Efficiency of Italian Asset Management Companies

Giuliana Borello[a], Francesca Pampurini[b]

[a] *Dep. SEGESTA*
Catholic University of Milano
via Necchi 5, 20123 Milan - Italy
[b] *Dep. of Economic and Financial Institutions*
University of Macerata
via Crescimbeni 20, 62100 Macerata - Italy

Abstract

This paper investigates the level of X-efficiency of Asset Management Companies (henceforth AMC), active in Italy. Efficiency has been widely studied in the previous literature with reference to the banking system and investment companies; the aim of these works was to identify and compare those factors that influence (positively) the level of efficiency of such intermediaries and to offer some guides to managers and policy makers. Despite the presence of a huge amount of works, Asset Management Companies have never been studied from this point of view, probably this is due to the lack of a common model that captures the production process of these intermediaries and to the difficulty of finding accounting data. We propose a model able to identify the characteristics of the production process of AMCs and we illustrate an empirical analysis based on a common technique named "stochastic frontier approach" applied to a sample of Italian AMCs. The results show that this sector is characterized by a low level of efficiency in terms of costs and by limited opportunities to leverage on profits since the market seems highly competitive. The Italian market is also characterized by the presence of many big companies, but the results show that high size does not mean high level of efficiency.

Keywords: Asset Management Companies, Efficiency, X-Efficiency
JEL classification: G20 G21 G24

1. Introduction

This work deals with the level of efficiency of a particular category of financial intermediaries, Asset Management Companies (henceforth AMC). We draw our attention on AMCs because in the last decade this sector underwent significant changes as a consequence of the financial crisis and the new attitudes of retail investors toward asset management. With respect to financial intermediaries involved in the production of asset management services we expect to observe

Email addresses: giuliana.borello@unicatt.it (Giuliana Borello), francesca.pampurini@unimc.it (Francesca Pampurini)

an evolution of their business strategies either in the organizational environment or in the distribution techniques in order to improve the cost and the quality of their products.

According to this idea we want to test if there is an organizational model which seems to be more suitable for Asset Management Companies such as an independent firm or a financial conglomerate.

Efficiency has been widely studied in the previous literature especially with respect to the banking system; a few amount of studies regarded investment companies, but there is not any work dealing with asset management companies. This is probably due to two reasons: first of all, it seems quite difficult to find a common model which is able to describe the production process of an asset management company, second, this sector suffers from a lack of account data because only a few companies are listed. There are some works dealing with profitability and performance of Italian Asset Management Companies but they are based on a different framework since they value efficiency only by means of multiples or OICR performances[1].

The huge amount of literature dealing with the efficiency of the banking sector is due to the fact that in the last decades this sector was involved in important structural changes that altered the morphology of the banking system in all major countries. In particular, literature is divided into two groups. A first group takes into account the impact of regulatory rules on the morphology the banking system. Here we can find works that illustrate the evolution of efficiency and performance indicators after strategic operations such as M&A or after the change of the manager[2].

A second group focused instead on the international comparison in order to identify a link between the structural organization of a particular country and the level of efficiency of the intermediaries belonging to that country[3].

Our study takes inspiration from those works referred to investment firms dealing with the estimation of economies of scale and scope. These models provide some useful criteria for the choice of the most appropriate model to represent the production technology of Asset Management Companies[4].

First of all we offer a brief description of the market in which Asset Management Companies operate. At the end of the year 2010 there were 195 active AMCs the 40% of them was specialized in open end funds and other products (such as pension funds)[5]. From the data offered by the Bank of Italy we saw

[1] See Geretto Morassut (2010) and Bianchi, Miele (2011).

[2] Belkaoui, Pavlik (1991), Cole, Mehran (1998), Bonin, Hasank, Bauer, Berger, Ferrier, Humphrey (1998), Esho (2001), Otten, Schweitzer (2002), Berkowitz (2003), Amel, Barnes, Panetta, Salleo (2004), Wachtel (2005), Iannotta, Nocera, Sironi (2007), García-Marco, Robles Fernández (2008), Ferris, Yan (2009), Kauko (2009).

[3] Dietsch, Lozano-Vivas (2000), Udell (2000), Liu, Beccalli (2004), Bos Schmiedel (2007), Lensink, Meesters, Naaborg (2008), Berger, De Young, Genay, Beccalli, Frantz (2009), Bolt, Humphrey (2010), Molyneux, Wilson (2010).

[4] All these works (except Boscia 1997) agree to use the revenues as measures of *output* and the cost of labour plus the cost of physic capital as a measure of *input*.

[5] Bank of Italy, Relazione per l'anno 2010, page 201.

that the year 2010 suffered from a decline in operating net earnings (9, 3% over the previous year); this is mainly due to the absence of extraordinary revenues (realized in 2009), to the growth of operating costs and to a slight decrease of assets under management. We have to notice that more than one third of Asset Management Companies registered a loss in the year 2010; the majority of these AMCs are those specialized in the area of closed end funds (REITS) but this category of AMCs had not yet reached a level of activity able to cover all the costs since the are "very young" companies[6].

In recent years, AMCs have been given particular attention by Consob and Bank of Italy. Since 2008 the Bank of Italy, Consob and the Ministry of Economy and Finance, with the participation of some intermediaries, set up a Working Group on Italian mutual funds in order to review the new laws and regulations necessary for the revival of the asset management industry. Results showed that the most important problems can be summarized in three issues[7]:

- regulatory asymmetries among mutual funds, insurances and bank bonds;
- the participation of AMCs in financial conglomerates that constrain the distribution channels;
- the tax regime that penalized Italian mutual funds relative to foreign funds[8].

The second point mentioned above is closely related to the analysis offered in this paper because the ownership of an Asset Management Company has a strong impact on its business model either in terms of product distribution choices, or in terms of pricing[9].

The analysis proposed in this paper wants to highlight the peculiarity of the AMC's production process with respect the banking sector and other investment companies in order to find a measure of efficiency that can fit the specificities of this industry.

In particular we study a sample of Italian AMCs using an econometric model that evaluates the level of *X-efficiencies* from the comparison between an efficient frontier (which represents the so called "*best practice* case) and the result referred to each single company of the sample.

---

[6] Bank of Italy, Relazione per l'anno 2010, page 216.

[7] Report of working group in Italian funds, "Fondi comuni Italiani: situazione attuale e possibili linee di intervento" – July 2008.

[8] This problem was recently solved with the law known as "Decreto Mille proroghe" which introduced a tax system similar to other European countries from 1st of July 2011.

