THE REAL COST OF ASYMMETRIC INCENTIVE FEES

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Abstract

In this paper using a unique database of mutual funds that charge asymmetric incentive fees we evaluate the ex ante cost of these variable compensations as the premium of a spread option on the active return of the fund. We find that the cost of the asymmetric fee can be very high and that it's very difficult for the typical to forecast this cost looking at the structure of the fee or at the tracking error of the fund without a formal evaluation technique. We also find out that the value of the fee is highly sensible to market conditions an can vary through time even without changes in the fee structure or in the fund investment policy. Given these evidences we conclude that the ex ante cost of the fee should be included in the information to prospective investors and should be considered in the fund performance evaluation. In the paper we also address the question of the rationale of asymmetric incentive fee: we conclude that in the Italian context these fee cannot be seen as signaling instrument and that, at best, they can be seen a an optimal contracting tool.

Jel codes: G18, G23

1 Introduction

The reward scheme for asset managers often consists of both management fees and performance fees. The former are set as a percentage of the assets under management; the latter are a function of the realized return on the managed portfolio.

Hedge fund managers almost always earn performance fees on the total realized return. For mutual fund managers, instead, performance fees are usually a percentage of the differential between their portfolio return and a hurdle rate. When the hurdle rate is set equal to the realized return on a prespecified benchmark portfolio, the performance fee is a percentage of the fund's active return .

Performance fees may be either symmetrical (fulcrum fees) or asymmetrical (bonus plan). When fulcrum fees apply, a manager who outperforms the benchmark receives a proportion of the active returns suffering a symmetrical deduction from the management fee in the event of underperformance. On the other hand, a bonus plan rewards out performance without penalizing underperformance.

The literature offers insights on the influence of performance fees on managers' investment choices (Carpenter 2000, Elton et al. 2003); on their optimal structure in terms of social welfare maximization (Das and Sundaram 2002); on their pro and cons as a tool to manage the agency problem arising between investors and managers, the screening problem of separating good managers from the bad, the signaling problem of conveying credibly any information advantages managers may possess (Admati and Pfeiderer 1997; Stremme (1999), Cuoco, Kaniel (2000)).

In this paper we focus, instead, on two different issues: the first one is how much are performance fees worth to a manager of mutual funds or, equivalently, how much do they cost as a percentage of asset under management to the investors. The second point is the rationale behind the use of asymmetric incentive fee: are they a signaling device used by fund managers to "advertise" their ability or they are an optimal contracting rule designed to produce an effective incentive to reduce the moral hazard problem?

Goetzmann et al. (2003) already addressed the first question with respect to the hedge fund industry. They point out how to reward managers through a compensation scheme based on performance fees set as a percentage of the realized total portfolio return is equivalent to grant the manager a call option on the same percentage of the portfolio with a strike price equal to the initial portfolio value. Exploiting standard option pricing theory, it is thus possible to derive an estimate of the ex ante value of this compensation stated as a percentage of the asset under management. The valuation formula they suggest properly accommodates for both the high rate of attrition common among hedge funds and the high water mark provision.

In this paper, we shift the focus from alternative investment funds to mutual funds. This shift let us offer a number of original contributions for two reasons.

First, a different option pricing model is needed to price the ex ante value of performance fees, as structured in the mutual fund industry. The entitlement to earn a certain percentage of the difference between the realized portfolio returns and the benchmark return amounts to hold an option to exchange the same percentage of the benchmark portfolio for the managed portfolio. We must then price the performance fee provision using the spread option pricing formula due to Margrabe (1978).

Second, while Goetzmann et al. (2003) derive just a general estimate of the value of the performance fee provision under standard assumptions on the size of the relevant parameters, we calculate how much, in terms of funds' net asset value, the managers of mutual funds established in Italy earned thanks to the performance fee they applied in the period 1998-2004. No such extensive

analysis is possible in the US markets. An amendment to the Investment Company Act enacted in 1970 by the US Congress made illegal to charge asymmetric performance fees (Golec and Starks (2004)). Since then only a handful of managers were brave enough to adopt fulcrum fees. Almost everyone opted, instead, for a reward scheme entirely based on management fees, depriving researchers of the data needed for a meaningful empirical investigation.

We find that when no constrained are placed on the type of performance fee that can be charged, as it is the case in Italy, the choice of charging some sort of performance fee strongly depends on the type of fund managed. Whereas about nine out of ten equity mutual funds operating in Italy charge performance fees, only one out of two bond fund do. The percentage decrease even further among money market funds, being just above 10%.

This evidence rises a question on whether this kind of performance compensation can be seen as an optimal contracting device. Holmstrom (1979) points out that when the agent's action is not observable the first best risk sharing compensation scheme is not viable because it doesn't produce a sufficient incentive for the agent to exert effort. Under these conditions the compensation agreement is usually a second best solution where the agent carries an additional level of risk in terms of performance-linked compensation.

Moreover, when no constraints are imposed, when choosing the type of performance fee to charge, money managers overwhelmingly opt for some form of bonus plan over fulcrum fees. In Italy, the latter never occurs. This evidence calls into questions the "signaling function" sometimes assigned to performance fee provisions. To be reliable a signal has to be costly to send, even more so for the bad type manager. Avoiding the fulcrum fee structure, managers escape much of the signalling needed to make it effective.

Further support against the signaling function of bonus plan can be found looking at the relation between the average size of incentive fee bearing funds: according to Elton, Gruber and Blake (2003) in 1999 in the US funds with incentive fees represented just 1.7% of the market in term of number of funds but they accounted for 10.7% of assets under management, having thus a greater average size that funds that did not charge incentive fees. In Italy the empirical evidence is not so straightforward: if we consider the market as a whole the funds that charged an incentive fee in 2003 accounted for 72.2% of the total number of operating mutual funds but only for 48.8% of assets under management. This evidence doesn't seem to fit with the assumption of an incentive fee that correctly signal a high performing portfolio manager.

Moreover, we are able to provide an estimate of the amount actual wealth transfer that occurred yearly from funds subscribers to fund managers due to these bonus plan. In 2004, through the per-

formance fee charged, the investment companies were able to impose on subscribers a cost as high as 2% of the asset under management. Since the average management fee for an equity fund is around 1.8% the compensation extracted through performance fee is highly relevant, however for subscribers it is a much less transparent charge. To assess the through ex ante value of an asymmetric performance option pricing techniques are necessary and the cost for the investors depends a great deal by apparently minor technical details such as the frequency of calculation and by external market condition such as asset volatility. Managers may also game the value of this fees through their management style since, lacking a high water mark provision, higher fund's volatility translate in an higher value of the performance fee.

Because of this, investors' protection consideration suggest the need for tight disclosure rule regarding the asset managers' compensation scheme. The information provided should be not only complete and accurate, but also comprehensible and easy to compare with similar information provided by competing funds in order to allow investors to make better informed choices. We suggest that through a proper use of option pricing results, mutual fund managers may conveniently convey all the information needed for conscious investment decisions.

