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GRADO EN ADMINISTRACIÓN Y
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PERFORMANCE PERSISTENCE
IN EUROPEAN EQUITY FUNDS

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ABSTRACT

Using a sample of European equity funds, in this paper we analyse if performance persistence exists for a period from 2002 to 2013. Data are obtained from Inverco's database. Portfolio analysis is used to test for performance persistence. I find strong evidence of performance persistence using semester returns: winner funds (funds with the best returns in one semester) show better returns in the next semester than losers (funds that had the worst returns in the previous period). A robustness analysis is done in order to test for persistence in one and two year. The results are very similar; performance persistence exists in our sample.

The main limitation is the variability of funds during the years and the impossibility to know which funds disappear or merged and became a new one.

KEY WORDS

Equity funds, persistence, returns, performance, fund portfolio.

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1. INTRODUCTION

The choice of this topic come from the recently boom of this type of financial product. Nowadays mutual funds have become one of the most popular products of saving. These are a safe way to get quite nice returns from your savings.

Mutual funds are investment products that allows investor to enjoy economies of scale through the access to well diversified portfolios.

Mutual funds are created and managed by a mutual fund management company. Investors buy shares of the fund; all these shares are the total assets under fund management. The number of shares that a fund has depends on the demand. This implies that the price of a share reflects the liquidity value. Usually the same fund management company owned different types of funds.

The literature about this product has increased exponentially during the last years, especially internationally. The reason is the big percentage that represents of the GDPs of most of industrialized countries. The mutual fund industry is more developed in countries with strong rules, laws and regulation, where the population have more education and where having a private pension plan is more important.

Mutual funds started its advance in Spain during the decade on the eighties and since the first moments it had been a preferred product among the Spanish investors.

The last five years have been very hard the economy but in spite of this the industry of mutual funds have overcame it. The industry has been able to adapt and work with normality. In April of 2014 the total assets under mutual funds reached 174.181 million of Euros. During 2013 mutual funds market experienced the best results since its beginning and which is even more important; the forecast predicts new records for this year.

Although the market fluctuations and the successive tax reforms, mutual funds have kept their position as preferred way of family savings. It has become a mature and prepared market to face new challenges. Last regulations and laws facilitate the creation of new ones and new types.

One of the most important advantages of these products is the wide variety of funds that exists in the market. This allows the investor to choose the fund that fits with their risk profile. Going from the most conservative funds to the most risky funds.

As there is a huge quantity of different funds, some investors have problems with the choice of these. After the election they should analyse some characteristics as the temporal horizon, liquidity of the product, risk and previous performance. This information should be proportionate and explained, if it would be necessary, by the intermediate.

Mutual funds are institutions of collective investment which means that the individual results depend on the returns of a group of investments. It doesn't have legal status. The fund is compound by the capital contributed by different participants.

Two of the main elements that constitute a mutual fund are the managing company and the depository.

The managing companies are limited societies which aim objective is managing the Collective Investment Institutions. These companies can develop the next activities; administer of the CII, which is compound of tasks like, keep the investors inform, through regular publications of brochures, value the CII, calculate the liquidity value, and some others, manage the assets, and commercialization of shares and participations. Managing companies have legal status.

Depositories function is to safeguard the values of the assets that are part of the CII's investments. These entities also supervise managing companies' manage.

Mutual funds are considered safe products but a percentage of risk is always associated to these products. It depends on the type of fund.

The diversification of the assets that composed the fund reduces the risk, but the possibility of having losses is always present. There are two main elements that determine the risk, volatility and the recommended time to stay in the fund. If these two variable increase, the risk associated to the fund also increased. Which means that the more variability of the prices of the assets the more risk the fund will have. Also the more time would be recommended to stay the more risk.

Considering the investment politic there are 5 types of mutual fund:

The first type is fixed income funds, which invest most of their total asset in fix income assets. This type use to give lower incomes but are less risky.

The second type is equity funds, which invest most of their money in assets of variable income. The returns that used to give are higher than the previous type but are more risky.

The third type is mixed income funds, as its name indicates this type is somewhere in between the fixed ones and the variable ones. This invest both on fixed and on variable s.

The fourth type is global funds, it doesn't have a previously define policy of investment. It may be high risky funds.

The fifth one is guaranteed funds, which guaranteed that at one specific date the investor will conserve the whole or part of its initial investment. Although its name indicates the opposite, these are not guaranteed funds. Some of them have the objective to achieve a fixed return but this is an objective not an obligation. These are not very liquid, so guaranteed funds are not recommended if the investor will probably need the money before the maturity of the guarantee.

The most important variables that every investor should analyse before choosing a fund are the following ones.

The risk profile and the investment policy; low risk funds, (fixed income funds and monetary funds), moderate risk funds (mixed funds) and high risk funds (equity funds, free investment funds...)

The period of time recommended staying in the fund. The brochure proportionate by the managing company should recommend it. It uses to vary a lot depending on the type of fund.

Commissions should be also taken into account. There are two types of commissions; managerial and deposit fee and subscription and refund fee.

Advertising, every investor should perfectly read the brochure proportionate and should remain that the disadvantages of the fund would not be explicitly written.

Historical returns, although it not necessarily ensures future returns. This variable, the historical returns, is on fact the one that will be analyse in this paper.

The main objective of this work is, through a variety of equity funds, analyse if historical returns of funds is a good indicator of future returns.

The rest of the study is structured as follows. In the section two there is a briefly revision of previous literature and the main objectives of the paper are describe. In the third section the database is presented and a description table is analysed. In the section four they main performance measures are explained. In the section number five there is a revision of how other authors have study persistence, the main procedures that can be used and the explanation of the procedure that was follow. In number six section a robustness check was done. In the section seven limitations of the study are shortly explained. Finally in the section 8 the main conclusions are commented.

2. PREVIOUS LITERATURE AND OBJECTIVES

There is an ample literature on performance persistence of mutual funds results. The main three objectives analysed are: a) if the results of a variety of mutual funds present persistence or not, b) if investors base their fund purchase decision on past performance information and c) if there is “smart effect” (the capability of investors to anticipate the future mutual funds results).

Analyzing whether persistence in the performance of mutual funds exists is very important for various reasons. Financial media give a lot of importance to its publications on the performance tables. These media also make an effort to identify the funds with higher returns. The reputation and even the payments received by the fund’s managers are also influenced by their capacity of constantly getting high performance in their funds. The financial group’s owners of mutual funds give wide information coverage of its performance if it has been high. They use marketing campaigns to make promotion and get new investors to the market or just from one fund to another. It is already known that historical performance is one of the most important data that investors consult. So if the fund has had a high performance in the previous periods they widely include this in the campaign and the brochure.

The analysis of persistence is also important from an academic view. It can be considered that persistence in performance is a synonym of predictability. If past performance is a good indicator of future performance it will indicate that there is information in past results that allows us to predict future results.

Several authors have already discussed about this. The controversy of this topic is wide; there are many differences among the results and conclusions of these papers. Furthermore, sometimes the results cannot be comparable due to in some of them the raw return of the fund and in others in the risk-adjusted return.