[9] A recent study conducted by Consob found that the OICR of AMCs belonging to a financial conglomerate are distributed by a few intermediaries belonging to the same group of the AMC. Moreover the fees paid by these AMCs to the other intermediaries of the same group are higher than the average market fee. See Consob, Relazione per l'anno 2010, page 200.

2. Definition of "efficiency"

The analysis of the efficiency of financial intermediaries is a very popular theme in literature because it captures the interest of various categories of operators such as: managers and stakeholders (mainly interested in profit maximization and cost minimization), the supervisors (interested in evaluating the effects of their decisions on the performance and stability of financial firms) and the entire financial system. In addition to the traditional performance analysis approach based on financial accounts (operating costs, revenues, gross profits, ROE, ROA, etc.) new models developed in order to take into account other strategic variables not represented in financial accounts data.

These new models are based on scale and scope economies. In particular scale economies represent the ability to reduce the average *output* cost by implementing the production scale (considering other factors as fixed) and then the size of the business. On the contrary, scope economies represent the ability to reduce costs by producing a particular mix of *output* knowing that the cost of this mix is less than the sum of the production cost of each single component[10].

Since the Nineties many other efficiency models were established in order to take into account not only the factors mentioned above, but also other discretionary variables that represent the decisional process of managers or other environmental variables that represent the context in which firms operate. These models are based on the concept of *X-efficiencies* and the construction of efficient frontiers. This technique is based on the comparison between the efficiency level of each intermediary and the efficient frontier (which represent the *best practice* case) other things being equal (especially environmental variables). The determinants of X-efficiencies depend both on the skills of the manager and on external factors. For this reason, models based on the measurement of *X-efficiencies* are preferable, since they are able to take into account the microeconomic environment in which the firm operates.

Several empirical studies, focused only on the banking system[11], showed that *X-inefficiencies* account for a value greater than 20% with respect to costs, while scale and scope economies account for less than 5%. This means that the most important variable able to improve the performance of the firm is directly linked to the ability of the manager to reduce costs and enlarge profits and does not depend on a particular scale of production (i.e. firm size) or a precise mix of products.

In this contest, in order to evaluate the performance it is necessary to define an algebraic function that represents the technology with which the firm transforms *inputs* into *outputs*. Then, it is possible to calculate the maximum number of output that can be produced using different combinations of input. The main problem concerning this function is related to the lack data available to the external analyst; to overcome this problem we can exploit the link be-

[10] See Panzar, Willig (1975, 1981).
[11] Berger, Hunter, Timme (1993) and Bauer (1993).

tween the production function and the minimum cost function (or maximum profit function)[12]. After the specification of the algebraic expression of the cost/profit function it is possible to derive the production equations (of *output* and *input*) that solve the optimization problem.

Before proceeding in the evaluation of *X-efficiencies* it is necessary to provide a better definition of "efficiency". Previous literature proposes three different definitions: standard profit efficiency, alternative profit efficiency and cost efficiency[13].

Standard profit efficiency measures the ability of a firm to produce the maximum possible profit given a particular level of *input* and *output* prices; it is the ratio of the predicted actual profits to the predicted maximum profits that could be earned by the best firm of the sample. This measure is obtained by the maximization of the standard profit function in which profits are considered variables while prices are considered exogenous. The profit function (in logarithmic form) is[14]:

$$\ln(\pi + \theta) = f(w, p, z, v) + \ln u_\pi + \ln \varepsilon_\pi \tag{1}$$

where π is the variable profit of the firm given by the income (interests and fees) earned from the variable *outputs* minus variable costs, θ is a constant added to every firm's profit to ensure that the argument of the natural logarithm is positive, w is the vector of prices of variable *inputs*, p is the vector of prices of variable *outputs*, z is the vector of the quantities of any fixed *inputs* or *outputs*, v is a set of market variables, ε represents random error and u represents inefficiency. Standard profit efficiency is then:

$$Std\pi EFF^i = \frac{\hat{\pi}^i}{\hat{\pi}^{max}} = \frac{e^{\hat{f}(p^i, w^i, z^i, v^i)} e^{\ln \hat{u}_\pi^i} - \theta}{e^{\hat{f}(p^i, w^i, z^i, v^i} e^{\ln \hat{u}_\pi^{max}} - \theta} \tag{2}$$

it represents the proportion of maximum profits that are really earned. A ratio of 70% means that the firm is losing about 30% of the potential profit. This ratio can reach a maximum value of 1 (for the best firm of the sample), but it could also be negative since a firm could lose more than 100% of its potential profits. This profit efficiency concept is quite spread in literature because of three advantages: first af all it accounts for errors on the *input* or *output* choice; second, it gives the same importance to the ability of the manager to raise profits or reduce costs; third, it is based on the comparison with the best firm of the sample that lies on the frontier.

Cost efficiency measures the difference between the cost of each firm and the cost of the best practice firm to produce the same *output* bundle under the same conditions. It is derived from a cost function where variable costs c depend on the prices of variable *inputs* w, on the quantities of variable *outputs* y, on any

[12] In the literature this relationship is known as "duality principle". Diewert (1974), Shephard (1970) e Varian (1990).

[13] See Berger, Mester (1997), page 898.

[14] See Berger, Mester (1997), page 899.

fixed *inputs* and *outputs* z, on environmental factors v and on inefficiency u_c (considering the error term ε_c). The cost function (in natural logs) is:

$$\ln c = f(w, y, z, v) + \ln u_c + \ln \varepsilon_c \tag{3}$$

The cost efficiency is the ratio of the cost of the best practice firm and the cost of each firm of the sample to produce the same *output*[15]:

$$CostEFF^i = \frac{\hat{c}^{min}}{\hat{c}^i} = \frac{e^{\hat{f}(w^i, y^i, z^i, v^i)} e^{\ln \hat{u}_c^{min}}}{e^{\hat{f}(w^i, y^i, z^i, v^i)} e^{\ln \hat{u}_c^i}} \tag{4}$$

This measure gives the proportion of costs or resources that are used efficiently: for example, a ratio of 70% means that the firm is 70% efficient or, equivalently, it waists 30% of its costs relative to a best practice firm. This ratio ranges over (0-1) where 1 represents the *best practice* firm. Also this cost function is quite spread in literature thanks to some advantages[16]. On the contrary to the profit function, it considers output quantities (and not prices) as given; the hypothesis of exogenous prices does not fit well for financial intermediaries while it is more realistic the idea of a level of pricing that varies with quantities.