The paper is organized as follows: section 2 outlines the presence of performance fees in the Italian mutual fund industry, section 3 introduces the main structural forms of incentive fees, section 4 address the problem of evaluation of asymmetric incentive fees, in section 5 we analyze the ex ante cost of incentive fees in the Italian market, section 6 concludes.

2 Incentive fees in the Italian mutual fund industry

The reference universe for our analysis consists of 1,012 mutual funds chartered in Italy and active at the end of 2003. Table 1 offers a breakdown of our fund population according to their investment specialization as defined by Assogestioni, the trade association of Italian investment companies.

At the end of 2003, funds charging incentive fees represented 72.2% of the universe and were responsible for 48.8% of the total asset under management.

[

Table 1 ABOUT HERE]

These percentages widely varies across the different categories of funds as defined by Assogestioni. While only 10% of money market funds, counting for just 1.8% of their total asset under management, charges performance fees, this form of compensation was a standard industry practice among equity funds with almost nine out of ten funds adopting it. Total returns funds and hybrid funds charging performance fees also largely outnumber those which don't by a 4:1 ratio, and it is even more so should the comparison be made in terms of asset under management. Bonds funds split almost equally in the two groups: 56.3% of them charges performance fees, counting however for just 49.7% of the total asset trusted to this category of mutual funds.

This empirical evidence can be used to address the question about the rationale of incentive fees in the Italian market. If we consider an agency setting where the agent has to be incentivated (trough a performance-linked compensation) to exert the proper effort, it appears that the sensitivity of the compensation to the performance should be stronger where the agent action has an higher impact on the performance of the process (otherwise the incentivation benefit would not offset the reduced efficiency of sub optimal risk sharing). In the mutual fund industry the potential effect of the active management effort on the portfolio performance can be proxied by the cross section volatility of assets: if the return of assets is very similar a fund manager cannot add much value by tilting the portfolio toward one asset or another. Table 1 seems to support this optimal contracting hypothesis since we see that incentive fees are widely used by Equity and Hybrid fund managers, but only 50% of Bond fund managers and 10% of Money market fund managers actually use them[1].

According to Elton and al. (2003), in the United States less than 2% of the mutual funds charges performance fees but accounts for 10.5% of the total asset under management by the industry. In the US, then, funds charging incentive fees are of a much larger size than the remaining funds. This evidence suggest that incentive fees may indeed be used as a signaling device by only those few investment companies with either superior management ability or superior access to information. We should in fact expect that these funds grow larger than the others both because they attract bigger inflows of capital from investors and because of a larger rate of return on the asset they manage.

The evidence from the Italian market, however, points in the opposite direction. Apart from bond funds, for all other categories either almost all or none of the competing funds charge performance fees leaving no room to claim that strategically conscious investment managers are using perform-

[1] We see also that incentive fees are used by 90% of total return mutual funds. In this kind of product the variability of the portfolio asset allocation (in terms of cash, bonds and stocks) adds up to the cross section volatility of assets.

ance fees to sort themselves out as the best in the lot. Moreover, for equity, hybrids and total return funds, the average size of those charging performance fees is only marginally higher than for the remaining funds leaving doubts about both their superior appeal for investors and their ability to achieve a superior rate of return on their assets.

It is even more so for bond funds whose size is on average slightly smaller when performance fees are charged. Despite only few of the money market funds charge performance fees, the signaling hypothesis must be refuted since they average 1/10 of the asset under management by the corresponding funds without performance fees.

The contrasting evidence offered by the Italian and the US market in terms of the signaling function of performance fees may be explained by their different nature. While in the US, the law necessarily requires incentive fees to be structured as fulcrum fees, in Italy, the only legal constraint comes from a recent regulation enacted by the Bank of Italy that prohibits mutual fund managers from charging performance fees whenever the returns on the fund is negative[2], regardless of the behavior of the hurdle variable. Taking advantage of the less intrusive regulation, when applying performance fees, Italian funds almost always shy away from fulcrum fees preferring to opt for the bonus plan structure. Only a handful of funds accept to be penalized when underperforming the benchmark.

As originally stated by Spence (1973), in order to function as a separating device a signal needs both to be costly to be sent and this cost must be higher the lower the quality of the sender. Since bonus plan carries no penalty for the asset managers, while fulcrum fees do, performance fees do not perform in Italy the same signaling function they do, instead, in the US. It is even more so if we consider that, without a high water mark provision, performance fee are more beneficial to asset managers the higher the volatility of fund's returns exceeding the value of the pre-specified hurdle variable. Since in no case in Italy mutual funds carries the high water mark provision, the signaling cost implied by an asymmetrical performance fee provision is lower, everything else being equal, for managers which fare worst in terms of risk.

In the Italian market, even the role of performance fees as an optimal contracting tool between managers and investors sometimes appears questionable. If used as such, performance fees should be set as a function of the realized portfolio returns in excess to the return on a normal portfolio used to identify the risk/return profile the asset manager is asked to provide, also known as benchmark.

[2] See Governor's Order no. 1.7.98, chapter IV, section II, para. 9.1.1, published in Supervisory Bulletin no. 7, 1998, pp. 30 et seq., and the subsequent clarification contained in Supervisory Bulletin no. 4, 2001, p. 4.

With the exception of total return funds, whose category is named by Assogestioni “Flexible funds”, all fund in Italy must state in their offering circular the benchmark choosen in order to help actual and potential subscribers to have a clearer idea of the quality of the investment service provided.

Strangely enough, only 74.4% of funds with a bonus plan charge performance fees as a function of the active return achieved. In the remaining 26.6% of funds, performance fees are based on the portfolio returns exceeding the value of an hurdle variable loosely related to the investment task the manager had to perform. This hurdle variable is defined differently from fund to funds. Some of the options are as follows:

a. the average rate of return realized by all other funds with similar Assogestioni categorization regardless of the actual investment style pursued that may vary a lot (think of an equity fund specialized in large cap value stock compared to another equity fund specialized in small cap value stocks);

b. the return on an index of Treasury bonds or the Euribor rates, both intended as a proxy of a risk free rate of return, sometimes increased by a certain number of percentage points to accomodate for the equity risk premium;

c. the returns realized by the funds itself N periods earlier;

d. the rate of inflation as measured by the consumer price index.

It is difficult to find a rationale for these choices in setting performance fees inside the optimal contracting framework provided by the agency theory.

In the cases in question, the correlation of the return of the fund with the index is generally lower than that calculated by comparison with the benchmark. As will be shown, the value of the incentive fee for the manager increases in inverse proportion to the correlation between the return of the fund and those of the index chosen to calculate the fee. If the incentive fee does not depend on the benchmark, but is calculated by comparison with another arbitrarily chosen index, it is legitimate to query the real ability of the fee structure to align the objective function of the manager with that of investor.

