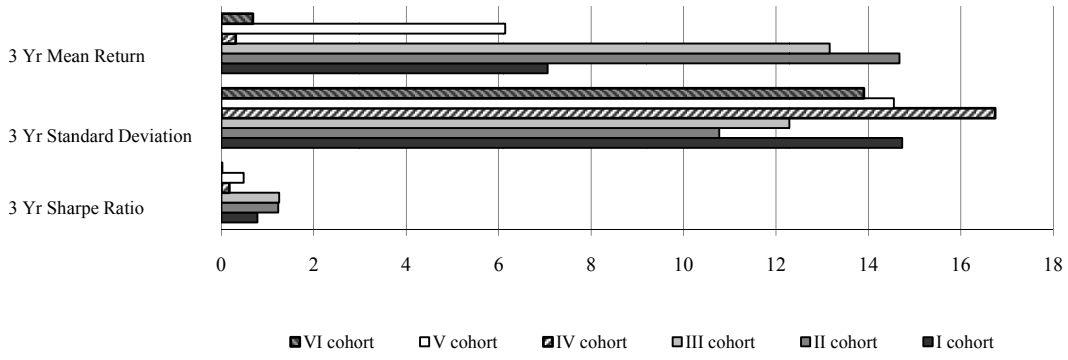

Fig. 7. Volatility measurements of cohorts of green funds (value in percentage)

Finally, we can draw some useful conclusions looking at the portfolio geographical distribution and the *R*-square values. The differences among the funds of the sample, especially in terms of performance and risk, may depend on:

- portfolio geographical diversification (or on the asset allocation among different countries);
- type of management adopted by each fund.

With regard to the first point, the portfolio diversification is a very important factor to consider, when we hold shares of an only company. It leads to a higher risk than holding shares which belong to more companies (Brealey et al., 1999). The geographical diversification is based on the premise that, financial markets in different parts of the world, may not be highly correlated with one another. For example, if the US and European stock markets are declining because their economies are in a recession, an investor may choose to allocate part of his portfolio to emerging economies with higher growth rates such as China, Brazil and India. In the case of green funds, the diversification is very important because it allows the investor to have a securities portfolio of companies that may belong to a specific sector (alternative energy, water, etc.) and can be located in different geographical areas.

However, in our sample, not all the cohorts of green funds have a high diversified portfolio (Figure 8). In fact, while some generations hold shares of companies of all the countries taken into consideration, effecting, in such a way, a good geographic diversification, other funds invest all their assets only in some specific areas. In fact, approximately 82% of funds of the fourth generation has a high diversification portfolio (their units are located in different countries), while 100% of funds of the second generation make an average diversification portfolio.

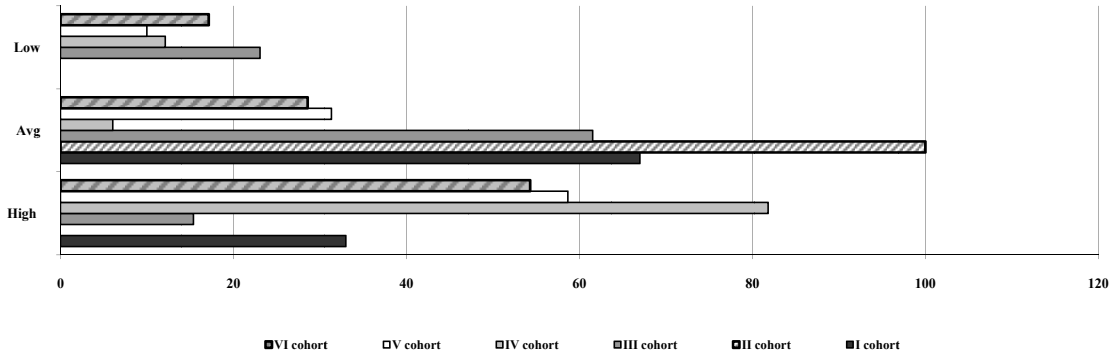

Fig. 8. Diversification degree of cohorts of green funds (value in percentage)

With regard to the second aspect, it is possible to use two types of management − active and passive. The active management refers to a portfolio management strategy where the manager makes specific investments with the aim of outperforming an investment benchmark index. In the passive management, investors expect a return that, closely, replicates the investment weighting and returns of a benchmark index, too. They will often invest in an index fund.

The *R*-squared value of cohorts of green funds is high, because it indicates a greater adaptation of the fund to the target market (Figure 9).

