



The performance of Italian equity funds

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Abstract

We estimate the risk-adjusted performance of Italian equity funds, using both net and gross returns (i.e., net returns plus management fees), employing single factor and multifactor benchmarks. With net returns, the funds' performance is not significantly different from zero. With gross returns, however, the performance is always positive, even when we use benchmarks which take account of the non-equity investments of the funds and measures which are not influenced by the market timing behavior of the portfolio managers. Our evidence supports the Grossman and Stiglitz's view of market efficiency, suggesting that informed investors are compensated for their information gathering. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Earlier empirical work on mutual funds' performance was conducted under the embarrassing alternative of irrational investors wasting money by investing

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in funds with negative performance on the one hand and inefficient capital markets dominated by managers systematically beating the market on the other. While the latter view became popular among practitioners, the former has become dominant in the academic literature. Jensen (1968) found that the risk-adjusted performance of US mutual funds was inferior, after expenses, to the performance of the benchmark portfolio, and that, before expenses, mutual funds' performance was scattered randomly around the CAPM market line. Therefore, Jensen concluded that mutual fund managers have no private information. A possible reconciliation has been suggested by Ippolito (1989) who found that the risk-adjusted net performance (i.e., net of fees and expenses) of a sample of US mutual funds was comparable to that of the chosen benchmark, so that managers were compensated for their information gathering, in accordance with Grossman and Stiglitz (1980) definition of market efficiency with costly information. In other words, mutual funds beat the market before expenses but not after management fees and turnover costs had been deducted from returns. Similar results were obtained by Grinblatt and Titman (1989a) and Droms and Walker (1996). Elton et al. (1993) argue that Ippolito's conclusions are due to the choice of an inefficient benchmark and that, after taking account of mutual funds' holdings of non-S&P500 securities, Ippolito's conclusions are reversed. The question is therefore, still open and new evidence from other markets can help to shed light on it.

In this paper, we provide the first comprehensive study of the performance of Italian equity funds.¹ Our results are free of survivorship bias, since in our sample period no equity fund disappeared from the Italian market, so that our dataset includes returns on all the equity funds in existence in Italy from 1984 to 1995. We analyze the risk-adjusted performance using both net returns (i.e., returns calculated after management fees but before load fees) and gross returns (i.e., returns computed adding back to funds' net returns the management fees paid each year by the funds) and using the CAPM and multifactor models. Managers' market-timing ability is taken into account in two ways: first, we estimate the Treynor and Mazuy (1966) and Henriksson and Merton (1981) measures of market timing; second, we estimate the positive period weighting (PPW) measure suggested by Grinblatt and Titman (1989b), which is not influenced by managers' attempts to time the market. Using a large and diversified set of benchmark portfolios, we find strong evidence in favor of the informationally efficient view of capital markets, since the returns to holding Italian equity funds were just enough to compensate for the funds' fees and risk.

¹ Owing to data limitations, the previous studies of Italian funds – see for example, Panetta and Zautzik (1991) and Ferretti and Murgia (1991) – analyzed a small number of funds of different categories, focusing on short periods.

The paper is organized as follows. In Section 2, we describe the data and the main institutional features of the Italian mutual fund industry. In Section 3, we describe the methods used to estimate the funds' risk adjusted performance. In Section 4, we discuss the results obtained and compare them to those obtained in the previous literature for other countries. Section 5 recalls the main findings and concludes. The data sources and the procedure used to group Italian funds into homogeneous categories are described in Appendices A and B.

2. The institutional framework and the data

Mutual funds have been introduced in the Italian financial system in 1984. Since then, the number of operating funds and the size of assets under management have grown very rapidly: at the end of 1994 there existed in Italy 354 mutual funds with total net asset value (NAV) equal to 130 billion Lira, approximately 7% of GDP. In this paper, we consider the period from June 1985 to 1995, a period characterized by large swings in the stock market, three episodes of fast increase of equity prices and two episodes of dramatic downturn. During the entire period the return on Italian government bonds was slightly higher than the return on Italian equities.

The data on mutual funds are obtained from the Bank of Italy mutual funds' database and were extended and cross checked with information collected from the funds' annual reports and from the specialized press (in particular, from "*Il Sole 24-Ore*"). The basic information includes the fund's name, the investment objective, the fund's NAV, the dividend distributions and the distribution dates, the management and incentive fees paid by the fund to the management company (see below). A detailed description of the data used in the paper is reported in Appendix A.

Before analyzing the performance of such a large and differentiated industry it is necessary to consider three issues: the classification of mutual funds, the effect of funds' expenses and fees on returns, the problem of survivorship bias. These issues are common to all performance studies, but the methods used to account for their effects depend on the institutional set up and on the data that is available.

2.1. Mutual funds classification

In order to make meaningful comparisons, funds must be classified into homogeneous categories. Two classifications are used in Italy: the Bank of Italy's classification and the classification used by *Assogestioni* (the Italian mutual funds association). However, neither can be used a priori for our objective. In fact, the Bank of Italy groups mutual funds into three main

institutional categories (bond funds, balanced funds and equity funds) according to the funds' investment objectives stated in the prospectus, but does not distinguish funds which invest primarily in Italian securities from those which invest mainly in foreign securities, a distinction that has become increasingly important in Italy since the 1990 liberalization of capital flows. The *Assogestioni* classification includes 20 different categories and distinguishes between Italian and international funds; however, this classification has been introduced only recently, and has been changed several times, to include 7, 14 and finally 20 groups. Furthermore, both classifications are only indicative, as managers can change a fund's investment policy. Therefore, we selected funds with similar investment objectives using a clustering procedure, in order to group funds ex-post, on the basis of the asset composition of each fund from January 1986 to June 1995.

The results of the cluster analysis suggest that the optimal number of clusters is four and that the categories which result from the analysis closely match the four-level aggregation of the 20 *Assogestioni* categories into Italian equity funds, Italian bond funds, international equity funds and international bond funds.² Given such a close matching between the ex-ante *Assogestioni* classification and the ex-post statistical classification, in the empirical analysis of the following sections, we use the categories 1, 3 and 9 of the *Assogestioni* classification (see Appendix B for details) since their public availability ensures that our results can be replicated.

2.2. The computation of returns

In measuring returns one has to consider two issues. First, it is necessary to distinguish between gross returns (i.e., returns calculated before management fees) and net returns (i.e., returns calculated after management fees). Clearly, investors are ultimately interested in net returns, that represent the income that they receive from their investment in mutual funds. However, net returns are influenced by the level of the management fees, that represent the price at which the asset management service is sold: in fact, the best (worst) performers could just be funds that pay lower (higher) management fees. Therefore, the evaluation of the managers' investment strategies must be performed on the basis of gross returns, that represent the output of the asset management service. Second, the funds' returns (net and gross) must be made comparable with those of the benchmarks, by considering the effect of the funds' fees and expenses, withholding taxes and the taxation on capital gains.

² The selection procedure and the results of the cluster analysis are discussed in Appendix B.

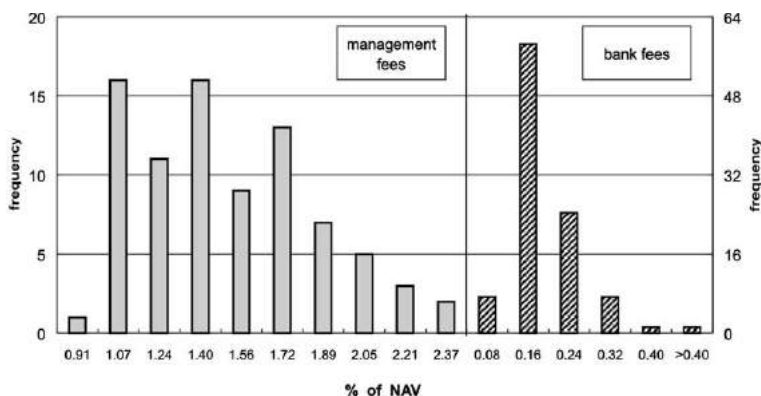


Fig. 1. Distribution of management fees and bank fees of Italian equity funds.