During the last twenty years these are some of the authors that have worked about questions related to performance or style (for example; Rubio 1993 and 1995; Álvarez , 1995; Freixas, Marín, Martínez and Rubio, 1997; Ferrando and Lasala, 1998; Basarrate and Rubio, 1999; Matallín and Fernández, 1999 and 2000; Menéndez and Álvarez 2000; Moreno 2003; Ferrúz and Sarto, 2004 or Ciriaco and Santamaría, 2005) or to the capability of investors (for example; Martínez, 2001 and 2003; Torre and García, 2001 or Ciriaco, Del Río and Santamaría, 2002 and 2003).

Internationally a wide range of authors have worked these topics. Some of them have shown the existence of positive and significant relationship between performances in consecutive periods, (for example; Hendricks, Patel and Zeckhauser, 1993; Goetzmann and Ibbotson, 1994; Brown and Goetzmann, 1995 or Wermers, 1997). All of them indicated that the main cause was the “hot hands effect” or the fact that investors use similar strategies not captured through the different categories or investment groups.

Other authors as; Elton, Gruber, Das and Hlavka (1993) and Elton, Gruber, Das and Blake (1996), affirm the performance of mutual funds is predictable just in the long-run.

Carhart (1992 and 1997) affirms the existence of persistence in the long-run due to the persistence in expenses and commissions. In the short-run, persistence exists due to management expenses and the “momentum effect”.

On the other hand, Menendez and Álvarez (2002) affirm that in Spanish market persistence does not exist in Equity Funds, with the exception of funds with lower returns that tend to persist in low returns.

Authors like Lakonishok (1992), Hendricks (1993), Patel (1994), Sirri and Tufano (1993 and 1998), Gruber (1996), Carhart (1997) or Fant (1999) ensure a positive and significant relation between previous returns and present cash flows.

Other papers conclude that during for periods for the financial sectors, the probability of losers continue being losers is much bigger than the probability of winners continue being winners.

3. THE DATABASE

This research uses Inverco's¹ public databases on a monthly liquidity value to European Equity mutual funds from January 2002 to December 2013. From all the varieties of funds that Inverco record I have focussed my attention on these type.

Inverco offers different databases, organized in 5 categories: National, divided in fixed income funds short and long run, mixed income funds, equity funds and monetary. International, divided in fixed income funds, mixed income funds, equity funds in Europe, Japan or EE.UU. Other fund, divided in fixed returns guaranteed, variable returns

¹ *Inverco*. (n.d.). Retrieved March 10, 2014, from <http://www.inverco.es/eFondosInversion.do>

guaranteed, partial guaranteed, absolute return and passive management. The last two categories are free investments and property funds.

As it was already mentioned the category selected was international funds, European Equity funds.

Various authors have demonstrated that the results on persistence of the fund's performance are independent of the categories studied. Some of them say that this is due to common investments strategies are follow, Brown and Goetzman (1995), Wermers (1997). Carhart (1992) says that it is due to the persistence of expenses and commissions or the entry of cash flows in the mutual funds, Gruber (1996), Carhart (1997) and Fant (1999).

It would be also interesting to make the analysis with a sample of fund of different categories and not just with European Equity funds, but this would not be possible. Besides a lot of authors have make the analysis with just one category of funds, for example; Malkiel (1995), Ribeiro (1999), Menendez and Álvarez (2000) or Otten and Banms (2002).

The documents downloaded show for every fund; the number of funds, the liquidity value at the end of each month, the variation between this and the liquidity value of the previous month and the variation with the one at the beginning of the year, the return for one, three, five, ten, fifteen and nineteen years. Other valuable information that is there is number of people that belong to the fund, the participants, the number of subscriptions and repaid during the month and during that year (until that month). It is also written the number of net subscriptions for the month and the year. The value of the total assets is another important data that can be noted, as in the other variables, the variation between that month and the previous one and between the beginnings of the year is also available. The last information offered is the Family funds at which each fund belongs.

3.1. Descriptive table

Before going deeply in the main topic, analyzing the semester returns in order to know whether there is persistence or not, a descriptive table was done, this is table 1. This table reflects the main variables already mentioned and some interesting data calculated. This has been made with annual data.

The first element is the number of funds but this will be analysed later on. The second element is liquidity value, in one line is represent the average liquidity value of all the funds at the end of each year. The range of liquidity value goes from 55.48 € in 2008 to 101.23 €

in 2010. In 2013 it was 80.84 €. It has varied a lot from one year to another during the whole period but especially since 2008, for example in 2008 decrease 28.50% and in 2009 increase 45.24%. The average for the whole period is 53.41 €.

The next item is the average assets under of the funds sample of each year and the total asset under the control of all of them. Both have constantly increased since the beginning of the period (2002) to 2008, concurrently with the beginning of the crisis. That year the assets of the funds experimented a decreased of -74.34%. After 2008 when the total asset under their control was 1463427 € it haven't moved regular, with increases and decreases in the total amount. It's important to know that also the number of funds decreased a lot in 2009. But in the last year (2013) both the total and the average equity have considerably increased.

The variable number of participants have move similarly to the equity. It has increased until 2008, then it experienced a decrease of 49.47% that year and after this the movements have been intermittently. In 2013 as in the previous variable, it has experienced a big increased. The average number of participants for these eleven years is 3056. Nowadays the total number of participant which belong to any fund is 133522, amount considerably lower than in 2002.

The next elements are the total number of subscriptions, repaid and net subscriptions. The number of subscriptions has increased year by year until 2008, as well as the number of repaid. Looking at the net subscriptions this idea is also reflected, from the end of 2007 and especially from 2008 the number of net subscriptions is negative.

In most of the elements studied the effect of the crisis in widely visible.

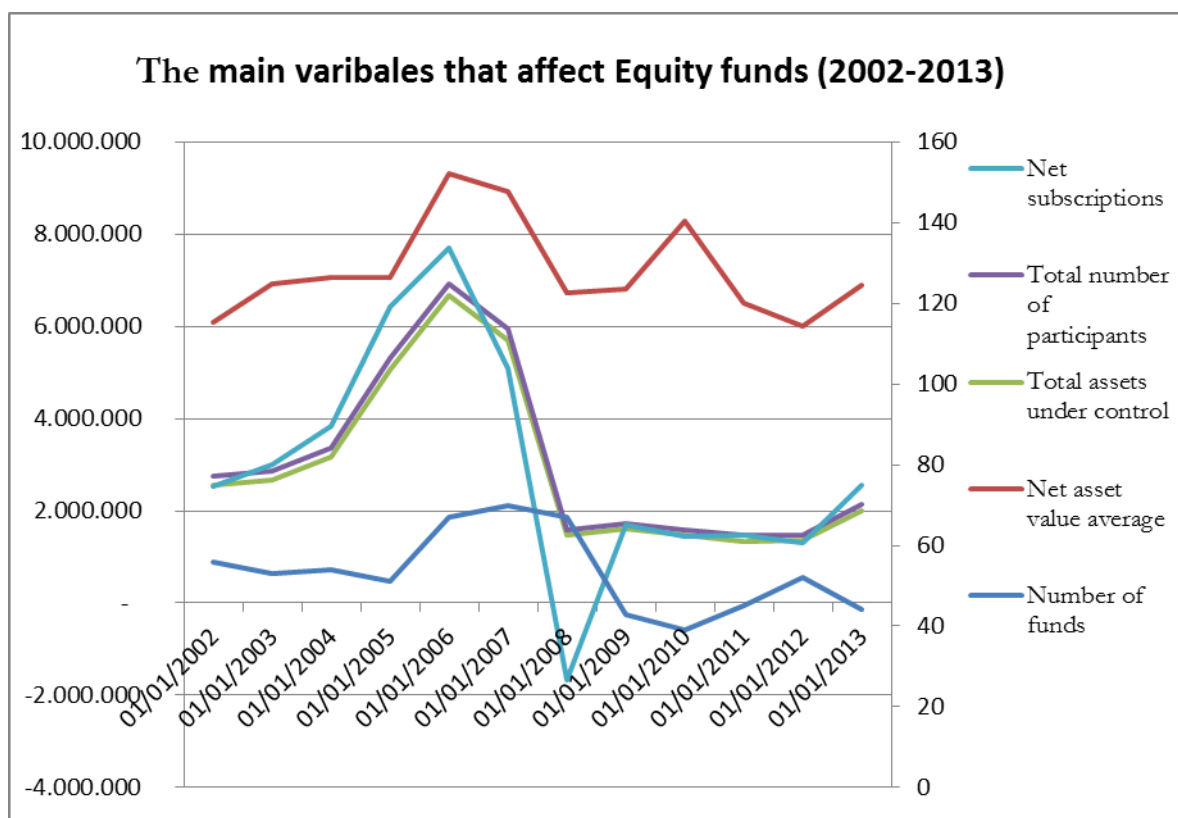
The average return of the fund per year has varied a lot. Intuitively the worst results would be in 2008, and checking the table this is confirmed. The average return for the investment funds' portfolios in 2008 is -33.92%. In 2013 these funds got good results with an average return of 15.29.