Berger and Mester (1997) proposed the so called alternative profit function in order to overcome some of the assumptions underlying cost and standard profit efficiency that are not met by financial intermediaries. This function employs the same dependent variable as the standard profit function and the same exogenous variables as the cost function: *output* is held constant, while output prices can vary. The alternative profit function (in log form) is[17]:

$$\ln(\pi + \theta) = f(w, y, z, v) + \ln u_{a\pi} + \ln \varepsilon_{a\pi} \tag{5}$$

Alternative profit efficiency is the ratio of predicted actual profits to the predicted maximum profits for the best practice firm considering the same *output*:

$$Alt\pi EFF^i = \frac{a\hat{\pi}^i}{a\hat{\pi}^{max}} = \frac{e^{\hat{f}(p^i, w^i, z^i, v^i)} e^{\ln \hat{u}_{a\pi}^i}}{e^{\hat{f}(p^i, w^i, z^i, v^i)} e^{\ln \hat{u}_{a\pi}^{max}}} \tag{6}$$

With respect to the characteristics of the AMCs of our sample we decided to refer to the alternative profit function since it is very useful when one or more of the following conditions hold:

(i) there are substantial unmeasured differences in the quality of financial services;

(ii) output are not completely variable and a firm cannot produce every output scale and product mix;

(iii) output markets are not perfectly competitive and the intermediaries have a relative market power over the prices they charge;

[15] See Berger, Mester (1997), page 899.
[16] See Berger, Mester (1997), page 898.
[17] See Berger 1997, page 901.

(iv) output prices are not accurately measured[18].

With regard to AMCs the hypothesis of non competitive markets detailed in item (iii) is real. Moreover, as stated in item (i), product/services offered by each intermediary are characterized by a low level of differentiation. Even the second hypothesis illustrated in item (ii) is reasonably satisfied since quantities of outputs are not completely variable.

3. The econometric model for efficiency estimation

The empirical literature shows a general consensus about the *X-efficiencies* advantage compared to the simple measurement of economies of scale and scope. The estimates obtained by the *X-efficiencies* model are quite heterogeneous, but the results are often different and not comparable with other estimation models.

The measurement of *X-efficiencies* is a two-stage approach: first you must choose the model for evaluating the efficiency and second you must define a function for the frontier estimate.

Regarding the first point we decided to use a parametric approach for two reasons: the high flexibility of the parametric model and the possibility to compare the results with some recent empirical studies[19]. The most important differences between the parametric and non-parametric approach are attributable to the following three factors: first, the non-parametric models do not allow the possibility of measurement errors; second, they do not consider that sometimes the performance may be influenced by random factors that have nothing to do with the strategies of the manager; lastly, the nonparametric models do not consider the possibility that the use of different accounting principles may cause deviations between the estimated values and the real ones. Not being able to manage these "exogenous" factors, the non-parametric models conclude that any difference between the efficiency estimate for each subject and the efficiency estimate for the *best practices* firm is entirely attributed to inefficiency.

After the decision of which parametric model is more appropriate, it is necessary to define the functional form of the production function, cost or profit. The models proposed by the empirical literature are three and they differ from each other by the way they interpret the *random error*, i.e. the measurement error (which is absent in non-parametric models): *Stochastic Frontier Approach* (SFA) also known as *Econometric Frontier approach*, *Distribution Free approach* (DFA) and, finally, *Thick Frontier approach* (TFA) [20].

---

[18] See Berger, Mester (1997), page 901.

[19] For a detailed overview of the differences between the two approaches, see Berger and Humphrey 1997.

[20] The DFA method assumes that the inefficiency of each firm is stable over time and that the random error tends to zero in the long term (Berger 1993, Berger, Humphrey 1992), while the TFA method assumes that the differences between the performance of subjects belonging to the highest and the lowest quartile - calculated in the same size group - is the *random error*,

In the literature, opinions about the three models are quite heterogeneous; if all the methods offered the same (or slightly different) results, the problem would be marginal. On the contrary, the choice of a particular measurement technique profoundly influences the value of efficiency.

In a parametric model, an operator is considered inefficient if the estimated cost is higher (or the estimated profit is lower) than the *best practice* firm of the sample after the unbundling of the *random error*; in other words, this occurs when the values of $\ln u_c$, of $\ln u_\pi$ and $\ln u_{a\pi}$ referred to each firm are different from the same values referred to the *best practice* firm[21]. The three methods outlined above differ in the way the term $\ln u$ is separated into two components: $\ln u + \ln \varepsilon$.

In this paper we decided to use the SFA method. This approach assumes that the noise component consists of two parts: the first is represented by the term $\ln u$ which measures the inefficiency (like the deterministic models), usually it follows a skewed distribution (typically semi-normal); the second is represented by the random error $\ln \varepsilon$ which follows a symmetrical distribution (generally the Gaussian). The (in)efficiency values of each operator of the sample are calculated on the basis of the estimated parameters of these two distributions: in particular, the measure of inefficiency is derived from the mean of the conditional distribution of $\ln u$ given $\ln u + \ln \varepsilon$, i.e. $\ln \hat{u} \equiv \hat{E}(\ln u \mid \ln u + \ln \varepsilon)$[22].

With regard to the algebraic formulation of the cost and profit functions to use in the SFA model, the literature proposes various solutions that differ from each other for the flexibility (or the ability to represent different production technologies) and for the ability to comply with certain properties[23]. They are the *Cobb-Douglas* , the *Constant Elasticity of Substitution* and the translog function (*Transcendental Logarithmic*). The first two functions are characterized by an excessive rigidity, while the third is more suitable since it allows variability in the elasticity of production and of substitution between the *input* and allows average cost curves in the form of a U. For these reasons - and the fact that it is widespread in the literature which inspired this work - we decided to represent the cost and the profit functions with a *translog*. In our case the translog cost function takes the following form:

---

while the differences between the performance of subjects in the highest and lowest quartiles represent inefficiencies (Berger and Humphrey 1991 and 1992, Bauer et al. 1993 and Berger 1993).

[21] See Berger 1997, p 906.

[22] See Berger 1997, p. 906.

[23] See Coelli et al. (1998).

$$\ln TC = \alpha_0 + \sum_{i=1}^{m} \alpha_i \ln y_i + \sum_{i}^{n} \beta_i \ln w_i + \frac{1}{2} \sum_{i=1}^{m} \sum_{j=1}^{m} \delta_{ij} \ln y_i \ln y_j +$$
$$\frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \lambda_{ij} \ln w_i \ln w_j + \xi \ln K + \frac{1}{2} \tau (\ln K)^2 + \sum_{i=1}^{n} \sum_{j=1}^{m} \rho_{ij} \ln w_i \ln y_j +$$
$$\sum_{i=1}^{m} \alpha_{ik} \ln y_i \ln K + \sum_{i=1}^{n} \beta_{ik} \ln w_i \ln K + \varepsilon_i \tag{7}$$

where TC is the total cost, y_i is the production level (i.e. the quantity), w_i is the *input* price, K is the financial capital, and α, β, γ, δ, ρ e τ are the parameters to be estimated.