3 The structure of incentive fees

An asset manager that charges both a management and an asymmetric performance fee earns

$$AF = a_0 + a_1 Max\left(R_p - R_b - K; 0\right) \quad (1)$$

where *AF* is the total payoff for the manager, a_0 is the management fee, a_1 is the participation rate, R_p is the fund return, R_b is the benchmark return (or the change in any other pre-specified hurdle variable) and *K* is the excess return needed to claim the right to a performance fee given by the second addendum in the right hand side of (1). K is often set equal to zero allowing the manager to collect a performance fee whenever portfolio returns exceed the benchmark return.

The payoff of a performance fee is proportional to the payoff of an option offering the right to exchange the benchmark portfolio for the fund portfolio (spread option) with a scale factor equal to the participation rate. It can also be interpreted as the payoff of a straight call option written on a fraction a_I of a long-short portfolio with a long position in the fund and a short position in the benchmark.

Any compensation scheme based on performance fee can therefore be valued accordingly using option pricing theory. Since these schemes are essentially option claims, their value to the manager, as well as their cost to the investors, is an increasing function of the underlying asset's volatility, here the tracking error of the fund portfolio with respect to its benchmark portfolio.

The tracking error is the risk any fund manager must accept in order to generate positive active returns on the managed portfolio or, in finance jargon, the necessary evil to accept, in the hope to gain a positive alpha [3]. As a measure of risk, the tracking error supports both *ex post* performance evaluations and ex ante definition of management policies and investment guidelines aimed to limit manager's freedom in investment decisions[4].

At first, it may appear odd that the investors agree to a compensation scheme based on a rule that rewards the relative (to the benchmark) riskness of the fund portfolio. An obvious risk of moral hazard arises since asset managers may pursue investment policies that widen the tracking error of the fund for the sole purpose of raising the value of their performance fees.

The moral hazard risk however is not as large as it seems since, contrary to a traditional call option holder the asset managers entitled to a performance fees remains exposed to a relevant downside risk. Chevalier and Ellison (1997), as well as Sirri and Tufano (1998) prove that performance achieved in the recent past are positively correlated with asset inflow in the fund. A record of outstanding performances attracts new investments, while one of bad performances deter them. Since

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[3] See Gupta, Prajogi, Stubbs (1999), p. 33.

[4] See Blitz, Hottinga (2001) pp. 19 et seq.

the management fee is proportional to the amount of assets under management, higher tracking errors increase the probability of poor performance relative to the benchmark putting at risk the growth of the fund and of the related management fees. The risk is amplified by the fund rankings published in the financial press (Goriaev, Palomino, Prat (2000)) where fund performance is often assessed using the information ratio (Goodwin (1998)), obtained as the ratio between the fund active return (alpha) and the tracking error. Moreover, Chevalier and Ellison (1997) suggest that asset managers working for investment companies are personally concerned about their career prospect or, also, about the value of their human capital. Poor fund's performances may lead the investment companies to remove the manager from his job or to stop his career depreciating considerably the value of his human capital. At an institutional level, the same concern arises in those investment companies that manages funds sponsored and placed by a different company. Once again , a high tracking error means higher probability of a relatively poor performance and higher job loss risk

Despite asset managers remain exposed to some downside risk, asymmetrical performance fees still provide an inappropriate incentive for investment strategies aimed to provide excess volatility in terms of tracking error. To avoid any remaining moral hazard risk, the US Legislation forbids asymmetrical performance fees, allowing only fulcrum fees. Letting FF be the total payoff to a manager that charges fulcrum fee, it follows that

$$FF = b_0 + b_1\left(R_p - R_b\right) \qquad where \quad FF > 0 \tag{2}$$

where b_0 is the management fee and b_1 is the participation rate to both the upside and the downside granted to the manager. Since in no fund the total payoff to the manager can be negative, a lower limit to the performance-linked component must be established. For instance, it may be agreed that should $(R_p - R_B)$ be less than a certain amount H ($H<0$), the performance-linked fee will be b_1H, where b_1H must always be smaller than b_0.

When this happens, the total payoff for the manager becomes

$$FF = b_0 + b_1 Max\left(R_p - R_b\,; H\right) \tag{2a}$$

or, by adding and subtracting b_1H in the right hand side,

$$FF = b_0 + b_1 H + b_1 Max\left(R_p - R_b - H\,; 0\right) \tag{2b}$$

Since the performance-linked component of the payoff is required to be symmetrical, to cap at b_1H the amount the manager is obliged to return to the fund in the event of underperformance, necessarily implies to impose an equal cap in absolute value, $-b_1H$, to the maximum performance fee the manager can earn when overperforming.

Because of this, the full payoff for a manager in the event of a fulcrum fee is

$$FF = c_1 + b_1 Max\left(R_p - R_b - H\,;0\right) - b_1 Max\left(R_p - R_b + H\,;0\right) \quad where \quad c_1 = b_0 + b_1 H \tag{3}$$

When entitled to a fulcrum fee, the fund manager holds both a long position on a spread option with strike H and a short position on a spread option with strike –H. He holds a bull spread position built using spread options. The value of a compensation scheme built as a bull spread remains positively related to the value of the underlying asset (here the active return) but it is also less sensitive to changes in the volatility of the underlying asset since it consists of both a long and a short position in options. In the jargon of the option literature, it menas that the vega is smaller for fulcrum fee than for bonus plan.

The above discussion shows two main results:

1. a symmetrical performance fee can never be greater than the corresponding management fee, while there is no upper limit to an asymmetrical performance fee;
2. the value of a bonus plan is more exposed to shifts in the tracking error than the value of a fulcrum fee provision.

The main variations on the basic asymmetrical structure

There are a number of variations to the basic asymmetrical structure of performance fee discussed above.

One of them has become especially important for the Italian market since the Bank of Italy has enforced it on mutual funds. It forbids managers to collect performance fees whenever the total return on the fund turned out to be negative during the observation period, regardless of the value of the active return.

The manager's total payoff with such an asymmetric performance fee becomes

$$AF = a_0 + a_1 d Max\left(R_p - R_b - K\,;0\right) \tag{4}$$

where d is a dummy whose value is 1 if R_p is positive and zero if R_p is negative or nil.

This modified payoff lowers the value of the performance fee provision. The manager cannot benefit from this incentive whenever portfolio returns are less negative than benchmark returns.

The basic asymmetrical fee structure can also be modified by setting a lower limit equal to zero for the benchmark return. Should the benchmark record a negative performance, it is nonetheless re-

quired a positive fund return to charge a performance fee. The total payoff for the manager then becomes

$$AF = a_0 + a_1 Max\left(R_p - Max\left(R_b ; 0\right); 0\right) \tag{5}$$

This modified version of the basic structure is also complaint with the regulation passes by the Bank of Italy. The value of the fee is even lower when calculated according to (5) rather than according to (4) if K is set equal to zero.

A third variation to the basic structure we found can be named "step-by-step" performance fees. In some funds the participation rate granted to the manager is set accordingly to a rising scale depending on the level of portfolio excess return compared to the benchmark. For instance, the participation rate may be equal to 10% should the active return falls between 1% and 2%; 0.20% should it be between 2 and 3% and 0.30% whenever the active return is greater than 3%[5]. The payoff of a step-by-step asymmetric performance fee is similar to the payoff of a portfolio of binary (digital) spread options.