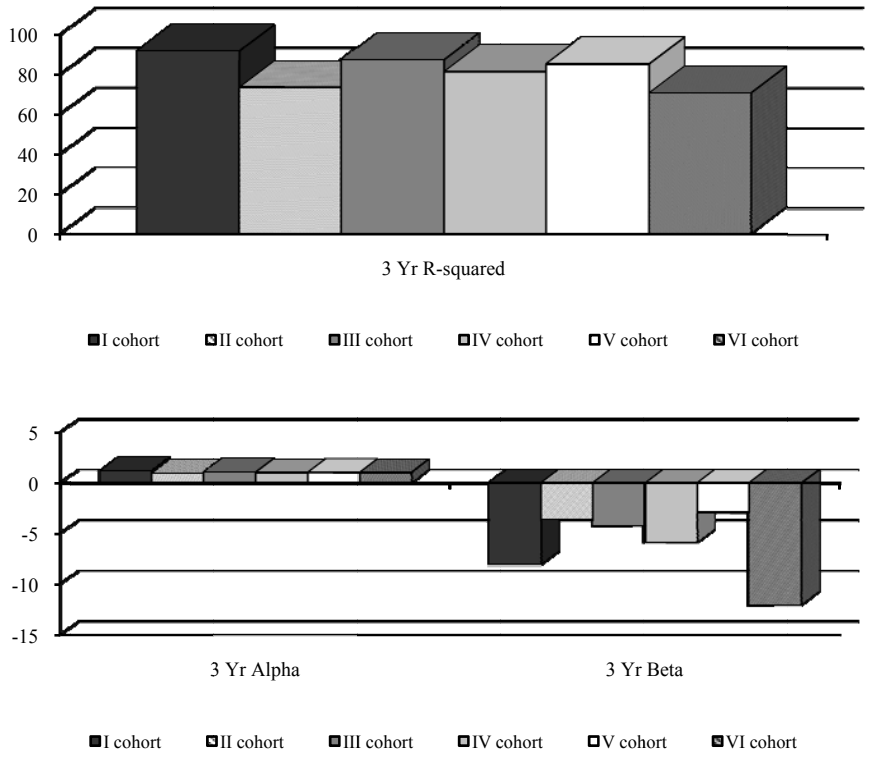

Fig. 9. Modern portfolio theory of cohorts of green funds (value in percentage)

Particularly, the green funds, born between 1985 and 1990, show the *R*-squared value equal to 91.71%. This suggests that more than 91% of the fund's returns can be explained by movements in the benchmark. The lower *R*-squared value is registered by the last generation (70.58%), that regards funds born between 2011 and 2012. A higher *R*-squared value indicates a more useful Beta figure. Green funds of the first generation have the *R*-squared value equal to 91.62%, but a Beta below 1;

it is most likely this happen, when we offer higher risk-adjusted returns. A low *R*-squared value means you should ignore the Beta.

Results and conclusion

The green finance describes a wide range of funding for environment-oriented technologies, projects, industries or businesses. A stricter definition of green finance refers to environment-oriented financial products or services, such as loans, credit cards, insurances or bonds. Green investment recognizes the value of the environment and its natural capital and tries to improve human well-being and social justice, reducing environmental risks and improving ecological integrity.

Within the financial system, the theme of green finance is increasing. Not only numerous financial institutions at international level, but also many domestic banks, have undertaken initiatives in the field of green finance.

Particularly, the World Bank acts through the projects, which finance the countries, that need to develop. The World Bank borrows from capital market and allocates credits through contributions of richer countries.

The growth of green finance urges, therefore, the use of mechanisms, such as the green rating, and tools, as green funds. Particularly, through green funds it is possible to invest in environmental markets, in companies, whose activities are concentrated in water treatment, against pollution, in the technology of waste, in areas such as alternative energy and energy efficiency.

From a quantitative point of view, 257 equity green funds, regarding the ecology, alternative energy, natural resources and healthcare categories, have an average value of TER about 1.9%, which allows to understand how a lot of investments has been absorbed by costs.

Empirical references, show that total returns are almost all positive, except, for the natural resources sector (-7.83%). The healthcare sector is the only one with the highest performance equal to 17.76%. Even if we consider a period of three years, the performance is negative for two sectors, probably, because of the recent crisis of financial markets. The most affected sector is that of the alternative energy (-5.41%), followed by the natural resources sector (-4.73%). Regarding the last five years' performance, however, the best return is that of the healthcare sector (12.04%), while the worst return is that of the alternative energy sector (-9.03%).

In terms of risk, the Standard Deviation (3Yr) for all sectors is equal, in average, to 15%. This means that the returns of funds do not have major variations in respect to the average performance of the relative sector, then the investors risk to achieve different returns, from those expected, is lower. The Sharpe Ratio has positive values only for the healthcare sector (1.18) and for the ecology sector (0.16). Funds of these sectors have been able to achieve, on average, a higher return than a risk free asset. On the contrary, the alternative energy sector (-0.36) and the natural resources sector (-0.08) have achieved a lower return than a risk free asset.

In conclusion, green funds have an increasing importance, even in times of financial crisis, and they continue to have a positive performance, resisting to the negative financial context. So, it is interesting to think about a future "alternative world politics" that is to say, the increase of the:

- responsible management of traditional resources;
- research and the development of alternative sources.