2.2.1. Funds' fees and expenses

The sources of the funds' expenses and fees can be better understood after a brief description of the Italian institutional framework. In Italy, a contract is signed among an investor, the fund's management company (which manages the fund's portfolio, thus, deciding the investment policy) and a custodian bank (which acts as a custodian of the fund's assets and which takes care of all the operations related to the fund's portfolio – e.g., coupon and dividend payments, etc.). There are three main categories of costs that are borne each year by the investors, since the fund's NAV is determined daily after these costs are subtracted.³

(a) Bank fees, i.e., the fees paid every year to the custodian bank as a percentage of the fund's NAV. Fig. 1 shows that in our sample period such fees range from 0.10% to 0.40% of NAV per year.

(b) Management fees, i.e., the fees paid every year to the management company as a percentage of the fund's NAV. This item includes also incentive fees, i.e., the extra fees that some of the funds pay to the management company if the return of the fund's portfolio exceeds a given benchmark. Fig. 1 shows that such fees have a wide dispersion: the values range from 0.91% to 2.37% of NAV per year, with the most frequent values falling between 1.07% and 1.72%.

(c) Trading costs, which include stamp duty, brokerage fees and bid–ask spreads paid by the funds on securities transactions.

Brokerage fees and bid–ask spreads cannot be isolated, since they are considered a capital item and are included in securities' prices, thus, influencing performance directly. On the contrary, stamp duty, bank fees and management

³ Investors usually pay also a load fee *una-tantum* as a fixed proportion of their investment. However, load fees are borne directly by the investors and do not influence the fund's NAV.

Table 1
Summary statistics of Italian equity funds^a

Year	<i>N</i>	NAV	Management fees	Net returns	Gross returns
1984	6	259	1.05	28.2	29.2
1985	20	6470	1.08	42.4	43.5
1986	29	38,489	1.02	27.4	28.5
1987	35	42,942	1.03	-13.2	-12.1
1988	52	32,770	1.09	14.2	15.3
1989	61	30,059	1.20	13.0	14.2
1990	69	27,791	1.28	-11.1	-9.9
1991	78	24,155	1.26	7.3	8.6
1992	82	19,011	1.40	2.9	4.2
1993	88	20,430	1.45	30.5	32.1
1994	100	33,665	1.48	0.6	2.1
1995	109	33,904	1.42	0.1	1.5

^a *N* is the number of funds operating at the end of each year. NAV is the annual average total net asset value (in billion lira) of the funds operating in each year. Management fees is the median value of the fees paid by the funds to the management companies as a percentage of their NAV. Net returns are the funds' returns computed including dividends and bank fees. Gross returns are net returns plus management fees. The returns are yearly averages of annualized monthly returns.

fees are included in the funds' annual report. Since the available benchmarks' returns are gross of custody and administration fees, we rectified funds' returns to make them homogeneous with those of the benchmarks by adding back the bank fees described under (a) above and stamp duty to the returns computed from the funds' unit values and dividends; we define the returns obtained in this way "net returns". We then computed the funds' "gross" returns by adding back to net returns the management fees described under (b). The continuously compounded net and gross yearly returns for Italian equity funds are reported in Table 1.

2.2.2. Withholding taxes

In Italy until June 1998 mutual funds received bond coupons and equity dividends net of withholding taxes (12.5% on coupons and 10% on dividends). Therefore, in order to measure the returns on mutual funds and those on the benchmarks homogeneously, we estimated the funds' performance using the returns on equity and bond benchmarks net of withholding taxes (see Appendix A).

2.2.3. The taxation of capital gains

In Italy the income received from mutual funds (both dividends and capital gains) is tax exempt for households. However, the latter pay a tax on the capital gains obtained from their investments in Italian funds indirectly; in fact,

the funds pay a tax which is proportional to their NAV (*imposta sostitutiva*).⁴ On the contrary, no tax is paid by households on capital gains on bonds and equities held directly. In order to focus on the effect of expenses on funds' performance, we decided to ignore the effect of the tax levied on the funds.

2.3. Survivorship bias

Survivorship bias arises if investors' withdrawals push the poorly performing funds out of the market, so that only superior funds remain alive. Therefore, performance measures based on samples which exclude funds which perished because of their inferior performance are upward biased – see Brown et al. (1992, 1996) and Hendricks et al. (1993). Our dataset on Italian mutual funds allow us to study funds' performance avoiding the survivorship bias that has influenced many of the previous studies – see, for e.g., Lehmann and Modest (1987), Malkiel (1995), Shukla and Trzcinka (1994) and Kahn and Rudd (1995). In fact, in our sample period none of the Italian equity funds perished, so that our results are not affected by survivorship bias.

3. Risk-adjusted performance measurement

In this work, we use two measures of performance. First, the standard Jensen (1968, 1969) α coefficient. As it is well known, Jensen's α is an unbiased measure of performance when the fund's manager has security-specific information but no timing information, while it is usually downward biased when the manager follows a successful timing strategy. We, therefore, also measure performance using Grinblatt and Titman (1989b, 1994) PPW measure, which is not influenced by the manager's timing strategy.

3.1. The Jensen measure

The α coefficient is equal to the intercept from the following time series regression:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_{im}(\tilde{r}_{mt} - r_{ft}) + \tilde{\varepsilon}_{it}, \quad (1)$$

where r_i is the return on fund i , r_f is the risk-free rate, r_m is the return of the benchmark portfolio and β_{im} is the fund's systematic risk, i.e., its sensitivity to

⁴ The tax paid by the funds (*imposta sostitutiva*) equals 0.05% of the value of government securities, bank deposits and bonds held in their portfolios, 0.10% of the value of convertible bonds and shares issued by Italian manufacturing firms and 0.25% of the value of all the remaining assets. The taxation of capital gains for both mutual funds and households has been modified by the Italian Minister of Finance in July 1998.

the return of the benchmark. A positive α indicates superior risk-adjusted performance, while a negative value indicates inferior risk-adjusted performance.

The choice of the benchmark is not an easy one, since it presents both theoretical and empirical difficulties. In addition to the well-known work of Roll (1977, 1978), empirical research has shown that performance evaluation is sensitive to the choice of the benchmark, see for example, Lehmann and Modest (1987) and Grinblatt and Titman (1994). A wider set of benchmarks will, therefore, provide information on the robustness of the results. The first model, Eq. (1), used to estimate the α is the CAPM, using both the value-weighted return on all the stocks listed on the Milan Stock Exchange (Vw-MSE) – which is theoretically implied by the CAPM – and the equally weighted return on all listed stocks (Ew-MSE).⁵

In a recent paper, Elton et al. (1993) show that the results obtained by Ippolito (1989) using the S&P index to measure the performance of US mutual funds were reversed once proxies are introduced to take account of the fact that US equity funds hold non-S&P equities and bonds in their portfolio. A similar problem arises when one analyses the performance of Italian equity funds. In fact, although in our sample period Italian equities represent the largest component of the funds' portfolio (approximately 60%), the proportion of Italian government bonds was also substantial (26%).⁶ Therefore, we estimate risk-adjusted performance using also a two-index benchmark which includes both an equity index (the Vw-MSE or the Ew-MSE) and a value-weighted index of Italian government bonds (see Appendix A):

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_{im}(\tilde{r}_{mt} - r_{ft}) + \beta_{ib}(\tilde{r}_{bt} - r_{ft}) + \tilde{\varepsilon}_{it}, \quad (2)$$

where r_b is the return on a portfolio of government bonds and β_{ib} is the sensitivity of the excess returns of fund i to the excess returns of the government bond portfolio. The choice of this two-index model can be justified on several grounds. One motivation often used in the literature – see for example, Blake et al. (1993) and Elton et al. (1993) – is to consider the funds as a combination of three portfolios (equities, government bonds and the risk-free asset) so that the return on the fund is the weighted average of the returns on the constituent portfolios, with weights β_{im} , β_{ib} , and $1 - \beta_{im} - \beta_{ib}$, respectively. Therefore, management performance is the return earned by the fund in excess of the return obtained by a combination of the three assets. In this view, Jensen's

⁵ To verify that benchmarks are not inefficient with respect to the uninformed investor, we calculated the α of the Vw-MSE with respect to the Ew-MSE and vice-versa, both with and without market-timing coefficients. In no case was the α statistically significant.