All structure of an asymmetric performance fee seen so far are unbounded above. Every so often, however, a provision may be set to enforce a ceiling on its payoff. If this happens, the manager can be said to be long in a bull spread strategy whose value is less exposed to a variation in the tracking error than the value of a corresponding asymmetrical fee with no upper bound.

A final factor that differentiates between the value of the different fees is the reference period. In this respect, a distinction is made between synchronous and asynchronous fees. "Synchronous" fees are incentive fees calculated on the basis of a reference period coinciding with the period between two successive deduction dates. For example, a synchronous quarterly fee is calculated 4 times a year on the basis of the active return earned in each quarter. The fee is asynchronous if the reference period is greater than the application period. For example, a fee applied every quarter on the basis of the performance achieved in the 12 months prior to the date of deduction is asynchronous.

The examples given demonstrate the wide variety of performance fees existing, and demonstrate the difficulty for the investor to compare the cost of different conditions.

4 Evaluation of asymmetric incentive fee

[5] A step-by-step rule can be applied also to fulcrum fees, as done in the US market by the Sentinel Growth fund.

As seen in the previous section, the value of an asymmetric performance fee provision in its basic structure, as defined in (1), can be derived appropriately pricing a spread option, that is an option written on the difference between the prices or price indexes of two financial assets.

The payoff of a call spread option is[6]

$$Max(S_1 - S_2 - K; 0) \tag{6}$$

where S_1 and S_2 are the current prices of the first and second assets, and K is the strike price.

For a spread option with a strictly positive strike price no closed-form solution for the pricing problem is available and suitable numerical procedures become necessary (Monte Carlo simulation or the three-dimensional binomial tree devised by Rubinstein (1991)).

If the strike price is set to zero, the spread option is called "outperformance option" or "exchange option". A closed form solution to the pricing problem of an exchange option is available even for the more general case when the two assets are not exchanged in a 1-to-1 ratio. If we let q_1 and q_2 be two parameters defining the exchange ratio among the two assets, the payoff on the exchange option is

$$Max(q_1 S_1 - q_2 S_2; 0) \tag{7}$$

The option price, $V(S_1, S_2, \sigma)$, is[7]

$$V(S_1, S_2) = q_1 S_1 e^{-D_1 T} N(d_1) - q_2 S_2 e^{-D_2 T} N(d_2) \tag{8}$$

where

$$d_1 = \frac{\ln\left(\frac{q_1 S_1}{q_2 S_2}\right) + \left(D_2 - D_1 + \frac{1}{2}\sigma^2\right)T}{\sigma\sqrt{T}} \qquad d_2 = d_1 - \sigma\sqrt{T} \tag{9}$$

and D_1 and D_2 are the dividends paid by S_1 and S_2, σ is the volatility of the spread which depends on the volatility of the two assets and on their correlation coefficient,

$$\sigma = \sqrt{\sigma_1^2 + \sigma_2^2 - 2\rho_{12}\sigma_1\sigma_2} \tag{10}$$

When evaluating according to (8) an asymmetrical performance fee provision in its basic version as given in (1) and K set equal to zero, the spread volatility, σ, must be intended as the tracking error

[6] The payoff on the corresponding put option is given by: $Max(K - S_1 + S_2, 0)$.

[7] The pricing of an exchange option is due to Margrabe (1978). We use here the extended formula as in Wilmott (2000).

of the fund (σ_{TE}), that is the volatility of the active return defined as the differential between the return on the fund and the return on the benchmark both stated in continuous time.

In those few instances where the hurdle variable used in calculating the performance fee is not the benchmark portfolio for the fund, the spread volatility relevant to price the performance fee provision is not the tracking error of the fund. It is the volatility of the spread between the return on the fund and the return on the pre-specified hurdle variable.

Exploiting the results in appendix 1, when K=0 the value of the performance fee provision for each euro of asset under management becomes a function of the tracking error of the fund, $V(\sigma_{TE})$,

$$V\left(\sigma_{TE}\right) = a_1\left[N\left(d_1\right) - N\left(d_2\right)\right] \tag{11}$$

where

$$d_1 = \frac{1}{2}\sigma_{TE}\cdot\sqrt{T} \quad \textit{and} \quad d_2 = d_1 - \sigma_{TE}\sqrt{T} = -\frac{1}{2}\sigma_{TE}\sqrt{T} = -d_1 \tag{12}$$

A simple approximation of (11) shows the direct relationship between the value of the performance fee provision and the volatility of the tracking error[8]:

$$V\left(\sigma_{TE}\right) \approx 0,4\cdot a_1\cdot\sigma_{TE}\cdot\sqrt{T} \tag{13}$$

According to (13), a provision for a performance fee charged once a year (T=1) on the active return realized over the period, with a participation rate of 10% and a tracking error of 5%, is worth 0.20% of the asset under management (0.4 x 0.1 x 0.05).

Equation (13) is useful to understand the differences in cost between fees with different maturity dates and periods, analysed in appendixes 2 and 3 below. The appendix 2 compares synchronous and asynchronous fees, participation rate being equal, while the appendix 3 analyses the cost of a synchronous fee on variation of the frequency of application.

Sensitivity analysis.

To complete the analysis, we will give some numerical examples to show the sensitivity of the value of incentive fees to changes in the volatility of the portfolio (σ_P) and the in the correlation be-

[8] It is sufficient to use the following approximation: N(d) ≈ 0.5 + 0.4 d. For further information, see Brenner and Subrahmanyam (1994).

tween the portfolio and the benchmark (ρ). The range of values considered is wider than that likely to be found in reality, but gives a better appreciation of the behavior of the fee.

In the analysis we will consider a fee structure where the hurdle rate is the benchmark of the mutual fund. In this case we can talk of tracking error and measure the sensitivity of the fee to changes in the fund management policy (the degree of active management). It's nonetheless important to remember that one fund out of three calculate the incentive fee using an hurdle rate that is not a portfolio. For these funds the tracking error can be very high (the concept itself is misleading) but the fee structure is usually more complex with maximum values and other peculiarities.

In all the examples reference is made to a synchronous quarterly fee, with a 20% participation rate, calculated in relation to an index with 20% volatility. In Table 2 we report the value of tracking error for different fund volatilities and correlation levels (given a benchmark volatility of 20%).

[INSERT Table 2 ABOUT HERE]

Table 3 shows the annual cost of a quarterly fee, calculated on an invested capital of 100 and for various degrees of tracking error. In the first row we consider a standard fee structure, ie. according to equation (1). The fee value approaches zero with the tracking error. To get a feeling of the italian market we can report that in our sample the average tracking error between june 2003 and june 2004 has been equal to 4.2%. As can bee easily seen the fee value increse rapidly with the degree of activity of the fund management policy. From Table 2 we see that the tracking error for a fund with the same volatility of the benchmark and a correlation coefficient equal t 0.9 is equal to 8.9%, with an expected fee value around 1.5%, slightly less than the average size of the managemtn fee for an equity mutual fund. Of course the incentive to create active risk does not translate directly in an incentive to create absolute risk: the tracking error can be increased reducing the fund volatility below the level of benchmark volatility.