Probably, combining these two actions, it will be possible to guarantee a sustainable future, based on an economic growth and a real improvement of the living conditions.

References

1. Adamo R. (2009). *La finanza etica. Principi, strumenti e finalità*. – Naples: ESI.
2. Adamo R., D. Federico, A. Notte (2011). La finanza ecologica e i fondi etici a vocazione ambientale, *Bancaria*, 2, pp. 81-95.
3. Aslaksen I., T. Synnestvedt (2003). Ethical investment and the incentives for corporate environmental protection and social responsibility, *Corporate Social Responsibility and Environmental Management*, 10 (4), pp. 212-223.
4. Battini F. (2000). *Riflessioni su etica, economia e finanza*. − Modena: Mucchi Editore.
5. Borghesi S., A. Vercelli (2005). *La sostenibilità dello sviluppo globale*. – Roma: Carocci.
6. Brealey R.A., S.C. Myers, S. Sandri (1999). *Principi di finanza aziendale*. – Milan: McGraw Hill.
7. Bromley D.W., J. Paavola (2002). *Economics, ethics, and environmental policy: contested choices*. – Oxford: Blackwell.
8. Brundtland G.H. (1988). *Il futuro di noi tutti. Rapporto della commissione mondiale per l'ambiente e lo sviluppo*. – Milan: Bompiani.
9. Capriglione F. (2004). *Etica della finanza, mercato, globalizzazione*. – Bari: Cacucci Editore.
10. Climent F., P. Sorianos (2011). Green and Good? The Investment Performance of US Environmental Mutual Funds, *Journal of Business Ethics*, 103 (2), pp. 275-287.

11. Derwall J., N. Guenster, R. Bauer, K. Koedijk (2005). The Eco-Efficiency Premium Puzzle, *Financial Analysts Journal*, 61, pp. 53-64.
12. Fineman S., K. Clarke (1996). Green Stakeholders: Industry Interpretations and Response, *Journal of Management Studies*, 33 (6), pp. 715-730.
13. Galema R., A. Plantinga, B. Scholtens (2008). The Stocks at Stake: Return and Risk in Socially Responsible Investment, *Journal of Banking & Finance*, 32, pp. 2646-2654.
14. Gladwint T. (1993). The meaning of greening: a plea for organizational theory. In Fischer K., J. Schot (eds.), *Enzironnzentul Strategis for Industry*. – Washington, DC: Island Press.
15. Hart S.L. (1997). Beyond greening: Strategies for a sustainable world, *Harvard Business Review*, 75 (1), pp. 66-76.
16. Hamilton S., H. Jo, M. Statman (1993). Doing Well while Doing Good? The Investment Performance of Socially Responsible Mutual Funds, *Financial Analysts Journal*, 49 (6), pp. 62-66.
17. Heinkel R., A. Kraus, J. Zechner (2001). The Effect of Green Investment on Corporate Behavior, *Journal of Financial and Quantitative Analysis*, 36 (4), pp. 431-449.
18. McCloskey M. (1990). Customers as environmentalists. In Hoffman W.M., R. Frederick, E.S. Petry (eds.), *Business, Ethics, and the Environment*. − New York: Quorum Books.
19. Novethic (2009). *Green Funds. A sluggish market*. – Paris.
20. Perez O. (2004). *Ecological Sensitivity and Global Legal Pluralism: Rethinking the Trade and Environment Conflict*. – Oxford: Hart Publishing.
21. Perna T. (1998). *La sfida etica al mercato mondiale*. – Turin: Bollati Boringhieri.
22. Ronchi E. (2000). *Uno sviluppo capace di futuro: le nuove politiche ambientali*. – Bologna: Il Mulino.
23. Rothschild K.W. (1993). *Ethics and Economic Theory*. – UK: Edward Elgar.
24. Sen A.K. (1986). *Etica ed economia*. – Bologna: Il Mulino.
25. Signori S., G. Rusconi, M. Dorigatti (2005). *Etica e finanza*. – Milan: Franco Angeli.
26. Statman M. (2000). Socially Responsible Mutual Funds, *Financial Analysts Journal*, 56 (3), pp. 30-39.
27. Starik M. (1995). Research on organizations and the natural environment: some paths we have traveled and the "field" ahead. In Post J.E., D. Collins, M. Starik (eds.), *Research in Corporate Social Pdonnance and Policy*. – Greenwich, CT: JAI Press.
28. Vigeo (2009). *Green social and ethical funds in Europe 2009 review*. − Milan.
29. Yunus M. (2003). *Il banchiere dei poveri*. − Rome: Feltrinelli.
30. White M.A. (1995). The Performance of Environmental Mutual Funds in the United States and Germany: Is There Economic Hope for Green Investors? *Research in Corporate Social Performance and Policy Supplement*, 1, pp. 323-344.