Moreover, it is necessary to impose the following restrictions:
$\delta_{ij} = \delta_{ji}$, $1 < i, j < m$
$\lambda_{ij} = \lambda_{ji}$, $1 < i, j < n$
$\sum \beta_i = 1$
$\sum \lambda_{ij} = 0$, $1 < i, j < n$
$\sum \rho_{ij} = 0$, $1 < i, j < m$

Among the variables of the translog function we chose to include also the financial capital to ensure that the model is able to take into account the differences in the size of the AMCs of the sample. In fact, the costs and profits referred to bigger companies are generally higher than the ones referred to smaller firms, so the error term is characterized by a higher variance. Using the financial capital, it is possible to control the size effect and obtain an estimate of efficiency that is homogeneous for all the AMCs of the sample[24].

The alternative profit function is specified in a similar manner; the only difference is that now the dependent variable is the profit (rather than the cost):

$$\ln(\pi + \theta) \tag{8}$$

where, $\theta = |\pi^{min} + 1|$ is a constant that is added to the profit of each operator in order to have the argument of the logarithm always positive. This transformation is necessary because an asset management company may occur losses in some periods (negative profit). All the other variables of the *translog* function remain unchanged. Another adjustment regards the null *outputs*. Since the logarithm of zero does not exist, it is necessary to adjust every case in which one or more *outputs* have a value equal to zero[25].

Another important factor to complete the definition of the model is the selection of *input* and *output* terms. To obtain a good estimate of efficiency

[24] For a discussion about the importance of financial capital for the estimation of efficiency and a bibliographic review about it, see Berger, Mester (1997), p. 909.
[25] The transformation applied is the Cox-box.

it is necessary that the set of *input* and *output* variables is able to represent the production process of AMCs. For this reason we estimate efficiency using different sets of variables and then we compare the results.

4. *Input* and *output* variables

This paper investigates the (in)efficiency levels of asset management companies operating in Italy using the SFA approach outlined above. In order to obtain an accurate and realistic efficiency measure it is really important to identify the best *input* and *output* variables that will be used in the translog function presented in section 3. The identification of AMCs' output products is really different from banks; therefore, our results cannot be compared with the efficiency measures shown by the rest of the literature, and with the *input* and *output* variables proposed by previous studies related to the banking sector. Since we propose an innovative issue, we analyse three different models characterized by a different mix of *input* and *output*, that represent different specifications of the production technology.

The AMCs production process consists in implementing asset management services with the use of labour forces (human capital), tangible and intangible assets (physical capital), and a certain amount of capital (financial capital). *Inputs* are thus represented by these three elements human capital, physical capital and financial capital, whose prices are represented by personnel costs, operating expenses (including current assets both tangible and intangible) and the sum of commission expenses and interest expenses[26]. With regard to the identification of *outputs* this work differs from previous literature because banks and investment firms offer to their customers a variety of products/services, while asset management companies offer only the asset management service. Therefore there is only a single *output* to consider. Regarding the choice of *output* data the only source available to the external analyst is the financial statement that shows both flow values (in the income statement) and stock values (in the balance sheet). The literature on efficiency (referred especially to investment firms) offers several arguments about the choice between these two types of variable[27]. Some works refer to revenues to measure the *output* on the assumption that the main products offered by investment firms are actually services and therefore they are better represented by *flow* variables[28]. Other works, however, use *stock* variables arguing that the goal of these company consists in maximizing the amount of trading (in the case of brokerage companies) and assets under management[29]. Using *stock* variables would also provide the further advantage that the results can be compared with previous studies about the banking sector (that are based only on these variables).

[26] *Input* prices are divided by (*total assets*) in order to account for differences between the size of the AMCs of the sample.

[27] For a review of the literature on the subject see Beccalli (2001).

[28] See Goldberg et al. (1991) and Anolli, Remains (1996).

[29] See Boscia (1997).

This paper estimates the efficiency of asset management companies operating in Italy through three different specifications of the econometric model presented in section 3 using human capital, physical capital and financial capital as input variables and using alternatively *flow* variables (as the interest margin) and two *stock* variables (Asset Under Management and a set of three balance sheet variables widely used in the previous banking literature) as output variables[30]. Table **??** shows the key variables used as *input* and *output* for each model and illustrates the name of the corresponding variable.

Table 1: Efficient frontier estimation models

Model A			
Input		*Output*	
w_1	Human capital: Price of labour	Operating income	y_1
w_2	Financial Capital = Fee and commission expense + interest expense		
w_3	Physical Capital = Administrative costs + Impairment/write-backs on property, plant and equipment		
Modello B			
Input		*Output*	
w_1	Human Capital: Price of labour	Asset Under Management	y_1
w_2	Financial Capital = Fee and commission expense + interest expense		
w_3	Physical Capital = Administrative costs + Impairment/write-backs on property, plant and equipment		
Modello C			
Input		*Output*	
w_1	Human Capital: Price of labour	Financial Assets	y_1
w_2	Financial Capital = Fee and commission expenses + interest expenses	Loans	y_2
w_3	Physical Capital = Administrative costs + Impairment/write-backs on property, plant and equipment	Fiscal Assets	y_3

For each AMC of the sample the *inputs* were divided by total assets in order to let the econometric model compare intermediaries of different size.

The efficiency level of each AMCs is closely related to the ability of managers to generate high profits and attract more mass to invest, so this paper presents first af all the estimates obtained from the first model (model A), based on the use of operating income (the sum of net interest income and net commission)

[30]The empirical analysis is carried out using the software FRONTIER Version 4.1 (see Coelli, 1992). For linear homogeneity purposes we normalized "total costs" and input prices with respect to labour and physical capital.

as a measure of *output*. This decision supports the hypothesis that one of the main purposes of the managers is to maximize revenues from asset management services represented - as known - in the form of commissions.

Than we estimate efficiency with a second model (model B) where the *output* variable is represented by a *stock* value, the Asset Under Management (AUM). It is quite intuitive to consider the amount of assets under management as a crucial factor in order to quantify the services carried out by AMCs.

Finally, the level of efficiency is estimated with the third model (Model C) that is based on the biggest balance sheet items in terms of value: financial assets, credits and tax assets[31]. This allows us to make a comparison with previous studies on efficiency. In particular, financial assets (i.e. bonds, equities and mutual funds) are purchased using part of the profits, first of all fees generated by asset management activity. Credits refer to commission income - claimed from underwriters of the shares of mutual funds - accrued during the last month of each year and settled during first month of the next year[32].