⁶ The remaining 14% of the equity funds' portfolio consisted largely of cash, Italian corporate bonds and foreign securities. Checks have been performed to verify that our results are not influenced by funds' holdings of foreign stocks (see below). In fact, although such investments are quite small, the variance of their returns might nonetheless influence our estimates.

measure, rather than an equilibrium relationship, can be thought of as the extra return earned by the manager compared to the return on a passive portfolio with the same risk. Alternatively, one could justify Eq. (2) simply by assuming a two-factor equilibrium model, in which the (equally or value weighted) stock indices and the government bonds index are the relevant factors.

If the funds' portfolios load heavily on specific subgroups of securities, the benchmarks described in Eqs. (1) and (2) might not take account correctly of the strategies followed by the managers. For this reason, we use two benchmarks based on mimicking portfolios. Following an approach which is consistent with the Arbitrage Pricing Theory of Ross (1976) and that has been extensively employed in the finance literature – see, for example, Lehmann and Modest (1987) and Connor and Korajczyk (1991) – the first of such benchmarks has been estimated using factor analysis. Relying on the results of Panetta (1996), we fitted a five-factor model, using maximum likelihood.⁷ The funds' α has been subsequently estimated from the following time-series regression:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \sum_{k=1}^5 b_{ik}(\tilde{r}_{kt} - r_{ft}) + \tilde{\varepsilon}_{it}, \quad (3)$$

where r_k is the return on factor k (the factor score) and b_{ik} is the sensitivity of the excess return of fund i to the excess return of factor k .

Finally, we estimated the three factor model of Fama and French (1992, 1993), who suggest that securities return in excess of the risk-free rate are explained by the sensitivity of their return with respect to three factors: (i) the excess return on a broad market portfolio; (ii) the difference between the return on a portfolio of small capitalization stocks and the return on a portfolio of large capitalization stocks (SMB, small minus big); (iii) the difference between the return on a portfolio of high book-to-market stocks and the return on a portfolio of low book-to-market stocks (HML, high minus low). The α has been estimated through the following time series regression:

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_{im}(\tilde{r}_{mt} - r_{ft}) + \beta_{iS}SMB + \beta_{iH}HML + \tilde{\varepsilon}_{it}, \quad (4)$$

where β_{iS} is the sensitivity of the excess return of fund i to the return on the SMB portfolio and β_{iH} is the sensitivity of the excess return of fund i to HML portfolio.

In total, the funds' α has been estimated using six different benchmarks: the Ew-MSE (Model 1), a two-factor model with the Ew-MSE and a portfolio of

⁷ In Panetta (1996) the optimal number of systematic factors is determined applying the cross validation technique suggested by Conway and Reinganum (1988). The methodology used to estimate the factor scores of Eq. (3) is described in Appendix A.

Italian government bonds (Model 2), the Vw-MSE (Model 3), a two-factor model with the Vw-MSE and a portfolio of Italian government bonds (Model 4), a five-factor model (Model 5) and the Fama and French three-factor model (Model 6).

3.2. Market timing

The foregoing analysis assumes that the manager's performance is entirely due to security-specific information. However, if the manager adopts a timing strategy, changing the risk of the portfolio in response to his or her forecasts on market wide returns, the α estimated from time series regressions is a downward-biased estimate of the manager's microforecasting ability. Therefore, the performance measurement literature has distinguished between security selection (the manager's microforecasting ability) and market timing (macroforecasting). In this work, we use two different models which have been suggested in the literature. The first one is based on the quadratic regressions of Treynor and Mazuy (1966) and Admati et al. (1986): if the fund's manager changes the portfolio's risk in response to anticipated changes of market conditions, increasing the β when the forecasted excess market return is positive and decreasing it in the opposite case, the fund's characteristic line will no longer be linear, and the beta in Eq. (1) becomes $\beta_{im}(t) = \beta_i + \gamma_i^{\text{TM}}(\tilde{r}_{mt} - r_{ft})$; the fund's risk–return relationship becomes

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_i(\tilde{r}_{mt} - r_{ft}) + \gamma_i^{\text{TM}}(\tilde{r}_{mt} - r_{ft})^2 + \tilde{\epsilon}_{it}. \quad (5)$$

In Eq. (5) the term α_i is the manager's selectivity, while the term $\gamma_i^{\text{TM}}(\tilde{r}_{mt} - r_{ft})^2$ measures the market-timing component of performance. A positive value of γ_i^{TM} indicates that the manager has superior timing ability.

An alternative model has been suggested by Merton (1981) and Henriksson and Merton (1981). The manager's market-timing ability is defined as the capacity to anticipate whether the return on the risky asset will be higher or lower than the risk-free rate. The manager is assumed to choose between two different levels of risk, which depend on the probability he or she attaches to the market excess return being positive.⁸ Therefore, the manager chooses, say, β_{i0} if $r_{mt} \leq r_{ft}$ and $\beta_i > \beta_{i0}$ if $r_{mt} > r_{ft}$. If we define the dummy variable $D_m = 1$ when $r_{mt} > r_{ft}$ and 0 otherwise, we can rewrite the Henriksson and Merton market-timing beta as

⁸ Henriksson and Merton (1981) show that their test is also applicable to the case in which the manager selects from more than two discrete systematic risk levels, chosen on the basis of different degrees of confidence in the forecasts. For an alternative approach in correcting the CAPM β see Lehland (1999).

$$\begin{aligned}\beta_{im}(t) &= \beta_{i0} + (\beta_i - \beta_{i0})D_m \equiv \beta_{i0} + (\beta_i - \beta_{i0}) \left[\frac{\max(0, \tilde{r}_{mt} - r_{ft})}{\tilde{r}_{mt} - r_{ft}} \right] \\ &= \beta_i + (\beta_i - \beta_{i0}) \frac{\max[0, -(\tilde{r}_{mt} - r_{ft})]}{\tilde{r}_{mt} - r_{ft}},\end{aligned}$$

so that

$$\tilde{r}_{it} - r_{ft} = \alpha_i + \beta_i(\tilde{r}_{mt} - r_{ft}) + \gamma_i^{\text{HM}} \max[0, -(\tilde{r}_{mt} - r_{ft})] + \tilde{\varepsilon}_{it}, \quad (6)$$

where $\gamma_i^{\text{HM}} = (\beta_i - \beta_{i0}) > 0$ indicates market-timing ability on the part of the manager. Merton and Henriksson interpret timing ability as a put option on the market portfolio with exercise price equal to the risk-free rate, so that the return from market timing, $\max[0, -(\tilde{r}_{mt} - r_{ft})]$, is the payoff from the put option: in particular, in (6) the return of the fund is equal to the standard CAPM formula plus the value of γ_i^{HM} put options on the market return, which have a positive value whenever the return on the market is lower than the risk-free rate.

The market-timing equations (5) and (6) are estimated using the models presented in Eqs. (1)–(4). Following Connor and Korajczyk (1991) and Shukla and Trzcinka (1994), the five-factor model of Eq. (3) and the Fama and French three-factor model of Eq. (4) have been estimated including in the regressions the square term of Eq. (5) and the put term of Eq. (6) only for the first risk factor. Although there is no theoretical reason for this choice, adding extra (squared or put) terms for each of the risk factors would have resulted in a severe reduction of the degrees of freedom for several funds. In the case of the five-factor model our choice is also empirically justified by the high correlation which exists between the factor score on the first factor and the returns on the market:⁹ from a practical point of view, our choice can be thought of as a simplification which allows us to estimate the manager's ability to forecast market returns, which we regard as the key variable. However, our choice has a negligible impact on the results.¹⁰

3.3. The positive period weighting measure (PPW)

A different performance measure has been proposed by Grinblatt and Titman (1989b) to avoid the bias induced by managers' timing strategy. Grinblatt

⁹ The correlation between the first factor obtained using factor analysis and the returns on the Italian market is close to 1. This result is analogous to that of Chen et al. (1986) for the US market.