[INSERT Table 3 ABOUT HERE]

The second line in Table 3 is related to an incentive fee which can be earned provided that the return on the managed portfolio is positive, as specified in the Bank of Italy regulations, the so called positivity constraint. Comparing the values we see that this condition has the effect of reducing the value of the option but the reduction is not clearly related to the tracking error level. The positivity constraint, in fact, generates the biggest reduction of the fee value when the correlation between the fund and the benchmark is high but the fund has a lower volatility: this combination maximizes the probability of getting a negative fund return with a positive active return. For a fund with a volatil-

ity equal to the benchmark volatility and a correlation coefficient equal to 0.9 the fee reduction is around 28.6%.

The third line in Table 3 shows the values of a fee calculated with a condition of non negative benchmark. In this case when the benchamrk return is negative he fee is calculated on a hurdle rate equal to zero. This specification further reduces the value of the fee compared with the cases seen before. Again we see that there is not a clear relation between the fee reduction and the tracking error: also in this case the condition that maximizes the fee reduction is a low fund volatility with a high correlation coefficient. For a fund with a volatility equal to the benchmark volatility and a correlation coefficient equal to 0.9 the fee reduction is around 45%.

The last line of Table 3 shows the values of an incentive fee that is superiorly bounded with a maximum value of 1% of the assets under management. We see that the presence of an upper limit strongly reduces the ex ante cost of the fee. Also the sensitivity of the value of the fee to the tracking error is lower when a maximum fee value is introduced.

A last remark on the evidences of Table 3 can be done noting that the expected value of the fee can be properly forecasted only considering together the fund management policy and the details of the fee structure: as we will see later using real market data this complexity generates a lack of transparency for this kind of compensation whose cost cannot be easily estimated by private investors.

5 The ex ante cost of incentive fees in the Italian mutual fund industry

Exploiting the insights derived in the previous sections, we estimate of the ex ante wealth transfer from funds' subscriber to funds' managers due to performance fee provisions found in Italian equity mutual funds. We obtain the data on mutual funds and benchmarks returns from DATASTREAM, while the information on the performance fee structure and benchmark portfolio were hand collected from the funds' offering circular.

Our sample consists of 335 funds representing 88.5% of the entire population of equity funds active at the end of 2003 and charging performance fees. Out of the existing 474 equity funds, 52 charged just the management fee and we had to discard 16 funds because they were merged on the last day of the semester and their time series was discontinued from the database we used. We also discarded 6 funds with one year of missing data and an additional 16 funds because we were unable to obtain or build the series of their benchmarks' returns. Finally, we didn't succeed in collecting information on the structure of the incentive fee for the remaining 32 funds.

The funds analyzed show a variety of performance fee structures.

As hurdle variable, most funds (223 or 66.6% of the sample) use the returns on the benchmark portfolio almost always a stock market index or a linear combination of stock market indices. In a relevant number of funds (45 or 13.4% of the sample) the incentive fee is a function of the difference between the fund's return and the return of a value weighted index of mutual funds with the same investment objective[9]. For un additional 56 funds (17.6% of the sample) the hurdle variable is a money market interest (usually Euribor or Eonia) plus a certain number of basis points. Finally, 11 funds charge performance fee on their total return. The managers of these funds, then, are entitled to a plain vanilla call option on the mutual fund net asset value rather than the previously discussed spread option which simplifies the pricing problem.

Regarding the frequency of computation, 195 funds (58% of the sample) is on a quarter basis; 21.2% on a monthly basis and 20.6% on a yearly basis.

With respect to Analyzing the participation rate we see that 40.1% of the funds earn a portion of the extra performance in the 18%-20% range, while 18.8% of the funds charge a 24%-25% and 14.9% calculate the incentive fee using a participation rate in the 10%-15% range. For the remaining 18.2% of the sample there is not a participation rate because the fee is calculated according to a naive scheme, for example as a fixed percentage of the fund value.

Moreover we have to consider that for the majority of funds in our sample (192 funds or 57.3%) the incentive fee is calculated with some sort of special provision: for 151 funds there is an upper bound to the value of the fee, and 28 of these funds also use a lower bound. For 74 funds the incentive fee is calculated as a fixed percentage of the fund value if the extra-performance is above a certain threshold (in these cases usually there are multiple thresholds with different coefficients).

These special provisions, together with the positivity constraint introduced by Bank of Italy in 2002, make it impossible to evaluate these fees with the close form solution of Margabe (1978), so we implemented the three-dimensional binomial tree (or binomial pyramid) developed in Rubinstein (1991) with 30 nodes and a risk free rate equal to 3%.

[INSERT Table 4 ABOUT HERE]

The results of the evaluation are reported in Table 4, the ex ante cost for the average fee is 0.43% and it's not statistically different across sub-samples of funds that use different kinds of hurdle

[9] In Italy, the leading indices on mutual fund performances, disaggregated for Assogestioni categories, are those supplied by Fideuram, known as Fideuram Indices.

rates. The most expensive fee has cost of 2.2% and it’s charged by a mutual fund that invests in emerging markets stocks and calculates the fee on monthly returns with a participation rate of 20%.

The high cost of the fee can be partly related to the significant tracking error of the fund, 9.51%, deriving by an excess of volatility (16.31% for the funds versus 13.84% for the benchmark) and correlation equal to 0.81. The relevance of the cost of the incentive fee can be fully assessed confronting it with the management fee of the fund that is equal to 2.0%. Looking at the cumulative distribution of fees cost (

Figure 1) we see that although 74% of the fees have a cost below 0.5% on a yearly base still there is a fat cue on the right side of the distribution with 6% of the funds with a fee above 1%. One of the main problems, in our opinion, is the "lack of transparency" on the cost of the fee: the fee structure alone can't be used to properly forecast the ex-ante cost without a quantification of the tracking error: the cheapest fee charged by a fund that has the same fee structure that we have seen before is 0.48%. The difference between the costs of the two fees, 1.72%, comes only from different tracking errors (9.51% for the first fund versus a meager 2.49% for the second fund). On the other side also the tracking error alone cannot be used to effectively asses the cost of the fee: the highest TE in our database (14.65%) belongs to a fund whose fee ex ante cost is "only" 2.15%.

The only difference in the fee structure between this fund and the most expensive fund is the fee frequency (quarterly vs monthly).

Another possible source of unpredictability is the presence of a special provision, for example an upper bound for the fee. There are two funds in our database with very similar tracking errors (7.89% for the first fund and 7.93% or the second), both of them charge a fee with a monthly frequency and a participation rate equal to 20%. The only difference in the fee structure is an upper bound of 1% to the fee charged by the second fund. The ex ante cost of the fee charged by the first fund is 1.67% versus a meager 0.30% for the second fund.