5. The sample and the results of the econometric models

The list of the Asset Management Companies of our sample was build from the data published in the Supervisory Register of the Bank of Italy and it accounts only for AMCs operating in Italy[33]. We concentrated only on AMCs that operate with open end funds and we discarded real estate AMCs, alternative AMCs, and private equity AMCs because they show a very different business model[34].

Therefore, our sample covers the entire population of AMCs operating in Italy over the period 2004-2010 for a total of 80 firms. It is an unbalanced sample since the number of AMCs active in each year is not always the same; it decreases when an intermediary exits the market or when it is acquired by another firm or else it increases when new AMCs obtain the authorization from the Bank of Italy to estabilish a branch and operate in our country (see table 2).

The majority of the AMCs of our sample belongs to a financial group: in particular 57 AMCs belong to a banking group while 7 AMCs belong to an

[31] The sum of these three items represents about the 85% of the total assets. On average, credits represent 53% of the total assets, tax assets represent the 5% and financial assets the remaining 27%. The latter represents the sum of different items: financial assets held for trading, financial assets valued at *fair value*, financial assets available for sale and financial assets held to maturity.

[32] For asset management companies belonging to a group, credits also include temporary loans to other companies of the same group, probably motivated by fiscal policies. This item often assumes a huge amount.

[33] In the sample there are also all the foreign AMCs that operate in Italy through a branch or a head office.

[34] Their cost/profit structure is different because they operate over a long time horizon and manage much more risky assets.

Table 2: Sample composition

Observed period	2004	2005	2006	2007	2008	2009	2010	2004-2010
n. of active AMC	70	74	71	66	62	60	57	80
n. of balance sheets analysed	70	74	71	66	62	60	57	460

Source: Bank of Italy – Supervisory Register.

insurance group; we have only a few independent firms. The foreign intermediaries are 20, they belong to an international group whose holding is not an Italian firm. Those AMCs that belong to an Italian or an international financial group can be considered captive because the managerial strategy surely depends on the aims of the holding. Moreover, these AMCs can benefit from the group synergies with respect to some areas such as distribution networks, back office procedures and real estate properties in which offices are located.

Italian AMCs are characterized by a huge differentiation in terms of size: very big intermediaries represent only a small proportion while small firms are quite numerous. On the contrary, the average value of total asset for bigger AMCs is about 567 euro/millions and it is about 109 times bigger than the average total assets of the smaller AMCs (which is equal to a 5,2 euro/millions)[35].

The values of *input* and *output* data for the econometric model illustrated in the previous paragraph 4 were extracted from the Public Records Office (CERVED) in which the balance sheets of the AMCs are stored. We collected and analysed 460 balance sheets (see table 2) for the period 2004-2010[36].

Unlike most of previous literature about *X-efficiencies*, we analysed not only cost efficiency, but also profit efficiency since we think that a manager should achieve both cost reduction and profit growth[37].

The empirical analysis presented in this work is based on the methodology of Battese and Coelli (1992) known as *error component model*[38].

[35] Bigger AMCs are those intermediaries that belong to the last quartile of the distribution, i.e. those 20 firms that show bigger values in term of total assets.Of course, we considered "small" those firms that belong to the first quartile of the distribution. See table 8 ahead.

[36] We illustrate here some problems concerning these balance sheets. First of all in the year 2005 AMCs adopted IFRS with the result that the new documents were not comparable with previous ones. In order to overcome this problem we collected data referred to the year 2004 directly from the balance sheets of the year 2005. Second, during the observed period Bank of Italy changed some items in the compulsory balance sheet scheme so, in order to compare values referred to different years we had to aggregate some of those items that are *input* or *output* of our model. Lastly, a problem raised about *Asset Under Management* (AUM) which is a variable of the model B (see table 1). The value of AUM is not recorded in the balance sheet documentation so we downloaded these data directly from the database of Assogestioni which is the Representative Association of the Italian investment management industry and represents most of the Italian and foreign Investment Management Companies operating in Italy. In order to obtain efficiency estimates from model B we had to build up a reduced sample which accounts for 60 AMCs associated to Assogestioni.

[37] see Spong et al. (1995).

[38] It estimates the stochastic frontier using a dataset in which variables are assumed to be distributed as a Truncated Normal Distribution and they can vary with time. The parameters

First of all we show the results obtained from model A which uses as *output* variable the operating income; this variable seems more coherent with the theoretical model illustrated in the previous paragraph 3. The operating income is the sum of net interest revenues and fee and commission income, so it is a variable able to measure the revenues coming from the asset management activity without being influenced by other extraordinary operations.

The results obtained with model A show that the efficiency index increases during the last 7 years with values between 56% and 62% (see table 3). This means that AMCs exploit about 60% of their dei loro *input*[39]. The efficiency index is approximately constant in the first half of the period, while it increases from 2007 on. This path should be due, partially, to the fact that the period 2004-2006 was characterized by a growth in the amount of the assets under management. From 2007 on, as a consequence of the crisis, the amount of new founds raised by AMCs becomes negative (see figure 1); this phenomenon forces AMCs to undertake strategies to retain costs in order to balance the negative effects of the severe fell in revenues. As regards profit efficiency model A shows an opposite trend; efficiency falls from 2007 in line with the dynamics of the asset under management. This means that AMCs loose on average the $42,2\%$ (that is $1-57,8\%$) of their revenues which could be reinvested in the production process.

Table 3: Model A: efficiency index estimates (percent)

	2004	2005	2006	2007	2008	2009	2010	Entire sample
Cost efficiency	56,3	56,3	56,3	57,7	60,2	61,8	62,4	59,2
Profit efficiency	60,5	60,5	60,5	59,5	56,4	55,5	55,4	57,8

As stated previously (see par. 3) we ran model B to obtain estimates of efficiency index using Asset Under Management as an *output* variable. AUM represents one of the most important strategic factors that guides the choices of the manager. Model B tries to evaluate the manager's skill on the basis of the amount of money they are able to attract.