¹⁰ For a subset of the equity funds we have repeated some of the regressions, including among the regressors the market-timing term for each factor, obtaining results similar to those shown below.

and Titman (1989b) show that if w_{mt} is a weighting process orthogonal to the excess return of the market and formed by non-negative elements summing to 1, then asymptotically in T :

$$\text{PPW}_i \equiv \sum_{t=1}^T w_{mt} (\tilde{r}_{it} - r_{ft}) \xrightarrow{p} \alpha^* \geq 0, \quad (7)$$

i.e., PPW is a consistent estimator of the manager's positive performance whenever the fund manager has selectivity and/or independent timing information. The same result holds even if timing and selectivity are correlated, provided the manager has constant absolute risk aversion. To make the PPW measure operational, we determine the weights using the following procedure (see also Cumby and Glen, 1990). First, we normalize the investor's initial wealth to 1 and assume that he or she has a power utility function $U(W_t) = 1/(1 - \vartheta)W_t^{1-\vartheta}$.

At the end of period t the investor's wealth is equal to $W_t = 1 + (1 - \beta_m)r_{ft} + \beta_m r_{mt}$ and, under the null hypothesis of no superior information and stationarity of returns, the investor's problem is ¹¹

$$\max_{\beta_m} E[U(W)] \cong \max_{\beta_m} \frac{1}{T} \sum_t \frac{[1 + r_{ft} + \beta_m(\tilde{r}_{mt} - r_{ft})]^{1-\vartheta}}{1 - \vartheta}.$$

The required positive weights can be obtained from the first order condition:

$$\sum_t w_{mt} (\tilde{r}_{mt} - r_{ft}) = 0, \quad (8)$$

where

$$w_{mt} = \frac{[1 + r_{ft} + \beta_m(\tilde{r}_{mt} - r_{ft})]^{-\vartheta}}{\sum_t [1 + r_{ft} + \beta_m(\tilde{r}_{mt} - r_{ft})]^{-\vartheta}}$$

and $\sum_t w_{mt} = 1$. The PPW measure is strictly positive if the portfolio manager has selectivity skill, both with and without timing activity. ¹² Under the normality condition and the null hypothesis of no superior information, a t -test for PPW is given by

$$\frac{\text{PPW}_i}{s_\varepsilon \sqrt{\sum_t w_{mt}^2}} \sim t_{T-K-1},$$

¹¹ In the case of a multiple benchmark β_m is a *vector* of portfolio holdings.

¹² Grinblatt and Titman (1989b) have shown that Jensen's α is still a period-weighting measure, with weights orthogonal to the benchmark and summing to 1 (by OLS properties) but no longer positive. In particular, Jensen's measure gives negative weights to returns in bull markets (r_{mt} above average), downward biasing the performance measure for successful market timers. The Treynor and Mazuy and the Henriksson and Merton measures are also period-weighting measures, with special correction for the assumed forms of beta variations.

where s_e is the root mean square error of Jensen's regression and K is the number of benchmarks used to define mean-variance efficient portfolios.

4. Empirical results

4.1. Performance results using Jensen's α

In order to perform the analysis we required at least 36 months of data; we have, therefore, eliminated from the sample the funds which became active after June 1992. This choice reduced our sample to 82 equity funds. For each fund, the performance was estimated using both net and gross returns over the available sample period (the funds became active at different dates during the 1985–1995 period).

The performance for the entire sector of equity funds was estimated constructing an equally weighted portfolio including all funds (a “fund of funds”).¹³ This choice is motivated by several reasons: first, a value-weighted aggregation would be dominated by the performance of few large funds;¹⁴ second, using the average performance of the single funds (rather than a fund of funds) would give a fund that is active for a small number of years the same weight of a fund that is active for the whole period; as our funds enter the market at different dates this representation of the performance of the Italian equity funds could be misleading.¹⁵ The t -statistics have been obtained using White (1980) heteroskedasticity-consistent standard errors procedure.

Table 2 shows the results for the funds' α estimated using the six models described previously; all the values are expressed as yearly continuously compounded returns. For the entire sample, using net returns, the estimated α is always positive (between 7 and 109 basis points) although never significant. The results obtained by estimating the CAPM with the Ew-MSE and Vw-MSE are similar, both when only the stock market benchmarks are used and when government bonds are added to the regressions. The inclusion of the government bond index worsens the α by approximately 80–100 basis points,

¹³ Several other studies have used the same performance measure. See, for example, Grinblatt and Titman (1994).

¹⁴ In our sample the funds' assets display a high degree of concentration, as the eight largest funds represent 40% of the total NAV (the 15 largest funds represent 60% of the total NAV).

¹⁵ Following one of the referees' suggestions, we check whether our results are sensitive to the choice of the synthetic performance measure (i.e., the fund of funds rather than the average alpha of the single funds). We have, therefore, replicated our results using the average alpha of the single funds; the significance tests were computed using the Gibbons et al. (1989) test, to control for the correlation among the returns of the single funds. This modification did not modify our results (the results are available from the authors upon request).

Table 2
Equity mutual funds performance: Jensen's α with net and gross returns^a

Model	All funds				Adj. R^2	Single funds					
	Net returns		Gross returns			Net returns			Gross returns		
	α	t_α	α	t_α		Neg. α	Significant α		Neg. α	Significant α	
							Pos.	Neg.		Pos.	Neg.
(1) Ew-MSE	1.09	0.89	2.41*	1.97	87.8	24	16	2	7	26	2
(2) Ew-MSE, government bonds	0.07	0.07	1.39	1.29	90.7	46	9	8	24	15	3
(3) Vw-MSE	0.90	0.95	2.23**	2.35	92.7	31	18	4	11	32	2
(4) Vw-MSE, government bonds	0.10	0.12	1.42*	1.71	94.5	41	11	6	20	21	3
(5) Five-factor model	0.90	1.01	2.22**	2.49	93.8	48	7	5	22	16	3
(6) Fama and French three-factor model	1.09	1.13	2.41**	2.50	92.6	26	16	4	10	34	2

^aFunds' performance has been estimated using monthly data from July 1985 to June 1995. In model (1) the market portfolio is the equally weighted portfolio including all shares listed on the Milan Stock Exchange (Ew-MSE); equities' returns are adjusted for dividend distributions and changes in the capital structure. In model (2) the benchmark portfolios are the Ew-MSE and a portfolio including the main categories of Italian government bonds (see Appendix A). In model (3) the market portfolio is the value weighted index including all stocks listed on the MSE (Vw-MSE). In model (4) the benchmark portfolios are the Vw-MSE and the Italian government bond portfolio. In model (5) the five factors have been estimated with maximum likelihood factor analysis, using the procedure suggested by Lehmann and Modest (1988) (see Appendix A). In model (6) the funds' performance has been estimated using the Fama and French (1993) three-factor model, which includes the Vw-MSE, the return on the size portfolio and return on the book-to-market portfolio. *All funds* is the performance of the equally weighted portfolio which includes all the funds in the sample. *Single funds* is the result of the regressions estimated for each fund separately. Funds' net returns include dividends and bank fees, while gross returns are net returns plus management fees. For the *single funds*, the coefficients are considered significant at the 5% level each tail. The α s are expressed on a yearly basis using continuously compounded returns.

* For the entire sector (*all funds*) the symbol means significant at the 5% each tail.

** For the entire sector (*all funds*) the symbol means significant at the 2.5% each tail.

reflecting the fact that in our sample period the Italian bond market outperformed the equity market. A positive value for the aggregate α is obtained also using the five-factor model (0.90% on an annual basis) and the Fama and French three-factor model (1.09%); however, even these results are not statistically significant. As far as the single funds are concerned, more than half funds had a negative performance, although the α s are rarely significant (2–8 negative and significant, 7–18 positive and significant).