Sensitivity to market conditions

The evaluation of the ex ante cost of the asymmetric incentive fee is performed in a risk neutral environment where the expected rate of return of every asset is equal to the risk free rate. Under this condition the value of the fee should not be influenced by current market expectations: the ex ante cost of the incentive fee is the same in a bull market or in a bear market. Nonetheless market conditions can have a big impact on the value of the fee via the impact that they have on the market volatility and on the behavior of fund managers, namely on the degree of active risk that the managers choose to take. We have been able to build complete time series of funds and benchmark returns in 2001 for 163 funds (out of 315 incentive fees bearing funds operating at the beginning of 2001) and we have calculated a fictional value of the fees using the actual fee structures but volatilities and correlations of 2001. The ex ante cost of the fee for these funds is reported in Table 5. The average fee increases to 0.79%, with a median increase of 0.24% in absolute value or 65.01% in percentage terms. The increase is generated by an increase in volatilities and a decrease in correlations, with a resulting change in tracking error equal to 4.25% for funds that use a market benchmark and 3.88% for funds that use the investment category benchmark. The fee increase seems to be highly relevant if we consider the for 39% of funds the change is more than twofold and for 13% of the funds is

larger than 400%. This high degree of instability of the fees ex ante cost adds to the lack of transparency that we have seen before: even the historical ex ante cost is not a good measure of the expensiveness of the fund if we expect changes in market volatility or in the fund investment policy.

[INSERT Table 5 ABOUT HERE]

The effect of the positivity constraint

In 2002 Bank of Italy introduced a restriction on the possible fee structures by saying that the fund cannot charge the performance fee when the fund return is negative. The rationale behind this decision was that the performance fee can be charged only when the performance of the fund is "satisfying" and that a negative performance can never be deemed satisfying, regardless the level of the active return. In Table 6 we have calculated the value of the fee without the positivity constraint. Looking at the whole sample we see a median increase of the fees of 0.09% in absolute terms and 31.37% in percentage terms. This number is influenced by the fact that funds that calculate the fee on the absolute return or uses a money market hurdle rate are not sensible to this provision. If we focus on funds that use a market or investment category benchmark we would observe a sharper increase, 38.60%, that rises to 42.38% if we focus of funds with market benchmarks. For these funds the possibility to charge the fee when the active return is positive and the fund return is negative would generate a significant increase in the value of the performance fee.

[INSERT Table 6 ABOUT HERE]

6 Conclusions

In this article we have drawn on the unique experience of a country where the current regulation allows investment companies to charge asymmetric performance fees on mutual funds return. In this context the vast majority of funds charges performance fees (in contrast with the US experience where the 1970 Investment Company Act forces the uses of symmetric performance fees and only a very small portion of funds charge this kind of fees).

Under this setting the incentive fee can hardly be considered a signaling instrument used by investment management to convey to the market information about their management ability. Market data on fees charged by funds with different investment objectives allow us to see the incentive fee as a tool for optimal contracting between investors and fund managers. Even this role of the incentive fee is questionable if we consider that two thirds of the fund charge a fee on the differential return of the fund over a variable that is not a market index and so does not provide an incentive to produce successful active management.

We have evaluated the ex ante cost of these fees applying the risk neutral methodology developed for spread options adapting it to the huge variety of fees structures. While the average fee cost is below 0.5% on a yearly base we see prices as high as 2.2% with a fat tailed distribution. Moreover this number is influenced by the low volatilities of financial markets in 2003-2004. Applying to the valuation volatilities and tracking errors of 2001 we get a median fee cost increase of 65%. The positivity constraint introduced by the Italian regulator in 2002 that forces investment company to charge the fee only when fund return is positive generated a sensible decrease in fees value.

One of the main hindsight that we get from this analysis is the lack of transparency on the cost of the incentive fee. The investor is giving to the investment company a call option on the difference between the fund and the benchmark return without receiving the relative premium and so:

The value of the option should be known by the investor, but how we demonstrated in the paper is very difficult, without a formal evaluation, forecast this cost looking at the fee structure or at the fund behavior. So the ex ante cost of the fee, calculated on the base of significant historical volatilities and correlation should be communicated to the investor by the investment company.

When the past performance of mutual funds is used to build ranks the ex ante cost of the fee (instead of the fee actually charged) should be subtracted from the funds return. The actual performance fee is not relevant in forecasting the fee that will be charged in the next period, while the ex ante cost would level the play field between good and bad performing funds and would give a more precise idea of the expensiveness of the fund.

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Appendix 1

In order to demonstrate that:

$$V(\sigma_{TE}) = a_1 C \cdot [N(d_1) - N(d_2)]$$

We consider first the payoff of an asymmetrical incentive fee:

$$a_1 \cdot C \cdot Max(R_p - R_b - k; 0)$$

Let $I_p(0)$ and $I_b(0)$ denote the indices expressing, respectively, the value of the fund and that of the benchmark at time $t = 0$ and $I_p(T)$ and $I_b(T)$ the (aleatory) values of the two portfolios at time T. After expressing the fund return and that of the benchmark on a basis equivalent to the period of length T*:*

$$R_p = \frac{I_p(T)}{I_p(0)} - 1 \qquad and \qquad R_b = \frac{I_b(T)}{I_b(0)} - 1 \tag{31}$$

it is possible to rewrite the payoff of an asymmetrical performance fee:

$$Max\left(\frac{I_b(T)}{I_b(0)} - \frac{I_p(T)}{I_p(0)} - k, 0\right) = \frac{1}{I_b(0)} Max\left(I_b(T) - \frac{I_b(0)}{I_p(0)} I_p(T) - k_1, 0\right) \tag{32}$$

with $k_1 = k/I_b(0)$

This expression takes exactly the form of the payoff of a spread option. If k_1=0 (i.e. k=0), expression (32) takes the form of an exchange option, thus allowing an immediate application of (21) in Section 3. However it is possible to further simplify the previous payoff. Without loss of generality we may assume $I_p(0) = I_b(0) = I_0$: actually it is sufficient to define the index measuring the value of the portfolio on the same basis as that of the benchmark. We obtain the following payoff:

$$a_1 \cdot C \cdot \left(\frac{1}{I_0}\right) Max(I_b(T) - I_p(T); 0) \tag{32a}$$

Now assume that the dividends D_1 and D_2, distributed by the Fund and the benchmark respectively, are equal to zero: other hypotheses can be handled relatively easily, since we are interested in pricing the asymmetrical fee *ex post*, on the basis of historically observed values.