Regarding the returns of the different funds 4 items have been calculated. The maximum and minimum indicate the range in which all the returns are included. Most of the funds that show a maximum returns are between 18% and 25%. It is easily appreciated and predictable that the worst results for the whole fund portfolio were in 2008. This year the maximum return was -11.59% and the minimum reached -80.78%. In 2011 the situation is similar, it is easily to imagine also taking into account that the average returns was negative. 2011 was not a good year for mutual funds investors.

The variance measure the distance between the mean and the values of series. As bigger is the variance bigger is the distance between the different returns of the funds. This measure cannot be negative. The variance in most of the periods is small; the average variance for example is 0.0017. This means that there is not a big difference between the funds returns.

The standard deviation is the measure of the standard quantity that the values differ from the mean. As well as the variance this cannot be negative. It is the dispersion measure more used and it is more useful than the variance. The standard deviation obtained for the year 2003 for example is 0.0869 and for 2006 is 0.1145. In 2006 the dispersion of the data from the average was much bigger.

All this variables evolution can be more easily seen in a temporary graph. This is the graph 1.



Graph 1: this graph shows the evolution of the main variables that affected Equity funds from 2002 to 2013. The variables presented are; net number of subscriptions, total number of participants, total assets under the funds and net value asset average.

This graph has two vertical axes. The right axe measures the variables; number of funds and liquidity value average. The left axe measures the following variables; total assets under control, total number of participants and net subscriptions.

The graph 2 shows the yearly average returns of the funds' sample from 2002 to 2013. It can be easily seen that the average returns behave heavily conditioned by financial situation. The worst period for equity funds performance matches with the economic crisis that affected the whole Europe. The situation improved during 2010 then the average return decrease again and in 2012 the results were negative. The results obtained last year were the best of the last 10 years so this can mean a positive tendency for the next years.



Graph 2: this graph shows the yearly average returns for the sample of funds from 2002 to 2013.

	30/12/2002	31/12/2003	31/12/2004	31/12/2005	31/12/2006	31/12/2007	31/12/2008	31/12/2009	31/12/2010	31/12/2011	31/12/2012	31/12/2013	Total average
Number of funds	56	53	54	51	67	70	67	43	39	45	52	44	53,41
Net asset value average	59,36	71,86	72,39	75,35	85,11	77,59	55,48	80,57	101,23	75,03	62,39	80,34	74,73
Net asset value increase		21,06%	0,75%	4,08%	12,95%	-8,83%	-28,50%	45,24%	25,64%	-25,88%	-16,85%	28,78%	0,05
Average assets	43.279	47.580	54.737	76.622	98.149	80.322	21.842	36.403	36.573	24.421	25.623	46.505	49.338
Total assets	2.553.437	2.664.474	3.174.723	5.057.082	6.674.160	5.702.867	1.463.427	1.601.730	1.462.915	1.343.177	1.358.021	1.999.706	2.921.310
Assets increase		4,35%	19,15%	59,29%	31,98%	-14,55%	-74,34%	9,45%	-8,67%	-8,18%	1,11%	47,25%	0,06
Average participants	3.551	3.424	3.405	3.696	3.822	3.651	1.955	2.836	3.103	2.249	1.946	3.035	3.056
Total number of participants	209.523	191.735	197.503	243.935	259.907	259.194	130.979	124.785	124.117	125.954	107.041	133.522	175.683
Participants increase		-8,49%	3,01%	23,51%	6,55%	-0,27%	-49,47%	-4,73%	-0,54%	1,48%	-15,02%	24,74%	0,02
Total subscriptions	768.266	922.520	2.105.633	3.024.536	4.744.156	4.787.366	481.603	560.991	452.530	584.137	292.634	935.115	1.638.291
Total repaid	1.002.103	768.982	1.639.952	1.908.127	3.974.080	5.660.256	3.730.524	592.301	605.334	590.324	443.870	506.402	1.785.188
Net subscriptions	- 233.837	153.538	465.681	1.116.409	770.076	- 872.890	- 3.248.921	- 31.310	- 152.804	- 6.187	- 151.236	428.713	- 146.897
Average return	-0,1853	0,1126	0,0371	0,1043	0,1093	-0,0799	-0,3392	0,1923	0,1049	-0,1476	0,1031	0,1529	0,0137
Standard deviation	0,0869	0,0336	0,0636	0,0423	0,1145	0,0560	0,1104	0,0254	0,0405	0,0546	0,0469	0,0412	0,0597
Variance	0,0076	0,0011	0,0040	0,0018	0,0131	0,0031	0,0122	0,0006	0,0016	0,0030	0,0022	0,0017	0,0043
Maximum	0,0646	0,1951	0,1841	0,2074	0,2601	0,0529	-0,1159	0,2424	0,2289	-0,0667	0,2168	0,2511	0,1434
Minimum	-0,3628	0,0145	-0,3305	-0,0452	-0,7610	-0,2731	-0,8078	0,0985	0,0022	-0,3097	-0,0111	0,0884	-0,2248

Table 1: This descriptive table shows the yearly values from 2002 to 2013 of the main variables that affect equity funds and the total average for the whole period.

4. METODOLOGY AND MEASURES OF PERFORMANCE

Many methodologies are used to measure the fund's performance three of the most important ones are; the Jensen's alpha, Treynor's ratio and Sharpe's ratio. Sharpe's ratio take into account the returns and risk of the funds without paying attention to any market index. In contrast, Treynor's ratio and Jensen's alpha take into account a market index. Both Treynor's and Sharpe's ratios are relative measures of performance. Jensen's alpha is an absolute measure.

Before explaining these three measures it is important to define the CAPM model (Capital Asset Price Model), which is the model I have used to adjust the returns.