When gross returns are used, the performance of the whole sample of funds becomes positive and always significant, except when the α is estimated using the two-index model with the Ew-MSE. The best performance is recorded with the Ew-MSE and with the Fama and French model. The results obtained using the value and equally weighted equity indices are similar (223 and 241 basis points, respectively, using only the equity benchmarks, and approximately 140 basis points using both equities and government bonds). The performance of the five-factor model (222 basis points on a yearly basis) is very similar to that obtained using only the equity benchmarks; this result might be due to the dominance of the equity factors in the estimation of the factor scores. The proportion of funds with negative alphas decreases to 25% approximately; about 20% of the funds display a significant positive performance, while the negative values are rarely significant.¹⁶

As previously mentioned, foreign holdings account for a very small proportion of the Italian equity funds' portfolio; however, the high volatility of returns on foreign stocks expressed in Italian lire might influence our performance results. Therefore, we made two checks: first, we repeated our regressions adding to our two-index model the return on a world stock index;¹⁷ second, we calculated the simple and rank correlation between the intercepts from the five-factor model and the foreign holdings in the funds' portfolios. The results of our tests suggest that foreign holdings have only a marginal influence on our estimates.¹⁸

Using both the Treynor and Mazuy quadratic regression and the Henriksson and Merton regressions, we have estimated the market timing coefficients – the γ s in Eqs. (5) and (6) – and the selectivity parameter α . For the whole sample, the value of γ relative to the equity indices is negative and not

¹⁶ Following one of the referees' request, we run further regressions orthogonalizing the right hand side variables of models (2), (4) and (6) (see Elton et al., 1993). The results obtained using this methodology are very similar to those obtained using non-orthogonal factors.

¹⁷ In the regressions we employed the returns on the Morgan Stanley Capital International World Stock Index. Similar results were obtained using the Morgan Stanley Europe Index.

¹⁸ When the returns on the world stock index are added to our two-index regressions, the average α decreases only slightly (by approximately 15 basis points). The simple correlation between the intercepts from the five-factor model and the proportion of foreign assets in the funds' portfolios is equal to 6% and is not significant. A similar result is obtained using the rank correlation.

Table 3
Equity mutual funds: Market timing^a

Model	All funds		Single funds			
	γ	t_γ	Neg. γ	Significant γ		
				Positive	Negative	
<i>Panel A: Quadratic regressions</i>						
(1) Ew-MSE		-0.08	-0.48	73	1	18
(2) Ew-MSE, government bonds:	$\gamma_{\text{Ew-MSE}}$	-0.08	-0.49	70	1	21
(3) Vw-MSE	γ_{GB}	2.99	0.44	23	6	2
(4) Vw-MSE, government bonds:	$\gamma_{\text{Vw-Mse}}$	-0.11	-0.90	52	7	17
(5) Five-factor model	γ_{GB}	-0.08	-0.70	51	5	15
(6) Fama and French three-factor model		-0.98	-0.20	48	4	11
		-0.04	-0.41	60	6	19
		-0.11	-0.90	50	7	18
<i>Panel B: Henriksson–Merton regressions</i>						
(1) Ew-MSE		-0.04	-0.68	74	1	17
(2) Ew-MSE, government bonds:	$\gamma_{\text{Ew-Mse}}$	-0.02	-0.46	70	1	14
(3) Vw-MSE	γ_{GB}	0.04	0.12	34	2	1
(4) Vw-MSE, government bonds:	$\gamma_{\text{Vw-Mse}}$	-0.03	-0.70	54	6	13
(5) Five-factor model	γ_{GB}	-0.01	-0.26	44	6	8
(6) Fama and French three-factor model		-0.24	-1.01	65	1	11
		-0.01	-0.20	53	8	10
		-0.03	-0.71	53	6	9

^aThe table reports the estimates of the market timing coefficients – the γ s in Eqs. (5) and (6). The models have been estimated using monthly gross returns from July 1985 to June 1995 (similar results have been obtained using net returns). The benchmarks used in each regression are described in Table 2. In models (2) and (4) a timing coefficient γ has been estimated separately for the equity and the bond index. In models (5) and (6) the timing coefficient has been estimated only for the first factor. *All funds* is the estimate obtained for the equally weighted portfolio which includes all the funds in the sample. *Single funds* is the result of the regressions run for each fund separately. In panel A funds' market timing has been estimated using the Treynor–Mazuy quadratic regression. In panel B the market timing coefficient has been estimated using the Henriksson–Merton model. The γ s are considered significant at the 5% level each tail.

significant (see Table 3).¹⁹ The estimates of the single funds show that approximately 20% of the funds have a negative and significant timing coefficient with respect to the equity returns, implying that managers engage in timing

¹⁹ If discretely compounded returns are a linear function of the β , use of continuously compounded returns could create a spurious impression of timing ability. Therefore, in order to check whether the estimates of the coefficient of the square term in Eq. (4) are influenced by the use of logarithmic returns, the market-timing regressions were replicated using discrete compounding. However, no difference was found, as one would expect since, over short horizons (one month), logarithmic and percentage returns are approximately equal.

activities but have no superior ability to forecast market-wide movements. Jagannathan and Korajczyk (1986) show that spurious evidence of perverse timing ability might arise as a consequence of non-linearities in returns originated by the option component of the funds' portfolios; however, the proportion of options in the portfolio of Italian equity funds is very small. Alternatively, our evidence of perverse timing might reflect the fact that funds engage in dynamic trading strategies (e.g., portfolio insurance) or invest in highly levered stocks. The estimates of the timing coefficients relative to the bond market suggest a similar picture: the value of the γ relative to the Italian government bond index are in general not significant, implying that managers cannot successfully forecast bonds' excess returns.

Table 4 shows the results obtained by estimating the selectivity parameter α using both the Treynor and Mazuy quadratic regression and the Henriksson and Merton regressions. In all models the inclusion of the market-timing term improves the estimated α , in line with the results obtained in previous studies (see for e.g., Henriksson, 1984; Connor and Korajczyk, 1991). Using gross returns, the funds' selection ability produces a risk-adjusted extra return ranging from approximately 150–350 basis points; such values are generally all significant at the 5% level.

Following Grinblatt and Titman (1994) we estimated the funds' total performance as the sum of the terms which represent managers' market-timing and selectivity abilities. In the Treynor and Mazuy framework the total performance (denoted by the symbol π) has been estimated using the expression

$$\pi_i^{\text{TM}} = \alpha_i + \gamma_i^{\text{TM}} \left[\frac{1}{T} \sum_{t=1}^T (\tilde{r}_{mt} - r_{ft})^2 \right].$$

Analogously, in the Henriksson and Merton framework the total performance has been computed as

$$\pi_i^{\text{HM}} = \alpha_i + \gamma_i^{\text{HM}} \left[\frac{1}{T} \sum_{t=1}^T \max(0, -(\tilde{r}_{mt} - r_{ft})) \right].$$

In order to test the significance of the total performance measures, the standard errors of π_i^{TM} and of π_i^{HM} have been calculated using the procedure suggested by Grinblatt and Titman (1994).²⁰ The tests have been made both for the

²⁰ The methodology used to calculate the significance of the Treynor and Mazuy total performance is discussed in Grinblatt and Titman (1994, Appendix B, p. 441). For π_i^{TM} the standard error was calculated as: $\text{SE}(\pi^{\text{TM}}) = \sqrt{q'Vq}$, where $q' = [1 \ 0 \ \text{var}(\tilde{r}_m - r_f)]$ and V is the variance covariance matrix of the coefficients in the quadratic regressions. Subsequently, the t -test for π_i^{TM} was calculated as $(\pi^{\text{TM}}/\text{SE}(\pi^{\text{TM}})) \sim t_{T-K-1}$. A similar procedure has been followed to compute the standard error and t -test of π_i^{HM} .