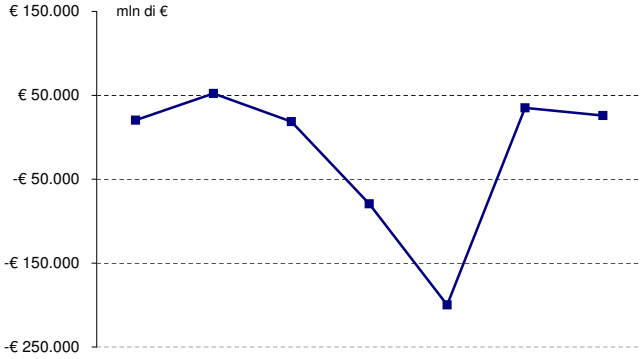
Asset Under Management data comes from the database of Assogestioni that collects periodic reports of the associates; in particular, for each AMC and for the entire observed period, we found the quarterly value of AUM, the annual data was obtained as the average of the quarterly data referred to the same year[40]. This means that to run model B we shaped a restricted sample (with

of the frontier are obtained with the maximum likelihood method.

[39]The average value presented in the table is not the arithmetic average of the yearly data, but it was estimated with the same model assuming the period 2004-2010 as a single period and nor as the combination of seven years. In this way the model is able to account for the time varying results of each single AMC.

[40]We decided to use the average vale instead of the final value of each year because it is not

Figure 1: Net inflows



Source: Assogestioni

respect to model A) that accounts of those AMCs that provided their quarterly data to Assogestioni for the period 2004-2010; in this restricted sample we have 60 AMCs[41]. Results from model B are shown in table 4, they are about on an average value of 63,7% in terms of cost and 64,9% in terms of profit. These results are quite similar to the previous ones (model A) and reveal that managers are more interested in cutting costs even if this strategy generates significant losses in terms of efficiency (in the same period). Despite this, model B provides higher efficiency values than model A.

Table 4: Model B: efficiency index estimates (percent)

	2004	2005	2006	2007	2008	2009	2010	Entire sample
Cost efficiency	64,1	62,5	63,4	63,7	65,7	64,3	63,1	63,7
Profit efficiency	67,0	67,8	66,0	65,4	62,5	63,1	63,4	64,9

Finally, in order to make a comparison with previous literature, we also ran model C that uses stock variables as *output*. This model is based on the hypothesis that an AMC invests its revenues in three kind of assets: financial assets, loans and tax credits. These three variables represent the most important items – in terms of volume – among the assets of the financial statement. We know that these variables are not able to describe the real production process of an Asset Management Company, but we decided to run this model only for comparison purposes since all the literature about bank X-efficiency is based on these data. The average value of efficiency estimated by model C is about

altered by fiscal or political choices.

[41] We have to notice that the AMCs associated to Assogestioni represent more than 90% of the whole Italian market.

67, 7% in terms of costs and 46, 4% in terms of profit (see table 5). The trend is quite the same as previous models: an increase in terms of cost efficiency associated with a reduction in terms of profit.

Table 5: Model C: efficiency index estimates (percent)

	2004	2005	2006	2007	2008	2009	2010	Entire sample
Cost efficiency	65,9	65,7	65,5	65,8	67,7	70,8	70,8	67,7
Profit efficiency	48,1	48,1	48,2	47,6	45,4	44,1	44,1	46,4

The comparison with the results of the three models gives some indications about the ability of each model to represent effectively the production process of Italian Asset Management Companies and than about the ability to offer a correct evaluation of the efficiency level of this sector. Afterwards we draw a comparison between the results obtained with the three models in order to identify peculiarity of each model. Since model B was run on a restricted sample, in order to compare the results of the three methodologies we evaluated model A and model C on the same restricted sample both for *cost efficiency* and for *profit efficiency*. Table 6 shows results.

Table 6: Efficiency index estimates on restricted sample (percent)

Cost efficiency								
	2004	2005	2006	2007	2008	2009	2010	Entire sample
Model A	66,1	65,8	67,9	69,4	73,4	76,3	77,2	72,3
Model B	64,1	62,5	63,4	63,7	65,7	64,3	63,1	63,7
Model C	33,1	31,1	32,1	31,9	34,3	34,6	33,8	34,1
Profit efficiency								
	2004	2005	2006	2007	2008	2009	2010	Entire sample
Model A	57,6	58,6	56,2	55,2	51,0	49,1	48,6	55,6
Model B	67,0	67,8	66,0	65,4	62,5	63,1	63,4	64,9
Model C	45,5	48,2	46,8	46,7	43,8	43,8	44,8	44,8

Efficiency estimates coming from the three models stood on different levels; model C gives lower values than model A and B and this is in line with our expectations since we said than this model is not able to represent correctly the production process of Asset Management Companies. On the contrary the values obtained from the two models that make use of a single *output* variable are closer; the only difference is that model A gives higher results in terms of cost efficiency while model B gives higher values in terms of profit efficiency. Despite this, the trend of the results of the three models are the same. This

means that the models we propose are really coherent with other traditional models even if they are based on different *output* variables such as operating income and AUM. The strong point of these new models is twofold: first af all they offer a true representation of the production process of those intermediaries that deal with asset management, second, they help identifying strategic factors that should drive manager's decisions.

In order to support the goodness of the *X–efficiencies* models proposed in this work, we ran a comparison between the results coming from model A and C based on the entire sample on Italian Asset Management Companies that deal with open end funds. Tables 3 and 5 show the results.

Another time these results reveal a strong coherence with model C (proposed bay the literature on banks) and model A (that fits well the production process of AMCs). The levels of efficiency proposed by the two models are very similar and also the trend in the observed period is really identical[42].

This work reveals that the technology and the production process of Asset Management Companies can be truly represented either with stock data or with flow variable (from the p/p statement) even if previous literature on bank efficiency has discarded the latter. The most important issue is not related to the alternative between data form income statement or from balance sheet, but it is related to the ability to find the most important variables that drive the strategic decisions of the manager and that characterize the target of the manager himself.

The comparison between the results coming from the entire sample and the results coming from the restricted sample reveal another important issue: in the case of *cost efficiency* the results offered by model A based on the restricted sample show higher efficiency levels than the results obtained with the same model on the entire population. On the contrary, in the case of *profit efficiency* the restricted sample show lower results than the entire population. As stated previously the only difference between the two samples is that the restricted one considers only the AMCs associated to Assogestioni which are the biggest ones. In the entire population there are also minor intermediaries characterized by smaller size. For this reason in the next paragraph we propose a closer examination of efficiency with respect with size.

5.1. Differentiation of Asset Management Companies with respect to size

As stated before, the goodness of the model we propose is also supported by the statistical distribution of the results obtained. Table 7 shows the main descriptive statistics of the cost and profit efficiency indexes resulting from the three different models. We decided to analyse the results of the models based on the restricted sample for two reasons: model A and model B provide a better fitting to the production process of AMCs and reveal a strong coherence with

[42]The robustness of the models are also supported by the results shown in the appendix where we report descriptive statistics for all the models presented in the work.

traditional models; on the other hand the results coming from model C seem more comparable with results proposed by previous literature.