The CAPM² is a frequently used model in financial economic. It was introduced by Jack L. Treynor, William Sharpe, John Litner and Jan Mossin independently. After more than 50 years of diverse criticisms it is still consider one of the easiest and more useful models. The main uses of the model are; the calculation of the cost of capital and the estimation of the expected returns of the investment with an associated risk.

The model has three components; the risk free rate (r_f), the beta of security (β) and the premium for market risk ($r_m - r_{fn}$) (which is the difference between the market return and the risk free asset).

Here is the formula:

$$R_i = r_{fa} + \beta_i * (r_m - r_{fn})$$

Where R_i is the return of the stock i . The beta coefficient (β_i) measures the return that the asset i experimented for every point in the market.

4.1. Measures

4.1.1. Jensen's Alpha

² See Martín, M. R. (2007). Los fondos de inversión: performance y persistencia. Monografía de la CNMV, 26, 14. And García, W. F. (2005) La teoría de portafolio y la gestión de inversiones de los fondos de pensiones de Perú 1997-2002. *Rev. Fac. Cien. Ecón. Nac. Mayor de San Marcos*, 10(25), 5-6.

The author of this measure³, Jensen (1967) affirm that the performance of a fund portfolio have two dimensions; the ability that the managers have to predict the evolution of the liquidity values and the ability to minimize the risk of the portfolio through the diversification on funds.

The Jensen' alpha takes into account just the first one, the ability of the managers to predict the evolution of liquidity value. So the Alpha is an estimation of the returns that the manager is able to predict due to his ability to predict the evolution of liquidity value.

The alpha is given trough the estimation of the model's constant. This alpha indicates the excess of returns that the investor is able to get taking into account the level of risk of the fund.

This is an absolute measure, allows making a ranking of funds depending on the alpha they got and give an absolute assessment on whether the fund is doing well or not.

The formula to calculate it is this:

$$\alpha_k = (R_k - r_f) - \beta_k (R_m - r_f)$$

Where R_k is the return of the mutual fund k , r_f is the return of the riskfree asset, R_m is the market portfolio return and β_k is the beta of the mutual fund k .

One of the bases is that all the funds with the same risk should have the same returns. So when alpha is bigger than 0 this means that this fund has better returns than the predicted by the model. In this case the manager would have some ability to choose assets.

4.1.2. Treynor's Ratio⁴

Treynor's ratio was introduced in 1965. This is a relative measure that measures the excess of returns obtain of a fund regarding with the risk free rate per unit of systematic risk assume.

³ See Martín, M. R. (2007). Los fondos de inversión: performance y persistencia. Monografía de la CNMV, 26, 15.

⁴ See Martín, M. R. (2007). Los fondos de inversión: performance y persistencia. Monografía de la CNMV, 26, 15. And García, W. F. (2005) La teoría de portafolio y la gestión de inversiones de los fondos de pensiones de Perú 1997-2002. *Rev. Fac. Cien. Ecón. Nac. Mayor de San Marcos*, 10(25), 7-9.

This hypothesis assumes that the assets are properly valued, so the only task of the manager is the diversification of the portfolio to adequate it to the level of risk selected.

So this measure does not take into account the additional return that can be obtained due to the abilities of the manager.

The formula to calculate it is this:

$$\text{Treynor's ratio} = E(R_k - r_f) / \beta_k$$

Where $E(A)$ means the expected value of A .

4.1.3. Sharpe's Ratio⁵

Sharpe's ratio was introduced in 1966. This relates the mean and the standard deviation of a fund's performance regarding with the risk free rate. So it indicates the additional returns obtained per unit of total risk assume.

In this case the fund portfolio can be not well diversified. This ratio can indicate is the fund is doing better or not than the market.

This measure is the most complete because it takes into account the total risk of the portfolio; the specific and the systematic or market risk.

The formula to calculate it is this:

$$\text{Sharpe's ratio} = E(R_k - r_f) / \sigma (R_k - r_f)$$

As bigger is the ratio bigger is the performance related to the risk.

If the ratio is lower than 0, the performance of the fund will be lower than that of the free risk rate. If it is lower than one, the performance obtained will be inferior to the risk assumed. Usually it uses to be greater than one.

4.2. The performance measure selected

After analyzing these measures, the Jensen Alpha measured was selected. The main reason was the thing that this is not just a statistical measure that shows whether exists self-correlation or not. With the Jensen's Alpha two portfolio are created, one will be formed

⁵ See Martín, M. R. (2007). Los fondos de inversión: performance y persistencia. Monografía de la CNMV, 26, 15. And García, W. F. (2005) La teoría de portafolio y la gestión de inversiones de los fondos de pensiones de Perú 1997-2002. *Rev. Fac. Cien. Ecón. Nac. Mayor de San Marcos*, 10(25), 7-9.

by the previous winners and the other one by the previous losers. So here what is measure are the results, not just the statistical. The result obtained will shows if the performance of the previous winners is greater than the previous loser's performance.

Using this measure we will get the idea of where is better to invest. Whether it is better to invest in a fund which had great performance in the previous period or not.

5. PERSISTENCE IN THE PERFORMANCE OF MUTUAL FUNDS

5.1. Previous literature and results

Most of the articles related with this topic are quite recent, but the basis articles are; Sharpe (1966) and Jensen (1968). Sharpe developed the "Sharpe ratio" ranked a sample of fund of two periods and found a positive relation between the rankings in the two periods.

However, Jensen using the "Jensen Alpha" concluded that there were a significant difference between the funds' performance and a random chance. After this other authors supported Jensen's results about that performance do not have a predictive value, (for example; Carlson (1970), Friend, Blume and Crockett (1970), or Dunn and Theisen (1983). They said that management do not have abilities to predict liquidity value and that is any fund obtained superior results this is by chance.

During the 90's many works showed evidence of performance persistence in mutual funds.

A great example of this is the work of Goetzmann and Ibbotson (1994). They used a large sample with more than 700 funds for a period of 13 years. Their objective was to study the long-run performance total fund return, in periods of two years. Once they got the performance of each fund they ranked all of them dividing them into winners and losers. The criterion to organize the funds was whether the raw returns were higher or lower than the median return of the period. The set of winners funds was present in four of the five period examined. The probability of getting a fund classified as winner in a previous period and once again as winner in the actual period was 60%.

Malkiel (1995) studied persistence trough contingency tables. He also studied the influence of the survivorship bias. After his studies concluded that previous papers that affirm that persistence exists in the short run were distorted due to the survivorship bias, (the returns obtained were overvalued due to funds with the lowest returns during some periods have been eliminated).

The survivorship bias has been repeatedly analysed and authors like Carhart, Carpenter, Lynch or Musto found that this weakened the results about persistence existence, (they came to the same conclusion as Maikiel).

Carhart (1992 and 1997) affirms the existence of persistence in the long-run, but ensure that the main causes of this are; the persistence in expenses and commissions. In the short-run, ensure that this is due to management expenses and the “momentum effect”. This is the accidental tendency to buy funds with the highest returns in the previous year.

5.2. Measures of performance persistence

In this section the main four alternatives to measure persistence will be describe. The first alternative describe is the GT, the second one the CPR, then the one given by Carpenter and Lynch and finally the portfolio analysis, by Carhart.

Both tests, CPR and Carpenter and Lynch are used to check the persistence of the results of consecutive periods. These two are non-parametric tests, it means that are more specific than the self-correlation analysis. Also give additional information about possible persistence sources.

In this paper the measure used has been the portfolio analysis.