Table 4
Equity mutual funds selectivity: net and gross returns^a

Model	All funds				Adj. R^2	Single funds					
	Net returns		Gross returns			Net returns			Gross returns		
	α	t_z	α	t_z		Neg. α	Significant α		Neg. α	Significant α	
							Pos.	Neg.		Pos.	Neg.
<i>Panel A: Quadratic regressions</i>											
(1) Ew-MSE	1.48	1.01	2.80*	1.90	87.7	12	18	3	7	41	2
(2) Ew-MSE, government bonds	0.24	0.18	1.54	1.16	90.5	30	7	4	12	13	2
(3) Vw-MSE	1.43	1.28	2.76**	2.47	92.7	26	18	5	12	38	2
(4) Vw-MSE, government bonds	0.57	0.56	1.87*	1.83	94.5	33	13	6	17	27	2
(5) Five-factor model	1.14	1.07	2.46**	2.30	93.8	30	9	3	14	21	2
(6) Fama and French three-factor model	1.62	1.43	2.94**	2.60	92.6	26	18	3	11	40	2
<i>Panel B: Henriksson–Merton regressions</i>											
(1) Ew-MSE	2.19	1.08	3.51*	1.73	87.8	9	23	2	4	40	2
(2) Ew-MSE, government bonds	0.69	0.36	1.96	1.03	90.5	21	6	2	12	14	2
(3) Vw-MSE	1.73	1.13	3.06**	2.01	92.7	20	15	4	15	28	1
(4) Vw-MSE, government bonds	1.23	0.85	2.51*	1.73	94.5	26	11	3	20	19	1
(5) Five-factor model	1.13	0.78	2.44*	1.69	93.8	35	6	3	21	12	2
(6) Fama and French three-factor model	1.94	1.26	3.26**	2.12	92.6	20	15	3	13	31	1

^a Funds' selectivity has been estimated using monthly data from July 1985 to June 1995. The benchmarks used in each regression are described in Table 2. In models (2) and (4) a timing coefficient has been estimated separately for the equity and the bond index. In model (5) and (6) the timing coefficient is estimated only for the first factor. *All funds* is the estimate obtained for the equally weighted portfolio which includes all the funds in the sample. *Single funds* is the result of the regressions run for each fund separately. Funds' net returns include dividends and bank fees, while gross returns are net returns plus management fees (see Appendix B). In panel A funds' selectivity is the constant term in a Treynor–Mazuy quadratic regression. In panel B funds' selectivity is the constant term obtained by estimating the Henriksson–Merton model. For *single funds* coefficients are considered significant at the 5% level each tail. The z s are expressed on a yearly basis using continuously compounded returns.

* For *all funds* the symbol means significant at the 5% level each tail.

** For *all funds* the symbol means significant at the 2.5% level each tail.

single funds and for the equally weighted portfolio of funds. The results of the analysis are very similar to those of Table 2, and therefore, are not reported; this is a consequence of the fact that funds' risk measures (the β s for the CAPM and the factor loadings for the multifactor models) do not change very much with the inclusion of the market-timing term.

In line with the results of Grinblatt and Titman (1994) for the US funds, the correlations between the performance estimates obtained using different benchmarks suggest that different benchmarks could provide different performance ranking of funds. In our case, however, the correlations are higher: for example, for the five-factor model and the two-index model (Vw-MSE plus Government bonds) the cross-correlation of the α s is about 83% in terms of ranks and 87% in terms of levels.

4.2. Performance results using the PPW

Performance results using the PPW measure are given in Table 5. They have been obtained by setting the relative risk aversion coefficient θ to 4.2, as in earlier estimates for the Italian stock market.²¹ A direct comparison with Jensen's α shows that the results are quite similar: net performance is positive but never significant; gross performance is always positive and significant for the all model except the two-index model with equally weighted MSE and government bond benchmarks. This similarity is not surprising, given the high sample correlation between Jensen's weights and the PPW weights (up to 98%). Given that the PPW measure is independent of the functional form of market-timing and β changes, this result indicates that Jensen's is a reliable performance measure for Italian equity funds.

Considering the results for single funds, we note that the PPW increases the number of negative performers, both net and gross of management fees. This reflects the fact that in most cases we found a (small) negative market timing, implying, in general, a (small) positive bias in Jensen's performance measure. For all models, the number of statistically significant results, however, is almost the same both with Jensen's α and the PPW measure. Fig. 2 shows the estimates obtained with the two performance measures using the same model (the two index model with the Vw-Mse and the government bond index): the simple and rank correlations are approximately equal to 82%. Using the five-factor model the same figures are 79% and 73%, respectively.

²¹ The relative risk aversion coefficient θ has been set to 4.2 according to the estimates of Panetta and Violi (1999) for the Italian stock market. A similar figure was obtained for Spain by Alonso et al. (1990). Cumby and Glen (1990) assume a value of 6, Grinblatt and Titman (1994) a value of 8. We also tried different values for θ , ranging from 3 to 6, but obtained negligible changes so that the PPW measure does not seem to be sensitive to the value of θ .

Table 5
Equity mutual funds' performance: positive period weighting measure with net and gross returns^a

Model	All funds				Single funds					
	Net returns		Gross returns		Net returns			Gross returns		
	PPW	t_{PPW}	PPW	t_{PPW}	Neg. PPW	Significant PPW		Neg. PPW	Significant PPW	
						Pos.	Neg.		Pos.	Neg.
(1) Ew-MSE	1.10	0.89	2.43*	1.96	29	12	3	13	22	2
(2) Ew-MSE, government bonds	0.07	0.06	1.40	1.28	54	6	9	36	13	5
(3) Vw-MSE	0.92	0.95	2.25**	2.34	39	15	7	15	26	2
(4) Vw-MSE, government bonds	0.08	0.09	1.41*	1.67	48	8	10	28	19	5
(5) Five-factor model	0.96	1.07	2.28**	2.53	49	9	8	28	13	2
(6) Fama-French three-factor model	1.11	1.14	2.43**	2.49	34	12	6	14	23	2

^a Funds' performance has been estimated with monthly data from July 1985 to June 1995, using Grinblatt and Titman (1989b) positive period weighting (PPW) measure. The benchmarks used in each model are described in Table 2. *All funds* is the PPW for the equally weighted portfolio which includes all the funds in the sample. *Single funds* is the PPW for each fund. Funds' net returns include dividends and bank fees, while gross returns are net returns plus management fees. For *single funds*, coefficients are considered significant at the 5% level each tail. The PPW measures are expressed on a yearly basis using continuously compounded returns. The t -tests for the PPW are calculated as in Grinblatt and Titman (1994).

* For *all funds*, the symbol means significance at the 5% level each tail.

** For *all funds*, the symbol means significance at the 2.5% each tail.

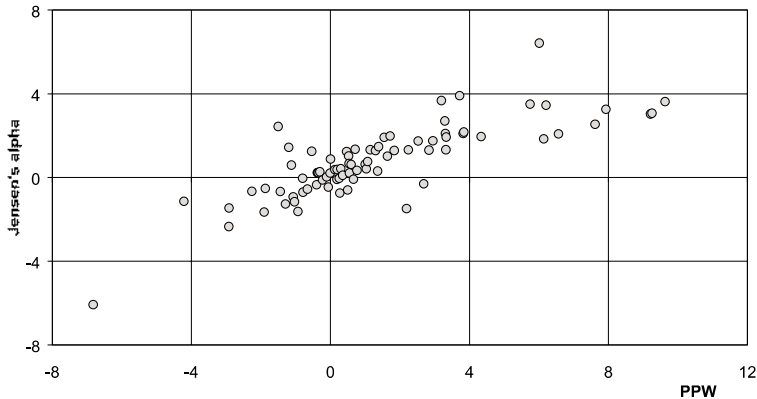


Fig. 2. Gross performance using Jensen's alpha and the positive period weighting measure (yearly continuously compounded returns).

Note: Jensen's alpha and the PPW have been estimated using a two-index model in which the benchmark portfolios are the value-weighted index of all shares listed in Milan and a portfolio of Government bonds.

5. Conclusions

In this paper, we provide the first comprehensive study of the performance of Italian equity funds. Using a dataset that is free of survivorship bias, we analyze the funds' risk-adjusted performance using both net returns (i.e., returns calculated after management fees but before load fees) and gross returns (i.e., returns computed adding back to funds' net returns the management fees paid each year by the funds). Our empirical results can be summarized as follows.

(a) Using net returns the Jensen's α of the Italian equity funds is approximately equal to zero and is not statistically significant. However, when the funds' α is evaluated on the basis of gross returns the risk-adjusted performance of the Italian equity funds is positive and statistically significant. These results are robust to the use of multifactor benchmarks which take account of the funds' investment in Government bonds or in specific subgroups of securities. Grinblatt and Titman's PPW measure of performance confirms the results obtained using Jensen's α .