By applying (21) and remembering that dividends are equal to zero, we obtain:

$$V(\sigma_{TE}) = \frac{a_1 C}{I_0}\left[I_b(0) \cdot N(d_1) - I_p(0) \cdot N(d_2)\right] = a_1 C \cdot [N(d_1) - N(d_2)]$$

Appendix 2

The cost of a synchronous fee does not generally coincide with that of an asynchronous fee having the same participation rate and the same frequency as the first. Suppose that the following fees are compared:

fee deducted quarterly and calculated on the excess return for the same period, amounting to: $a_1 Max\left(R_p - R_b ; 0\right)$

fee deducted quarterly and calculated on the excess return for the 12 months preceding the date of deduction, amounting to: $a_1 Max\left(R_p - R_b ; 0\right)$

In case 1, the fund manager benefits during the year from 4 options, each of which has a quarterly duration and begins to run on the maturity date of the preceding one. If our calculations are related to a unit capital, the quarterly fee has the value of:

$$0{,}4 \cdot a_1 \cdot \sigma_{TE} \cdot \sqrt{\frac{1}{4}}$$

Assuming, for the sake of simplicity, a tracking error that is constant over time, to obtain the annual cost of the incentive fee it is sufficient to multiply the preceding value by 4, obtaining:

$$2 \cdot 0.4 \cdot a_1 \cdot \sigma_{TE}$$

In case 2, the manager again benefits from 4 options during the year. However, in the case considered, all the options exist simultaneously, have maturity dates three months apart, and each one has a duration of 12 months. On these assumptions, 4 options, with a residual life of 3, 6, 9 and 12 months, are in existence at the start of the year. 3 more options will implicitly be entered into at 3-month intervals during the year. The initial value of each option is: $0{,}4 \cdot a_1 \cdot \sigma_{TE}$, still assuming that the tracking error is constant. The cost of each option must then be attributed to the year to which it relates. The total annual cost is therefore:

$$C = \left(\frac{3}{12} + \frac{9}{12}\right) \cdot 0.4 \cdot a_1 \cdot \sigma_{TE} + \left(\frac{6}{12} + \frac{6}{12}\right) \cdot 0.4 \cdot a_1 \cdot \sigma_{TE} + \left(\frac{9}{12} + \frac{3}{12}\right) \cdot 0.4 \cdot a_1 \cdot \sigma_{TE} + 0.4 \cdot a_1 \cdot \sigma_{TE}$$

$$C = 4 \cdot 0.4 \cdot a_1 \cdot \sigma_{TE}$$

As will be seen, the annual cost of the incentive fee is roughly twice as high in case 2 as case 1.

Appendix 3.

Fund regulations sometimes specify that the periodic performance fee is expressed on an annual basis, by multiplying the percentage applied to each period by the number of periods in the year. For example, a monthly incentive fee amounting to 1% of the excess return is converted to an annual fee of 12%. This method of calculating the equivalence between fees charged at different intervals is incorrect, because the value of the option increases approximately in proportion to the square root of the maturity period. Consider the following examples, all of which relate to a unit capital:

1) Annual fee amounting to a percentage a_1 of the excess return

Implicit annual cost: $0{,}4 \cdot a_1 \cdot \sigma_{TE}$

2) Quarterly fee equal to a percentage $a_1/4$ of the excess return

Value of a quarterly fee = $0{,}4 \cdot \frac{a1}{4} \cdot \sigma_{TE} \cdot \sqrt{\frac{1}{4}}$

Implicit annual cost = $0{,}4 \cdot a_1 \cdot \sigma_{TE} \cdot \frac{1}{2}$

3) Monthly fee equal to a percentage $a_1/12$ of the excess return

Value of a monthly fee = $0{,}4 \cdot \frac{a_1}{12} \cdot \sigma_{TE} \cdot \sqrt{\frac{1}{12}}$

Implicit annual cost = $0{,}4 \cdot a_1 \cdot \sigma_{TE} \cdot 0.2887$

The annual value of the fees charged in cases 2 and 3 is 50% and just under 29% respectively of the value of the fee used in case 1.

Table 1
Incentive fees in the Italian mutual fund industry

The table reports for various categories of mutual funds the use of incentive fees.. The data on mutual funds operating at the end of 2003 come from Assogestioni, the Italian association of investment companies. Data on incentive fees come from prospectuses issued by the various investment companies.

	Number of funds	**Asset under management (millions of €)**	**Funds that charge incentive fees**	
			As a % of the number of funds	*As a % of Asset under management*
Equity funds	474	74.793,8	87,7%	90,0%
Hybrid funds	84	32.097,3	76,2%	80,4%
Bond funds	360	170.203,6	56,3%	49,7%
Money Market funds	39	96.130,0	10,0%	1,8%
Flexible funds	55	5.819,6	80,8%	93,6%
Total	**1012**	**379.044,2**	**72,2%**	**48,8%**

Table 2
The effect of fund volatility and correlation on tracking error

The table quantify the tracking error of a mutual fund with the volatility in column and correlation in row measured against a benchmark with a 20% yearly standard deviation.

		Fund Standard Deviation									
		5%	**10%**	**15%**	**18%**	**20%**	**22%**	**25%**	**30%**	**35%**	**40%**
Correlation Coefficient	**0.00**	20.6%	22.4%	25.0%	26.9%	28.3%	29.7%	32.0%	36.1%	40.3%	44.7%
	0.25	19.4%	20.0%	21.8%	23.3%	24.5%	25.8%	27.8%	31.6%	35.7%	40.0%
	0.50	18.0%	17.3%	18.0%	19.1%	20.0%	21.1%	22.9%	26.5%	30.4%	34.6%
	0.75	16.6%	14.1%	13.2%	13.6%	14.1%	15.0%	16.6%	20.0%	24.0%	28.3%
	0.80	16.3%	13.4%	12.0%	12.2%	12.6%	13.4%	15.0%	18.4%	22.5%	26.8%
	0.85	16.0%	12.6%	10.7%	10.6%	11.0%	11.7%	13.2%	16.7%	20.9%	25.3%
	0.90	15.7%	11.8%	9.2%	8.7%	8.9%	9.6%	11.2%	14.8%	19.1%	23.7%
	0.95	15.3%	11.0%	7.4%	6.3%	6.3%	6.9%	8.7%	12.6%	17.2%	21.9%
	0.99	15.1%	10.2%	5.6%	3.3%	2.8%	3.6%	5.9%	10.6%	15.5%	20.4%
	1.00	15.0%	10.0%	5.0%	2.0%	0.0%	2.0%	5.0%	10.0%	15.0%	20.0%

Table 3
The ex ante cost of asymmetric incentive fees for different tracking error levels and different boundary conditions.

Standard Fee is the ex ante cost of an asymmetric incentive fee. When the *Positivity Constraint* is applied the value of the fee is zero when the fund return is negative (regardless of the sign of the active return).Under the *Non negative Hurdle Rate* condition when the benchmark return is negative the fee is calculated on a zero benchmark return. When the *Maximum Fee 1%* rule is applied the value of the fee cannot exceed 1% on a yearly base. The ex-ante cost of incentive fees has been simulated, for every tracking error level) using a binomial pyramid with 30 nodes, a risk free rate equal to 3%, a quarterly frequency, a participation rate equal to 20%, benchmark volatility equal to 20%.