5.2.1. GT

This measure was proposed by Gribblatt and Titman (1993).

GT statistical⁶ estimates the covariance between the relative weight of a fund and its later performance.

If investors don't have “smart effect”, the capability to anticipate the results and the expected returns are constant during the time, the relative weight of a fund and its evolution will not be correlated with their current return. The statistical will be around 0.

Otherwise if the “smart effect” exists the statistical will be positive.

Here is the GT statistical, where “ $R_{j,t}$ ” is the returns of the fund j for the period $t+1$ and “ $W_{j,t}$ ” is the weight of the fund respects the total assets of the category for the current period, being “ $W_{j,t-1}$ ” the weight of the fund for the previous period.

⁶ See Ciriaco, A., Del Río, C., Santamaría, R. (2003). ¿Tienen los inversores habilidades de selección? Resultados con fondos de inversión. *Revista de Economía Aplicada*, 11(32), 2-4.

$$GT_t = \sum R_{j,t} + 1 * (W_{j,t} - W_{j,t-1})$$

5.2.2. CPR (*Cross-Product Ratio*)

The CPR methodology⁷ classifies all the funds of the sample in two groups; winners and losers. To be part of the winners group a fund must present a performance higher than the median of the sample. In contrast, a fund that belongs to the losers group will have a performance lower than the median.

So this method associates the consecutive winner's mutual funds during two periods. These are denoted WW. The consecutive loser's mutual funds during two periods are denoted as LL.

This method contemplates the possibility that a fund that was classified as winner become loser, (or vice versa). These funds will be denoted as WL (if it passed from being winner to being loser) and as LW (if it passed from being loser to being winner).

The statistical used is the CPR:

$$CPR = (WW * LL) / (WL * LW)$$

This is the statistical used, assuming as null hypothesis the lack of persistence.

$$Z = \log(CPR) / \sigma_{\log(CPR)}$$

5.2.3. *Carpenter and Lynch*

These two authors proposed a Chi-Squared test⁸ through comparing the absolute frequencies of the four groups of funds (WW, LL, WL and LW).

The null hypothesis of this test is also the lack of persistence of the mutual funds.

Carpenter and Lynch found that the test X^2_1 is good to detect persistence and this is the most robust if the database has survivorship bias.

This is the formula of the X^2_1 :

$$X^2_1 = [(WW - N/4)^2 + (LL - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2] / (N/4)$$

⁷ See Ciriaco A. and Santamaria, R. (2005). Persistencia de resultados en los fondos de inversión españoles. *Investigaciones Económicas*, 29(3), 10.

⁸ See Fernández, A. C., Aquilué, R. S. (2005). Persistencia de resultados en los fondos de inversión españoles. *Investigaciones Económicas*, 29(3), 11.

5.2.4. Portfolio analysis

This is the methodology used to test performance persistence in this paper. The portfolio methodology⁹ was developed by Carhart (1997). The procedure that he followed started through the calculation of cumulative fund returns for a period of one year¹⁰. Then Carhart ranked the funds depending on its cumulative returns, from the lowest one to the highest. The next step in this method is to divide the entire sample into deciles¹¹; this is, dividing it into ten portfolios formed by the same number of funds. Observing then the returns of these funds over the next period, (after one year). This procedure is repeated for every period, giving a return series for each year.

This allows us to analyse whether annual persistence in mutual funds exist or not.

An alternative that Carhart proposed also in his study is to analyse if performance persistence exist not just for the next 12 months, if it exists for the next five years¹².

5.3. Performance persistence in Europe Equity mutual funds

As it was already said the performance measure used was the Jensen's Alpha and the persistence measure was the portfolio analysis.

The variable analysed has been the historical returns. With the aim of having a short term vision of future returns the analysis was focused on semester returns. Consequently using the liquidity value of the last day of June and December, the semester return of each fund was calculated. So the semester return was calculated for the whole period, from 2002 to 2013. This implies that 24 semester returns were obtained. These semester returns obtained were used during the whole work.

To develop this work it was necessary to create a new database. Due to the data that Inverco proportionate was monthly liquidity value.

⁹ See Otten, R., & Bams, D. (2002). European mutual fund performance. *European Financial Management*, 8,(1), 18.

¹⁰ Although Carhart proposed this model for one year, in this paper the analysis will be done for periods of 6 months. Semester returns will be analysed.

¹¹ Carhart divide his sample into deciles but due to the low number of funds of the database. It would not have sense to divide it into ten portfolios. These will be divided in two portfolios. The first one composed of the funds that got the worst returns in the previous year and the second composed of the funds that got better returns.

¹² Carhart repeated the same process but analysing the returns of the funds five years later. In this paper a robustness analysis will be done, it will be study the performance persistence for one and for two years.

One of the first problems that emerged was the fact that until the end of 2007 the funds were classified just in the basis of the names of the different funds. It represented a problem because some of the funds changed its names, disappear or just merge one with another adopting a new name. So without the number of reference that CNMV assigned to each fund it was even more difficult the identification of that problem that arises during the whole period. From 2008 to 2013 CNMV adopted this method of organization of assign to every fund a reference number. This makes easier the organization of the fund sample during the last years.

As some of the funds disappear, emerge or just new ones were created the number of available funds each month has considerably varied as it was already explained. It supposed a problem in the study of persistence. It was not possible to know which funds merged with another or the name that the new one adopted. Because of this problem some data was lost. So there was a bias consist on the problem of identifying the mutual funds.

For example the first month evaluated the database present 55 funds and in the last one 44 funds. The maximum sample is 70 funds, in December of 2007, and the minimum is 36, June of 2011.

Another important fact to study the persistence is the thing that the database is free of survivorship bias. Every month the entire funds that were part of the database are there, independently whether it survives over the whole period or not.

Once all the funds were organized and ordered the next step was calculate the semester returns for each fund. To calculate this, the logarithmic return was used. The logarithmic return for one period is; the logarithm of the liquidity value of the last period divided by the liquidity value of the previous period, in this case, of the previous six month.

$$\text{Return}_{(t-1, t)} = \ln (\text{Liquidity value}_{(t)} / \text{Liquidity value}_{(t-1)})$$

After applying this formula, it was achieved the semester returns for every fund, for 24 periods.

After this, the next step was working with these data; the objective was to create two portfolio funds from the sample. A portfolio consisted of the funds which show the lowest returns and another one consisted of the funds which show the highest returns in the previous period. The first one will be named as losers and the second one as winners. The loser's portfolio will be consisted on the 30% funds with lowest returns and the winner's portfolio on the 30% funds with the highest returns in the previous period.

The next step was to check if the funds that presented the lowest and the highest performance in the previous period still present it in the next period.

To calculate whether persistence exists or not in our sample, the technique used has been obtaining the mean performance of the funds that were part of the winners or losers in the previous period. Once the mean performance of each portfolio was obtained the process was repeated. A rank of the second period was done, it was ordered by returns obtained. And the whole process was repeated obtaining the averages (the average performance of the winners of the previous period and of the losers of the previous period).

After repeating the process 24 times a new table was developed. The table consisted on the average performance of the winners and the losers for each period, from 31/12/2002 to 31/12/2013.

Before analyzing the difference between winners and losers' returns, the objective was to know if the winners' return average and the losers' return average was different from zero.

To prove this two hypothesis test were proposed.