(b) The market-timing coefficients are rarely positive and significant, suggesting that funds' managers do not successfully anticipate market-wide movements for both the bond and the equity market.

(c) Using the same benchmark, the correlation between the α and the PPW is approximately equal to 90%. Using the same performance measure but different benchmarks, the (simple and rank) correlation coefficient between the

estimates is still high (ranging between 85% and 94%) thus confirming only in part the results obtained by Grinblatt and Titman (1994) for US funds.

Our results support the Grossman and Stiglitz (1980) view of market efficiency, suggesting that informed investors are compensated for their information-gathering. Unlike previous studies, ours concludes that the funds' ability to compensate investors for fees and risk is not just a consequence of the upward bias on performance induced by investors' withdrawals driving poor performers out of the market. In fact, in our sample period none of the Italian equity funds perished, so that our results are not affected by this factor.

The lack of survivorship bias is a very interesting feature of our dataset. Given the enormous literature analyzing the impact of survivorship bias on the persistence of performance, further research should investigate whether Italian equity funds' risk-adjusted returns are stable over time. Moreover, future work should inquire into why the mutual fund industry in Italy looks so different from other countries: for example, why managers with negative performance are not promptly driven out of the market. These and other related questions are part of our research agenda.

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Appendix A. Data sources and the construction of the mimicking portfolios

In this Appendix, we describe the sources of the data and the methods used to construct the variables employed in the paper.

A.1. Stock price indices

Two stock price indices were used in the analysis, the equally weighted and value-weighted indices of all the shares listed on the Milan Stock Exchange (Ew-MSE and Vw-MSE). Returns were calculated as the monthly logarithmic change in prices, adjusted for the payments of net dividends (in the dividend

months) and for changes in the capital structure due to script issues and right issues, etc. The data were drawn from the Bank of Italy share price database.

A.2. Government bond price index

The returns on Italian government bonds have been computed as the simple average of the returns on the most important categories of Italian government bonds – CCTs (*Certificati di Credito del Tesoro*, long-term floating-rate bonds) and BTPs (*Buoni Poliennali del Tesoro*, long-term fixed-coupon bonds). The data were collected from the monthly statistics published by the Bank of Italy in the *Supplemento al Bollettino Statistico, Il Mercato Finanziario*. Returns have been calculated as the monthly logarithmic changes in the total return index (which is adjusted for net coupon payments).

The risk-free rate is the rate of return on three months BOT (*Buoni Ordinari del Tesoro*, Treasury bills) net of withholding tax. We assume a flat term structure between one and three months.

The construction of the factor scores of the five-factor APT model were estimated using maximum likelihood factor analysis (MLFA). We first calculated the covariance matrix S of the monthly returns of the 104 shares which were continuously listed on the MSE from December 1983 to June 1995. Subsequently, we used MLFA to decompose the covariance matrix into the 104×5 factor loading matrix Γ and the 104×104 residual risk matrix Φ :

$$S = \Gamma\Gamma' + \Phi. \quad (\text{A.1})$$

The 104×1 vector of portfolio weights w_j for each of the five benchmark portfolios was then estimated using the minimum idiosyncratic risk portfolios (Mirp) procedure suggested by Lehmann and Modest (1988):

$$\begin{aligned} \text{Min}_{w_j} w_j' \Phi w_j, \quad j = 1, \dots, 5, \\ \text{s.t. } w_j' \Gamma_k = 0 \quad \text{for } j \neq k, \\ w_j' \iota = 1, \end{aligned}$$

where ι is a vector of ones and Γ_k is the vector of the loadings of each security to factor k (i.e., the k th column of the loading matrix Γ). The portfolio weights were then multiplied by the monthly excess returns on the securities to determine the monthly time series of the returns on the five benchmark portfolios (the factor scores).

A.3. The construction of size and book-to-market factors

In order to mimic risk factors related to size and book-to-market variables, portfolios of shares were formed following the methodology described in Fama

and French (1993). In June of each year (from 1984 to 1995) all the common shares (*azioni ordinarie*) listed at the MSE were ranked on size (the market value of each share multiplied by the outstanding number of shares). The shares were then split into two groups: in the first group (small, henceforth S) have been included all the shares with size below the median, while in the second group (big, B) have been included the shares with size above the median. The shares were also split into three groups on the basis of the book-to-market ratio (BTM), i.e., the ratio between book equity and market equity (BE/ME): in the first group (low, L) have been included all shares in the bottom 30%, in the second (medium, M) the shares in the middle 40% and in the third (high, H) the shares in the top 30%. Six portfolios were then formed, combining the previous size and BTM groups (S/L, S/M, S/H, B/L, B/M, B/H). For example, the S/L portfolio includes the shares which are both in the S and the L groups. Monthly value-weighted returns were then calculated for each portfolio from July of year t to June of year $t + 1$. In each month, the return on the portfolio which should mimic the SMB factor was then calculated as the difference between the simple average of the three small portfolios and the simple average of the three big portfolios:

$$r_{\text{SMB}} = \frac{1}{3} [(r_{\text{S/L}} + r_{\text{S/M}} + r_{\text{S/H}}) - (r_{\text{B/L}} + r_{\text{B/M}} + r_{\text{B/H}})]. \quad (\text{A.2})$$

A similar procedure was followed to obtain the return on the portfolio which mimics the risk factor related to BTM:

$$r_{\text{HML}} = \frac{1}{2} [(r_{\text{S/H}} + r_{\text{B/H}}) - (r_{\text{S/L}} + r_{\text{B/L}})]. \quad (\text{A.3})$$

Only ordinary shares which were listed at the end of each year t were included in the calculation of the SMB and HML portfolios. The data on BTM are drawn from *Indici e dati*, a volume published every year by Mediobanca and containing accounting and market information on all Italian firms listed on the MSE. When both the single firm and the consolidated BTM ratio are reported (for listed firms which belong to a group) the first one was used. Data on the number of outstanding shares were drawn from the Bank of Italy share price database.

A.4. Data on mutual funds

The data on mutual fund unit values, the value of dividends, distribution dates and fund portfolio holdings have been drawn from the Bank of Italy mutual funds database and were cross checked with the data reported by *Il Sole 24-Ore*. Data on bank fees, management fees, incentive fees and the residual item “other expenses” have been drawn from the Bank of Italy’s database and from the funds’ annual report (*rendiconto annuale*).

Appendix B. The statistical classification of mutual funds

We classified funds using cluster analysis, on the basis of the similarity of their portfolio holdings.²² The analysis has been conducted using the SAS cluster procedure, which minimizes the differences inside each cluster and maximizes the differences between different clusters. In order to estimate the optimal number of clusters, for each fund, we calculated the percentages of the following categories of assets in its portfolio: (1) Italian government securities; (2) Italian corporate bonds (3) Italian convertible bonds; (4) foreign bonds; (5) Italian equities; (6) foreign equities; (7) liquid assets (CDs, bank deposits, etc.); (8) other financial assets. Using the first seven classes of assets, the number of clusters has been estimated on the basis of the test suggested by Sarle (1983), which reaches a maximum in correspondence with the optimal number of clusters.²³ The analysis has been performed on the basis of the average proportion in the funds' portfolio of the asset categories in the whole period 1986–1995 and in two subperiods (1986–1989 and 1990–1995). For the entire period and for the second subperiod the test statistic indicates that the optimal number of clusters is equal to 4 (in both cases the maximum value of the test between 1 and 50 clusters is obtained when the number of groups is equal to 4). The classification of the single funds is highly stable (only one fund changes category from the entire period to the second subperiod). However, in the first subperiod there is no evidence of an optimal number of clusters: the test hits a local maximum when the number of clusters is equal to 7 and reaches higher and increasing values when the number of clusters is higher than 15.

The four groups which have been identified using ex-post data by the cluster analysis closely match a four-level aggregation of the ex-ante classification used by the *Assogestioni*: the first cluster (*Italian equity funds*) includes the funds which belong to categories 1, 3 and 9 of the *Assogestioni* classification; the second (*International equity funds*) includes categories 2, 4, 5, 6, 7, 8, and 10; the third (*Italian bond funds*) includes the funds in categories 11, 13, 15 and 16

²² Sharpe (1992) distinguishes between internal methods of style determination, based on portfolio shares and external methods based on returns.