Table 7: Descriptive statistics of efficiency indexes on restricted sample (percent)

	Model A		Model B		Model C	
	Cost. eff.	Pr. eff.	Cost. eff.	Pr. eff.	Cost. eff.	Pr. eff.
Average	72,3	55,7	63,7	64,9	34,2	44,8
Median	78,6	50,5	66,3	62,8	40,2	38,5
St.Dev.	15,1	16,2	17,1	17,6	25,1	24,6
Min	29,6	31,6	34,9	36,3	12,2	11,5
Max	96,4	98,4	95,4	97,6	93,8	95,8

The table 7 shows that the results referred to model C are really lower than the ones coming from the other two models, so we decided to exclude them from the comparison. The results of models A and B are closer than we concentrate our attention on the indexes coming from model B which is based on Asset Under Management and, according to our opinion, is more in line with the theory discussed in the previous paragraph and with the production process of AMCs.

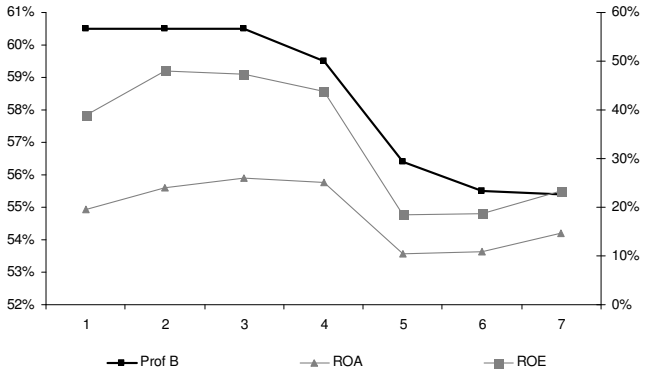
Model B reveals a strong differentiation in terms of efficiency between the AMCs of the sample: the standard deviation is respectively $17,1\%$ and $17,6\%$ for cost and profit efficiency. This means that the difference between the best and the worst AMC is pronounced. Another difference between *cost efficiency* and *profit efficiency* estimates is related to the fact that in the case of *cost efficiency* there are many firms characterized by a low level of efficiency and only few firms characterized by high efficiency (in fact, the median of the distribution is higher than the average for all the models). The opposite in the case of *profit efficiency* even if the difference is lower[43].

This uniformity between the average and the median of the results referred to profit efficiency reveals a peculiarity of the Italian market: the low level of competition between AMCs especially in terms of products and pricing. This means that it very difficult for a manager to play on marketing in order to increase profits; in fact, the statistical distribution of profit efficiency is less homogeneous (the standard deviation is equal to $16,2\%$ and $17,6\%$ for the results coming respectively from model A and B) than the difference between the best and the worst firm is much more pronounced.

Unless the case of profit efficiency the results about cost efficiency show that all the AMCs set up a cost reduction strategy (in fact, the standard deviation is lower). This is probably due to the fact that the recent crisis forced the intermediaries to adopt a strategy of cost reduction in order to break even and avoid a loss. The existence of a huge number of firms characterized by low levels of

[43] In the appendix we reported the efficiency estimates for each year in the period 2004-2012. See tables 9 and 10).

Figure 2: Comparison between ROA, ROE and profit efficiency



cost efficiency (witnessed by the difference between the average and the median) should mean that the morphology of the Italian asset management sector can be improved in terms of efficiency. We think that in the next future this system will undergo an important evolution quite similar to the reorganization of the bank system that occurred in the last decades.

This consideration is supported by the results discussed by previous literature about *X-efficiencies* of Italian financial intermediaries.

The study of Beccalli (2004) on a sample of investment companies over the period 1995-1998 showed that the index of cost efficiency was about $58,4\%$.

Another work of Anolli and Resti (1996) on Italian brokerage companies during the year 1993 revealed an efficiency level between 59% and 63%.

Both these results are in line with the estimates obtained with model B, the one that is based on a single *output* variable, the Asset Under Management (se table 4). This fact supports our idea that the Asset Under Management is one of the key variables that describes the production process of asset management companies and represents also an important item for the business strategies of the manager.

Previous literature focused its attention mainly on *cost efficiency*, but the following results suggest to pay attention also to *profit efficiency*.

Figure 2 shows the evolution of some traditional indicators of profitability, ROA (*return on assets*) and ROE (*return on equity*), referred to our dataset for the period 2004-2010 together with the index of profit efficiency obtained with model B. The patterns of these three indexes are quite the same. This means that it is really important to take into account income variables in the analysis of *X-efficiencies* and to provide a joint reading with cost variables. In the same way for the manager it is important to pursue both cost reduction and profit improvement because a constant growth of operating costs combined with the impossibility to adjust the *pricing* of the products may cause a strong income imbalance since revenues cannot cover costs.

5.2. Efficiency and firm size

The comparison between efficiency indexes estimated on the entire sample rather than on the restricted sample revealed conflicting results with respect to cost efficiency and profit efficiency. Since the reduced sample accounts only for those intermediaries associated with Assogestioni that are the most important in terms of size, in this section we will analyse the significance of the relationship between efficiency and AMC size. In order to investigate the effect of firm size on X-efficiencies, the sample was divided into four groups (quartiles) as a function of their total assets. The analysis was conducted on the entire sample, the population of traditional Italian active AMCs during the entire period under investigation. The data were estimated on the basis of model A and are related both to the indicator of cost efficiency than profit.

Table 8: Efficiency and size of AMCs (percent)

		Cost efficiency				
	Total asset*	average	median	σ	min	max
1 Group	5,212	83	86	10	62	95
2 Group	14,565	69	72	15	42	93
3 Group	43,340	59	57	14	39	83
4 Group	567,208	50	42	16	25	77
		Profit efficiency				
	Total asset*	average	median	σ	min	max
1 Group	5,212	39	75	9	21	60
2 Group	14,565	53	74	15	34	80
3 Group	43,340	64	74	14	42	91
4 Group	567,208	76	75	18	47	98

* this is the average value over the period 2004-2010 – mln of euros

Also this analysis showed a marked difference between asset management companies operating in our country because of the presence of a large number of small firms. The first three groups of table 8 show similar values for total assets , while this value is higher for the operators belonging to the fourth group. Strangely, small companies seem more virtuous than large operators, with reference to cost efficiency (which decreases with firm size), while the opposite result emerges with respect to profit efficiency. Also this case confirms the lack of homogeneity within the sample: the operators belonging to the first three groups show very similar efficiency indexes whose value is close to the average of each group; on the contrary, big firms show a high variability (measured by the standard deviation) within their category.