The first one was related to the winners' returns. The null hypothesis is that its average was equal to zero and the alternative hypothesis was that its average is different from zero. The same hypothesis test was proposed for losers' returns.

The result of Alpha in winner's case is 0.0339 but the p-value is bigger than 0.1 (it is 0.1835) so the null hypothesis cannot be rejected. The losers' Alpha is 0.0046 which is almost zero; the p-value is very big, 0.86779 so the null hypothesis cannot be rejected.

(These results are presented in the Table 2)

			OLS
		Coefficient	P-Value
CL	Constant	0.0046054	0.86779
CW	Constant	0.0339152	0.18352

Table 2: this table shows the results obtained analysing the winners and losers performance separately

5.3.1. Raw returns

Now the question that rose is if there is a difference between these two funds' portfolios.

To analyse the persistence on the funds' performance a regression model was used. This implies that the difference between the winners and the loser's performance (for each period) will be equal to the Alpha (α) plus the error term.

The model used is:

$$(CW - CL)_t = \alpha + \varepsilon_t$$

The null hypothesis is that Alpha will be equal to zero, which implies that there is no difference between the winners and the loser's returns, the alternative hypothesis will be that Alpha is different from zero, that there is a difference between the winners and the loser's average. This difference can be both positive and negative.

If this Alpha is positive this means that the winner's portfolio have bigger returns that the losers portfolio. Otherwise if the Alpha obtained is negative, the winner's portfolio will have lower returns than the losers' portfolio.

The programme used to compute this regression has been Gretl¹³.

The Ordinary Least Squares (OLS) procedure was used. The value of the constant obtained, Alpha, is 0.02930 and the p-value is 0.01876. As the p-value¹⁴ is lower than 0.1, the null hypothesis (that Alpha is equal to 0) is rejected.

As the alpha obtained is positive, this implies that winner's returns are higher than loser's returns. Winners have on average semester returns 2.930% higher than losers.

(These result are presented in the Table 3)

			OLS	HAC
		Coefficient	P-Value	P-Value
Simple model	Constant	0.0293098	0.01876	0.00764

Table 3: this table shows the results obtained with the simple model

$$(CW - CL)_t = \alpha + \varepsilon_t$$

¹³ Gretl is free software used to complete econometrics analysis.

¹⁴ If the null hypothesis is right the p-value becomes fundamental for the decision. If the p-value is lower or equal to the level of significant conventionally established, 0,1 or 0,05 the null hypothesis should be rejected. The p-value shows the probability of having the result that has been obtained if the null hypothesis is true.

In time series approach, self-correlation is very important. If self-correlation exists, this means that the OLS estimators can be biased, and it will be necessary to correct them.

So it was checked if self-correlation exists for the data. The null hypothesis in this case is that self-correlation does not exist. The Ljung-Box statistic is used to test for self-correlation. The result is 0.4669. The p-value obtained is 0.494 (which is much bigger than 0.1) so the null hypothesis cannot be rejected. So there is no significant self-correlation in the data.

Another important thing that can affect the variance of the estimators is heteroscedasticity. The OLS test assumed that the variance is stable, that heteroscedasticity does not exist.

Using the OLS procedure, the alpha coefficient is positive and significant (p-value=0.00764), at conventional levels. The same conclusion is obtained using the Newey-West procedure to compute robust errors¹⁵.

After this process it can be affirmed that performance persistence exists in this sample of European Equity funds for a temporary line of 6 months, a semester.

5.3.2. Risk-adjusted returns

Once the simple model has been worked and the results affirm that performance persistence exists, we have to take into account the risk. Note that the idea that can explain why the winners still have better returns in the future is because these funds invest in more risky assets. In the same way, losers will still have worse returns in the future because these invest in assets with low risk. Theoretically assets that give better returns have more risk associated.

To study this idea a risk-adjusted analysis is necessary. The model used will be CAPM.

Comparing this model with the previous one the main difference will be the market return.

As in this paper the type of fund analysed are European Equity funds that market return selected was Eurostxx50. The Eurostoxx50 is a stock index of the Euro zone. It is composed by the fifty biggest and the most liquid stocks. It was introduced on February 1998.

Before starting with the CAPM model the objective was to get the monthly returns of this stock market. Once these monthly returns were downloaded from the webpage of

¹⁵ The intention was to study heteroscedasticity through the White test but the program said that there was not enough number of coefficients to calculate it.

Investing¹⁶, the procedure followed to obtain the semester returns was the same as with the funds. The semester logarithmic return was calculated for the whole period, from 2002 to 2013. After obtaining this the CAPM model was proposed. This model includes the Beta (β) which measures the risk that the winners' minus the losers' portfolio, have in relation to the market risk.

Here is the proposed CAPM model:

$$(CW - CL)_t = \alpha + \beta_{CW-CL} * RM_t + \epsilon_t$$

The interpretation of the Alpha (α) is the same as in the previous model. If Beta (β) is positive this means this means that the winners risk is higher than the losers' risk. If Beta is negative this means that losers have more risk than winners.

Once all the data were obtained and the model proposed, as in the simple model, the OLS model method was used to solve it.

The null hypothesis is that the winners' average return is not different than the losers' average returns. The alternative hypothesis is that their average returns are different.

The results obtained show that the value of the constant is 0.0300 this has almost not change from the one obtained with the simple model (0.0293). The p-value obtained is 0.01344 which is lower than 0.05, so the null hypothesis can be rejected.

The null hypothesis for this model is that winners and losers have the same adjusted-return and the alternative hypothesis is that their adjusted-return is different.

The beta coefficient for the RM variable is -0.1412 which means that winners and losers do not exhibit significantly different risk (p-value is 0.1112). More importantly, the alpha coefficient is once again positive and significant at conventional levels, which implies that winners display higher adjusted return than losers. These results are presented in the Table 4.

			OLS	HAC
		Coefficient	P-Value	P-Value
RM model	Constant	0.03000178	0.01344	0.0111
	RM	-0.141271	0.11126	0.16596

¹⁶ Investing.com. (n.d.). Retrieved April 20, 2014, from <http://es.investing.com/ratesbonds/spain-10-year-bond-yield-historical-data>

Table 4: this table shows the results obtained with the CAPM model, taken into account risk, $(CW - CL)_t = \alpha + \beta_{CW-CL} * RM_t + \epsilon_t$

We have used the same procedure to test for self-correlation and heteroscedasticity. The Ljung-Box statistic was used to test for self-correlation. The result is 0.0329. The p-value obtained is 0.859 (which is much bigger than 0.1) so the null hypothesis cannot be rejected at conventional levels. So there is no significant self-correlation in the data.

In order to test for heteroscedasticity we use the White test. Under the null hypothesis of absence of heteroscedasticity, the TR^2 is distributed as a Chi-squared with two degrees of freedom. The test value is equal to 1.50651 (p-value=0.4708). So the null hypothesis cannot be rejected, heteroscedasticity is not observed in the data (the variance does not change). In spite of these results, we have computed the HAC variance for robustness.

As in the OLS case, the alpha coefficient is positive and significant using robust errors (HAC)

After all this process it can be affirmed, for this sample of European Equity fund and in this period of time (from 2002 to 2013) performance persistence exists. Both in the raw returns analysis and in the risk-adjusted returns analysis. So the winners in one period have better performance, on average, in the next semester than the losers.