²³ The test of Sarle (1983) compares the expected value of the ratio (R^2) between the variance inside each cluster and the total variance under the null hypothesis that the data represent random drawings from a single k -dimensional uniform distribution, where k is the number of variables considered in the analysis (in our case 7, the proportion of the first seven categories of assets in each fund's portfolio) with the actual value of the same ratio for the sample under consideration. Positive values of the test indicate the possible presence of clusters, i.e., sampling from a mixture of a k -dimensional normal distribution with equal variances and equal sampling probabilities. For a Monte Carlo analysis on the performance of the test in selecting the optimal number of clusters see Sarle (1983).

and the fourth (*International bond funds*) includes categories 12, 14, 17, 18, 19 and 20. For only nine of the funds considered is the correspondence between the classifications obtained by cluster analysis and that used by *Assogestioni* violated.²⁴

References

- Admati, A.R., Bhattacharya, S., Ross, S.A., Pfleiderer, P., 1986. On timing and selectivity. *Journal of Business* 58, 1–26.
- Alonso, A., Rubio, G., Tusell, F., 1990. Asset pricing and risk aversion in the Spanish stock market. *Journal of Banking and Finance* 14, 351–369.
- Blake, C.R., Elton, E.J., Gruber, M.J., 1993. The performance of bond mutual funds. *Journal of Business* 66 (3), 371–403.
- Brown, S., Goetzmann, W., Ibbotson, R., Ross, S., 1992. Survivorship bias in performance studies. *Review of Financial Studies* 5, 553–580.
- Brown, S., Goetzmann, W., Ibbotson, R., Ross, S., 1996. Rejoinder: The J-shape of performance persistence given survivorship bias. New York University Salomon Center Working Paper S-96-37.
- Chen, N., Roll, R., Ross, S., 1986. Economic forces and the stock market: Testing APT and alternative asset pricing theories. WP 119, Graduate School of Business, University of Chicago.
- Connor, G., Korajczyk, R., 1991. The attributes, behavior, and performance of US mutual funds. *Review of Quantitative Finance and Accounting* 1, 5–26.
- Conway, D., Reinganum, M., 1988. Stable factors in security returns: Identification using cross validation. *Journal of Business & Economic Statistics* 6, 1–15.
- Cumby, R.E., Glen, J.D., 1990. Evaluating the performance of international mutual funds. *The Journal of Finance* 45 (2), 497–521.
- Droms, W.G., Walker, D.A., 1996. Mutual fund investment performance. *The Quarterly Review of Economics and Finance* 36 (3), 347–363.
- Elton, E.J., Gruber, M.J., Das, S., Hlavka, M., 1993. Efficiency with costly information: A reinterpretation of evidence from managed portfolios. *The Review of Financial Studies* 6 (1), 1–22.
- Fama, E.F., French, K., 1992. The cross-section of expected stock returns. *The Journal of Finance* 47, 427–465.
- Fama, E.F., French, K., 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33, 3–56.
- Ferretti, R., Murgia, M., 1991. Fondi comuni di investimento: Costi di gestione e performance. In: Penati, A. (Ed.), *Il rischio azionario e la borsa*. Centro di Economia Monetaria e Finanziaria P. Baffi, Università Bocconi, Milano, pp. 571–629.
- Gibbons, M., Ross, S., Shanken, J., 1989. A test of the efficiency of a given portfolio. *Econometrica* 57 (5), 1121–1152.
- Grinblatt, M., Titman, S., 1989a. Mutual fund performance: An analysis of quarterly portfolio holdings. *Journal of Business* 62 (3), 393–416.

²⁴ In the cluster procedure we used all the funds which were active before 1994 (293 funds), excluding three funds for which the dataset was not complete. Our statistical classification differs from that of *Assogestioni* for six international equity funds (classified ex-post as Italian equity funds) and for three Italian bond funds (classified ex-post as international bond funds).

- Grinblatt, M., Titman, S., 1989b. Portfolio performance evaluation: Old issues, new insights. *Review of Financial Studies* 2, 393–421.
- Grinblatt, M., Titman, S., 1994. A study of monthly mutual funds returns and performance evaluation techniques. *Journal of Financial and Quantitative Analysis* 29 (3), 419–444.
- Grossman, S., Stiglitz, J., 1980. On the impossibility of informationally efficient markets. *The American Economic Review* 70, 393–408.
- Hendricks, D., Patel, J., Zeckhauser, R., 1993. Hot hands in mutual funds: Short run persistence of relative performance 1974–88. *The Journal of Finance* 48, 93–130.
- Henriksson, R., 1984. Market timing and mutual fund performance: An empirical investigation. *Journal of Business* 57, 73–96.
- Henriksson, R., Merton, R., 1981. On market timing and investment performance II: Statistical procedures for evaluating forecasting skill. *Journal of Business* 54, 513–533.
- Ippolito, R.A., 1989. Efficiency with costly information: A study of mutual fund performance 1965–1984. *The Quarterly Journal of Economics* 104 (1), 1–23.
- Jagannathan, R., Korajczyk, R.A., 1986. Assessing the market timing performance of managed portfolios. *Journal of Business* 59 (2), 217–235.
- Jensen, M., 1968. The performance of mutual funds in the period 1945–1964. *The Journal of Finance* 23, 389–416.
- Jensen, M., 1969. Risk, the pricing of capital assets, and the evaluation of investment portfolios. *Journal of Business* 42, 167–247.
- Kahn, R., Rudd, A., 1995. Does historical performance predict future performance? *Financial Analysts Journal*, November, 43–52.
- Lehmann, B., Modest, D., 1987. Mutual fund performance: A comparison of benchmarks and benchmarks comparisons. *The Journal of Finance* 42 (2), 233–265.
- Lehmann, H.E., Modest, D., 1988. The empirical foundations of the arbitrage pricing theory. *Journal of Financial Economics* 21, 213–254.
- Lehland, H.E., 1999. Beyond mean variance: Performance measurement in a nonsymmetrical world. *Financial Analyst Journal* 1, 27–36.
- Malkiel, B., 1995. Returns from investing in equity mutual funds 1971–1991. *The Journal of Finance* 50 (2), 549–572.
- Merton, R., 1981. On market timing and investment performance I: An equilibrium theory of value and market forecasts. *Journal of Business* 54, 363–406.
- Panetta, F., 1996. *The Factor Structure of the Italian Stock Market*. Ph.D. Dissertation, London Business School, London.
- Panetta, F., Violi, R., 1999. Risk premia, consumption and financial structure from the unification of Italy to today. Bank of Italy, Discussion Paper no. 353.
- Panetta, F., Zautzik, E., 1991. Evoluzione e performance dei fondi comuni mobiliari italiani. In: Penati, A. (Ed.), *Il rischio azionario e la borsa*. Centro di Economia Monetaria e Finanziaria P. Baffi, Università Bocconi, Milano, pp. 527–567.
- Roll, R., 1977. A critique of the asset pricing theories' tests – part I: On past and potential testability of the theory. *Journal of Financial Economics* 4, 129–176.
- Roll, R., 1978. Ambiguity when performance is measured by the securities market line. *The Journal of Finance* 33, 1051–1069.
- Ross, S.A., 1976. The arbitrage theory of capital asset pricing. *Journal of Economic Theory* 13, 341–360.
- Sarle, W.S., 1983. Cubic clustering criterion. SAS Technical Report A-108, SAS Institute Inc, Cary, NC.
- Sharpe, W., 1992. Asset allocation: Management style and performance measurement. *Journal of Portfolio Management* 18 (Winter), 7–19.
- Shukla, R., Trzcinka, C., 1994. Persistent performance in the mutual fund market: Tests with funds and investment advisers. *Review of Quantitative Finance and Accounting* 4, 115–135.

- Treynor, J., Mazuy, K., 1966. Can mutual funds outguess the market. *Harvard Business Review* 44, 131–136.
- White, H., 1980. A heteroscedasticity-consistent covariance matrix and a direct test of heteroscedasticity. *Econometrica* 48, 817–838.