Tracking Error	**1%**	**2.5%**	**5%**	**7.5%**	**10%**	**15%**	**20%**	**25%**	**30%**	**35%**	**40%**
Mutual Fund Volatility	*20%*	*22%*	*22%*	*25%*	*25%*	*30%*	*35%*	*40%*	*40%*	*40%*	*40%*
Correlation Coefficient	*0.999*	*0.997*	*0.975*	*0.969*	*0.923*	*0.894*	*0.875*	*0.859*	*0.684*	*0.484*	*0.250*
Standard Fee	0.16	0.40	0.81	1.20	1.61	2.41	3.20	3.99	4.80	5.59	6.38
Positivity Constraint	0.10	0.38	0.68	1.03	1.29	2.14	2.97	3.81	4.47	5.16	5.91
Non negative Hurdle Rate	0.09	0.36	0.58	1.02	1.25	2.07	2.88	3.70	4.16	4.59	5.02
Maximum fee 1%	0.16	0.29	0.39	0.40	0.43	0.43	0.43	0.43	0.44	0.45	0.46

Table 4
The ex-ante cost of asymmetric incentive fees

Incentive fees have been evaluated using a binomial pyramid (one-dimensional binomial tree for panel D) with 30 nodes and a risk free rate equal to 3%. Volatilities of funds and benchmarks and correlation coefficients have been calculated using one year of daily returns from July, 1 2003 to June, 30 2004. Funds in panel A calculate the incentive fees on the excess return of the fund over a market index or a portfolio of market indices. Funds in panel B calculate the incentive fee on the excess return of the fund over the return of a value weighted index of mutual funds with the same investment objective (the widely known Fideuram Indices). Funds in panel C calculate the incentive fee on the excess return of the fund over an Interbank interest rate (usually the Euribor or the Eonia). Funds in panel D calculate the fee on the absolute return of the fund.

		Hurdle Rate			
	Whole Sample	**Panel A Market Index**	**Panel B Inv. Category Index**	**Panel C Risk Free Rate**	**Panel D No Hurdle Rate**
N° of Funds	335	223	45	56	11
Average Fee	0.43%	0.39%	0.61%	0.46%	0.32%
St. Deviation	0.35%	0.38%	0.35%	0.17%	0.07%
Highest Fee	2.20%	2.20%	1.40%	0.88%	0.44%
Mean Fund St. Deviation	12.35%	12.45%	11.93%	12.53%	10.91%
Mean Benchmark St. Deviation		12.34%	11.61%		
Mean Correlation		92.90%	90.17%		
Mean Tracking Error		4.19%	5.23%		

Table 5
Sensitivity to market conditions of asymmetric incentive fees

Incentive fees have been evaluated using a binomial pyramid (one-dimensional binomial tree for panel D) with 30 nodes and a risk free rate equal to 3%. Volatilities of funds and benchmarks and correlation coefficients have been calculated using one year of daily returns from January, 2 2001 to December, 31 2001. Funds in panel A calculate the incentive fees on the excess return of the fund over a market index or a portfolio of market indices. Funds in panel B calculate the incentive fee on the excess return of the fund over the return of a value weighted index of mutual funds with the same investment objective (the widely known Fideuram Indices). Funds in panel C calculate the incentive fee on the excess return of the fund over an Interbank interest rate (usually the Euribor or the Eonia). Funds in panel D calculate the fee on the absolute return of the fund. *Median fee change* is the median of the distribution of differences between ex-ante costs of incentive fees calculated with correlation and volatilities of year 2001 and the costs of the fees obtained using statistics from the July 2003 - June 2004 period. *Median fee % change* is the ratio of median fee change to the cost of the fee calculated with the July 2003 - June 2004 statistics. *Mean Fund Volatility change* is the average change in funds volatilities from the period July 2003 - June 2004 to the 2001. *Mean Benchmark Volatility change* is the average change in benchmarks volatilities from the period July 2003 - June 2004 to the 2001. *Mean Correlation change* is the average change in the linear correlation coefficient between funds and benchmarks returns from the period July 2003 - June 2004 to the 2001. *Mean TE change* is the average change in the tracking error between funds and benchmarks returns from the period July 2003 - June 2004 to the 2001.

		Hurdle Rate			
	Whole Sample	**Panel A Market Index**	**Panel B Inv. Category Index**	**Panel C Risk Free Rate**	**Panel D No Hurdle Rate**
N° of Funds	163	93	41	18	11
Average Fee	0.79%	0.74%	1.02%	0.66%	0.55%
St. Deviation	0.45%	0.46%	0.49%	0.19%	0.16%
Highest Fee	2.74%	2.63%	2.74%	0.92%	0.96%
Median fee change	0.24%	0.29%	0.36%	0.16%	0.20%
Median fee % change	65.01%	78.29%	49.43%	27.76%	65.76%
Mean Fund volatility change	6.20%	6.42%	6.51%	3.66%	7.38%
Mean Benchmark volatility change		6.75%	5.83%		
Mean Correlation change		-3.84%	-3.62%		
Mean TE change		4.25%	3.88%		

Table 6

The effect of positivity constraint on the ex-ante cost of asymmetric incentive fees

Incentive fees have been evaluated using a binomial pyramid (one-dimensional binomial tree for panel D) with 30 nodes and a risk free rate equal to 3%. Volatilities of funds and benchmarks and correlation coefficients have been calculated using one year of daily returns from July, 1 2003 to June, 30 2004. The incentive fees have been calculated without the positivity constraint introduced by Bank of Italy in 2002. Funds in panel A calculate the incentive fees on the excess return of the fund over a market index or a portfolio of market indices. Funds in panel B calculate the incentive fee on the excess return of the fund over the return of a value weighted index of mutual funds with the same investment objective (the widely known Fideuram Indices). Funds in panel C calculate the incentive fee on the excess return of the fund over an Interbank interest rate (usually the Euribor or the Eonia). Funds in panel D calculate the fee on the absolute return of the fund. *Median fee change* is the median of the distribution of differences between ex-ante costs of incentive fees calculated without the positivity constraint and the costs of the fees with the constraint. *Median fee % change* is the ratio of median fee change to the cost of the fee calculated with the positivity constraint.

		Hurdle Rate			
	Whole Sample	**Panel A Market Index**	**Panel B Inv. Category Index**	**Panel C Risk Free Rate**	**Panel D No Hurdle Rate**
N° of Funds	335	223	45	56	11
Average Fee	0.55%	0.56%	0.72%	0.46%	0.32%
St. Deviation	0.43%	0.49%	0.37%	0.17%	0.07%
Highest Fee	2.63%	2.63%	1.85%	0.88%	0.44%
Median fee change	0.09%	0.13%	0.10%	0.00%	0.00%
Median fee % change	31.37%	42.38%	20.71%	0.00%	0.00%

Figure 1
The cumulative distribution of the ex-ante cost of asymmetric incentive fees

Incentive fees have been evaluated using a binomial pyramid (one-dimensional binomial tree for fees calculated on the mutual fund absolute return) with 30 nodes and a risk free rate equal to 3%. Volatilities of funds and benchmarks and correlation coefficients have been calculated using one year of daily returns from July, 1 2003 to June, 30 2004.