We can compare these results with the one obtained by Ciricaco A. and Santamaría R. (2005). They study mutual funds in Spain from 1992 to 1992. As in this study, they found positive performance persistence for semester and annual returns. They found more significant persistence in the winners than in the losers. In the same way, studying adjusted-returns by risk, performance persistence was also found. As it can be imagine they affirm that persistence is lower for equity funds, whose assets are more volatile.

The same results were obtained by Ciriaco A., Del Río C. and Santamaría R (2003) in a previous study. On the other hand Requejo S. M. and Otero S. A. (2000) obtained for a sample of equity funds from 1991 to 1998 that performance persistence does not exist for annual periods.

6. ROBUSTNESS CHECKS

After analysing the performance persistence of the sample in semester, the idea to analyse it in the medium and in the long run became interesting.

At the beginning the idea was to make a comparison between the results of performance persistence in the short run (semester) and in the long run (holding a period of three years). This has not been possible due to the problems with the data derived from funds that disappear or merged into new ones. This make that after some years the historical series has almost disappear due to most of the funds are different that the funds from the first period. So the decision was to compare the results of the short run with the result of the medium run, (both in annual and biannual periods).

The objective was to calculate, in the biannual case, the average of the 4 semesters. Obtaining a semester average performance of the next two years.

Here the problem of funds that disappear or merged into new ones is also present. In some cases the four semester returns of the fund are not available, in this case the average calculated will be composed of three, two or one semester.

For example if we check for the period from 30/06/2007 to 30/06/2009 they number of fund that appear are 82 but just 42 funds have the returns data for the four semesters.

This problem is smaller in the annual period than in the biannual period, but it also has an effect in the annual analysis.

In the next two subsections these procedures will be briefly describe and the results will be analyse.

6.1. Performance persistence in Europe Equity mutual funds in annual periods

In this subsection the aim was to study if the performance persistence for this sample exists also for annual periods.

The first task was to calculate, from data of semester returns, the annual returns for every fund. The procedure followed was to sum the returns of the next two semesters and divide the value obtained by two. In this way the semester return for one year¹⁷ was obtained.

The method used was the same as in the semester analysis, the portfolio analysis. So after calculating the semester returns for a period of one year, for every fund in every period, the first semester (30/06/2022) was ordered from the fund with the lowest return to the one with the highest return. Then it was checked the funds that presented the lowest and the highest performance in the previous period still present it two semesters later.

¹⁷ The yearly semester returns were calculated in order to take advantage of the semester returns of the Eurostoxx50 already calculated.

To calculate whether persistence exists or not in our sample, the technique used was the same. Obtain the mean performance of the funds which were part of the winners or losers in the previous period. This was repeated period by period.

A new table with the average performance of the two portfolios was developed. This table was composed by semester returns for a period of one year.

Again the first thing was to check if the winners' and losers' average returns were different from zero. The same two hypothesis tests¹⁸ were proposed.

The results for the losers' are; Alpha is equal to -0.0158 and the p-value is 0.51125. As it is higher than 0.1 the null hypothesis of being equal to zero cannot be rejected.

The results for the winners' are: Alpha is equal to 0.04235 and the p-value is 0.06891. This is lower than the significant level conventionally established. So with the conventional level the null hypothesis of been equal to zero is rejected.

After this we can conclude that the loser average return is negative and take a value of -0.0158 and for the winners is positive and take a value of 0.06.891

(These results are presented in the Table 5)

			OLS
		Coefficient	P-Value
CL	Constant	-0.01581	0.51125
CW	Constant	0.04235	0.06891

Table 5: its shows the winners and losers yearly semester performance separately.

To analyse if there is a difference between the losers' semester return for one year and the winners' raw returns were used.

Through the OLS method¹⁹ these results were obtained.

The value of the constant obtained, Alpha, is 0.05817 and the p-value is 0.00001. As the p-value is much lower than 0.1 and the null hypothesis is rejected.

¹⁸ The null hypothesis for both was that its averages were equal to zero and the alternative hypothesis was that its averages were different from zero.

¹⁹ The hypothesis test proposed was the same as in the semester period procedure. The null hypothesis was that the winners and losers' average is the same. The alternative hypothesis was that this is different.

As the alpha obtained is positive this implies that winner's returns are higher than loser's returns. Winners have on average semester returns 5.817% higher than losers.

(These result are presented in the Table 6)

			OLS	HAC
		Coefficient	P-Value	P-Value
Simple model	Constant	0.05817	0.00001	0.00001

Table 6: it shows the results obtained with the simple model for yearly semester performance.

Ljung-Box statistic is used to test self-correlation. The hypothesis test proposed was the same (the null hypothesis is that self-correlation does not exist and the alternative hypothesis in that self-correlation exists). In this case, the result is 0.3875 and the p-value is 0.534 as this is bigger than the conventional level of significance, the the null hypothesis cannot be rejected. So there is no significant self-correlation in the data.

The Newer-West procedure was used to compute robust errors and the same conclusion as with the OLS procedure was obtained.

After this process it can be affirmed that performance persistence exists in this sample of European Equity funds for a temporary line of 12 months (semester returns for a holding period of one year).

The next question derivate from this is if this is produce due to the winners funds invest in more risk assets and the losers in less risk assets. The CAPM model was used and the hypothesis test was the same as the previously proposed.

The value of Alpha obtained is 0.05781. Alpha has taken almost the same value as in the simple model (0.05871). The p-value is 0.00001 which is much lower than the conventional levels, so the null hypothesis is rejected.

The Beta coefficient for the RM variable is 0.03846 which indicates that winners and losers do not exhibit significantly different risk. The p-value is 0.70538 which is higher than 0.1.

The main result of this study in that the alpha coefficient is also positive at conventional levels, which means that winners have higher adjusted return than losers.

(These results are presented in the Table 7)

			OLS	HAC
		Coefficient	P-Value	P-Value
RM model	Constant	0.05781	0.00001	0.00002
	RM	0.03846	0.70538	0.76821

Table 7: it shows the results obtained with the CAPM model, taken into account risk, for yearly semester performance.

Ljung-Box statistic is used to test self-correlation. The hypothesis test proposed was the same as in the previous one. The result is 0.4173. The p-value obtained is 0.518 (which is bigger than 0.1) so the null hypothesis cannot be rejected. So there is no significant self-correlation in the data.

In this case it was possible to do the White test to test heteroscedasticity. The null hypothesis proposed was homoscedasticity. The TR^2 obtained is distributed as a Chi-squared with two degrees of freedom. The test value is 0.15083 and the p-value is 0.9273. So the null hypothesis cannot be rejected, homoscedasticity can be rejected.

The Newer-West procedure was used to compute robust errors and the same conclusion as with the OLS procedure was obtained.

After this first robustness analysis it can be affirmed that as in the semester returns procedure, performance persistence exists for semester returns holding a period of one year. So the winners in one semester have better performance, on average, after two semesters than the losers.

6.2. Performance persistence in Europe Equity mutual funds in biannual periods

In this subsection the aim was to analyse if the performance persistence for this sample exists also for biannual periods.

As in the previous subsection the first task was to calculate, from data of semester returns, the biannual returns for every fund. The procedure followed was the same but adding the next four period returns instead of the next two, and dividing the value obtained by four. In this way the semester return for two year²⁰ was obtained.

²⁰ The yearly semester returns were calculated in order to take advantage of the semester returns of the Eurostoxx50 already calculated.

The method used was the same as in the semester analysis, the portfolio analysis. So after calculating the semester returns for a period of two years, the first semester (30/06/2022) was ordered from the fund with the lowest return to the one with the highest return. Then it was checked the funds that presented the lowest and the highest performance in the previous period still present it four semesters later.

As in the other procedures a table with the average performance of the two portfolios was developed. This table was composed by semester returns for a period of 2 years.

Again the first thing was to check if the winners' and losers' average returns were different from zero. The same two hypothesis tests²¹ were proposed.

The results for the losers' are; Alpha is equal to -0.0558 and the p-value is 0.04358. As it is lower than 0.1 and even to 0.05 the null hypothesis is rejected.

The results for the winners' are: Alpha is equal to 0.05047 and the p-value is 0.00242. Once again this is lower than the significant level conventionally established. So the null hypothesis of been equal to zero is rejected.

After this we can conclude that the loser average return is negative and take a value of -0.0558 and for the winners is positive and take a value of 0.05047.

(These results are presented in the Table 8)

			OLS
		Coefficient	P-Value
CL	Constant	-0.05588	0.04358
CW	Constant	0.05047	0.00242

Table 8: its shows the winners and losers biannual semester performance separately.

To analyse if there is a difference between the losers' semester return for a period of two years and the winners the raw returns were used.

²¹ The null hypothesis for both was that its averages were equal to cero and the alternative hypothesis was that its averages were different from cero.

Through the OLS method these results were obtained: The value of the constant obtained, Alpha is 0.10636 and the p-value is 0.00001. As the p-value is much lower than 0.1 and the null hypothesis is rejected.

As the alpha obtained is positive this implies that winner's returns are higher than loser's returns. Winners have semester returns 10.636% higher than losers.

(These result are presented in the Table 9)

			OLS	HAC
		Coefficient	P-Value	P-Value
Simple model	Constant	0.10636	0.00001	0.00003

Table 9: it shows the results obtained with the simple model for biannual semester performance.

Ljung-Box statistic is again used to test self-correlation. The hypothesis test proposed was the same as in point 6.1. In this case, the result is 1.4774 and the p-value is 0.224, as this is bigger than 0.1, the the null hypothesis cannot be rejected. So there is no significant self-correlation in the data.

The Newer-West procedure was used to compute robust errors and the same conclusion as with the OLS procedure was obtained.

After this process it can be affirmed that performance persistence exists in this sample of European Equity funds for a temporary line of 24 months (semester returns for a holding period of two years).

The CAPM model was used to check if this positive difference was due to the risk exposition and the hypothesis test was the same as the previously proposed.

The value of Alpha obtained is 0.10733. Alpha has taken almost the same value as in the simple model (0.10636). The p-value is 0.0001, which is lower than the conventional levels of significance, so the null hypothesis is rejected.

The Beta coefficient for the RM is -0.04816 and the p-value is 0.08719 this coefficient is lower than the 0.1 conventional level of significant so the null hypothesis can be rejected and we can say that losers' risk is higher than winners risk.

Once again the main result of this study in that the alpha coefficient is also positive at conventional levels, which means that winners have higher adjusted return than losers.

(These results are presented in the Table 10)

			OLS	HAC
		Coefficient	P-Value	P-Value
RM model	Constant	0.10733	0.00001	0.00001
	RM	-0.40816	0.08719	0.04742

Table 10: it shows the results obtained with the CAPM model, taken into account risk, for biannual semester performance.

Ljung-Box statistic is used to test self-correlation. The hypothesis test proposed was the same. The result is 1.4774. The p-value obtained is 0.224 (which is bigger than 0.1) so the null hypothesis cannot be rejected. So there is no significant self-correlation in the data.

In this case it was possible to do the White test to test heteroscedasticity. The null hypothesis proposed was homoscedasticity. The TR^2 obtained is distributed as a Chi-squared with two degrees of freedom. The test value is 2.7059 and the p-value is 0.2584. So the null hypothesis cannot be rejected, homoscedasticity can be rejected.

The Newer-West procedure was used to compute robust errors and the same conclusion as with the OLS procedure was obtained.

After the second robustness analysis it can be affirmed that as in the semester returns holding one year, performance persistence also exists for semester returns holding a period of two years. So the winners in one semester have better performance, on average, after four semesters than the losers.

7. LIMITATIONS

The first and more obvious limitation is that frequently some of the funds disappear or merge and new ones are created. In fact, due to the last years had been very hard for the financial sector, this had happened even more frequently.

The first consequence is that when the calculation of the semester returns was done, some of the funds didn't have a liquidity value in the next period. It made difficult the organization of the portfolio but also it can create problems with the data.

For example if two of the funds that were in the database of June merged during the next six months, these two won't appear in the database of December. On December database will appear a new one. The first thing is that it would be difficult to identify that it is the new merged fund and almost impossible to calculate the percentage each fund that composed the new one. So there is a bias consist on the problem in identifying the mutual funds.

Another consequence and even more relevant is that some of the losers funds will probably disappear and this have a horrible effect for the persistence analysis. There will be a truncation of the data set. So probably the persistence results obtained won't be hundred percent correct. The average performance obtained will be overestimated due to only surviving funds will be evaluated.

The low quantity of funds provided by the database present another problem. The problem is that as smaller is the sample more sensible will be to an extreme or extraordinary performance. This is, if for example the performance of 20 winners is taken to calculate the average of it and we have an extreme performance in one of them the result will be highly conditioned by this value. It wouldn't be so serious if instead of creating a portfolio of 20 funds the portfolio would have 100 funds for example.

Also the fact that in some periods the number of funds comes to 70 and in others to 36, make the analysis less reliable.

Other limitation faced in this project was the thing that exist better information sources with more completed database, but this databases are not public.

As it has been describe exist more measures and techniques to measure the performance and the persistence in the results in mutual funds. Some of them take into account more aspects and provide more reliable information, but I didn't have enough knowledge in the topic or the necessary information to work on it.

8. CONCLUSIONS

Nowadays the controversy about this topic is huge. Some studies show performance persistence in the short-run, explaining this due to the abilities of the managers ("hot hands"), other studies show persistence for the long-run, explaining this because of the managers' ability to choose and also difference in the information they can get. In other studies performance persistence has not been found.

This paper examines performance persistence for a sample of European Equity funds. The sample is composed by the funds that belong to the sample in some moment of the studied period (2002-2013), so the sample is free of survivorship bias.

The first conclusion is the existence of performance persistence for semester raw returns. This is that funds that got the best returns in one semester will get the on average the best returns next semester, and vice versa.

Once this question was solved the next analysis was to study if this difference between the winners' and losers' returns was due to different risk exposition. A risk-adjusted analysis was developed and the market return selected was Eurostoxx50. The CAPM model showed that risk exhibition is not a significant variable and that winners will have better returns in the next period than losers.

The next conclusions come from the robustness analysis. Performance persistence has been tested for a period of one and two years. For one and two years, the raw returns show that persistence clearly exists. As bigger is the period study, bigger is the persistence observed.

Analysing the risk-adjusted results for both robustness analysis we get the same conclusions, performance persistence exists and it is not explained by risk

We can conclude that performance persistence exists for the three holding period's analysed (semester, annual and biannual) and as this is not explained by risk other variables should be taken into account.

It is very probable that investors analyse previous returns in order to choose an equity fund.

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