This result is also consistent with previous literature: Anolli and Resti (1996) prove that even if smaller brokerage companies seem less efficient, among the more efficient intermediaries there are some medium size firms (but their efficiency decrease with time).

Our analysis shows results very similar to Boscia (1997); also this author showed that the more efficient brokerage companies are the smaller ones (with an efficiency index equal to 81%), while bigger firms appear less efficient (with a value of about 73%).

6. Conclusions

This work takes inspiration from a previous study of Consob and Bank of Italy which aimed to identify the most important factors affecting Italian AMCs' efficiency. That work showed that the growth of these intermediaries was constrained by some elements among which the most important seemed the belonging to a banking or insurance group that constraints the distribution channel.

Our study is focused on *X- efficiencies* of Italian Asset Management Companies both in terms of costs and in terms of profits. We use financial accounts data and an econometric model based on efficient frontiers to estimate cost and profit efficiency.

Our models revealed that Italian AMCs show average *X- efficiencies* of $63,7\%$ in terms of costs and of $64,9\%$ in terms of profits. Moreover, the results about profit efficiency show that there is a strong competition between those intermediaries that can be defined as *price-takers* with respect to the pricing of their products (fees). On the contrary there are still significant room for improvement with respect to costs. Our models reveal that the majority of the AMCs of our sample is characterized by a low level of *cost efficiency* and only few intermediaries are really virtuous. This means that the manager's skill in optimizing the production process and in reducing costs are really important. According to previous literature focused on Italian intermediaries our models reveal that smaller AMCs are more efficient in terms of costs with respect to bigger operators (cost efficiency decreases with size), while they show low level of efficiency on terms of profits. This is consistent with the hypothesis that for Italian asset management companies it is really hard to adjust the pricing of their products.

May be we should expect that the Italian industry of AMCs, which is made up of a huge number of small firms (like the banking sector in the Nineties), will soon enter a reorganization process that will favour bigger operators.

As we stated in previous sections, the Italian asset management industry is concentrated in the hands of a few large players. Since 2007 it took place an important concentration process among the bigger operators of the financial industry and many AMCs were involved in M&A operations. These operations came as a consequence of the merge between two or more banking groups that took place 1-2 years before. In most cases the mergers only concerned *captive* AMCs: during the observed period we did not find and M&A operation between *captive* and *non captive* AMCs. Further research could analyse the opportunity of favouring the constitution of independents AMCs rather than the creation of a proprietary AMC within each banking group in order to offer branded products to retail investors. Within this work we analysed the effects of the

most important M&A operations that involved the bigger AMCs of our sample during the observed period (all these operations took place in 2007). Results are in line with our expectations: the efficiency level dos not vary very much in the period immediately following the aggregation, while it shows a slight but steady growing trend in the subsequent years. Therefore it seems interesting to pursue this issue in order to asses whether there is actually the possibility for AMCs to exploit scale economies by merging with other firms and cutting operational costs.

Another issue that is worth of further attention is the comparison with the level of efficiency of *captive* and *non captive* operators in order to discuss relative advantages. In our sample there are few independent firms so we cannot ran a statistical analysis. By the way, we tried to afford this issue. With respect to cost efficiency we saw that non captive AMCs are characterized by higher efficiency levels than the average of the entire sample so they are more able to reduce costs than other operators belonging to financial conglomerates. On the contrary, with respect to profits, it seems that these AMCs undergo the pricing choices of bigger firms; in fact, their efficiency is lower that the average of the entire sample.

Finally, we suggest another theme for further research; this is the international comparison. Given the high level of globalisation of this industry, it should be interesting to compare the efficiency of Italian asset management companies with similar firms operating in other countries; this comparison should also take into account differences between AMCs that operate in bank oriented systems and AMCs that operate in market oriented systems in order to discover factors that influence (in a positive way) the level of efficiency of intermediaries.

APPENDIX: Analysis of the robustness of the models proposed

In this section we report some data that describe the features of the econometric models presented in the work.

In particular, tables 9 and 10 present the main descriptive statistics of the results obtained using models A, B and C applied to the entire sample and the restricted sample.

Tables 11, 12 and 13 report the efficient frontier coefficients estimate (in case of costs) resulting from the econometric models presented in section 3.

The magnitude and sign of these coefficients represent the relationship (direct or inverse) that the model requires for the variables under observation, therefore, they offer some clues for a financial and economic interpretation.

All estimated coefficients are statistically significant (except those relating to financial capital K). The coefficient related to *output* (indicated by the variable Y) is positive and statistically significant and this is consistent with reality: the higher the level of *output* quantities, the higher the total cost. In fact, the coefficient of each *output* expresses the relationship that an increase in the production of a given activity has on the formation of total costs.

Regarding the value of each *output* squared, the relative coefficient is always positive and indicates that an increase in its level results in a more than proportional increase in total costs.

The cross-products between the *output* variables (only in model A) indicate the opportunity to exploit economies of scope. However in our model assume a negative sign.

The *input* price value (denoted by the variable w) is positive, but barely significant. The constant term (intercept), which represents the amount of fixed costs, assumes a positive sign and is statistically significant.

Almost all the estimated parameters have the expected signs and a good statistical significance, therefore the model used for the estimation of *X-efficiency* is economically and statistically robust.

Table 9: X-efficiencies estimates over the sample of AMCs in the period 2004-2010. Entire sample.

Model A

X-eff	AMC	Average	Median	Std dev	Min	Max
Total	80	0,592	0,665	0,188	0,250	0,953
X-eff	AMC	Average	Median	Stddev	Min	Max
2004	70	0,563	0,647	0,180	0,237	0,924
2005	74	0,563	0,650	0,182	0,241	0,925
2006	71	0,563	0,651	0,184	0,245	0,926
2007	62	0,603	0,681	0,189	0,254	0,954
2008	60	0,618	0,684	0,183	0,331	0,954
2009	57	0,624	0,676	0,179	0,336	0,955
2010	57	0,624	0.676	0.179	0.336	0.955

Model C

X-eff	AMC	Average	Median	Std dev	Min	Max
Total	80	0,677	0,765	0,164	0,247	0,964
X-eff	AMC	Average	Median	Std dev	Min	Max
2004	70	0,659	0,746	0,162	0,243	0,963
2005	74	0,657	0,730	0,162	0,244	0,964
2006	71	0,654	0,725	0,164	0,246	0,964
2007	66	0,657	0,742	0,167	0,247	0,964
2008	62	0,677	0,763	0,167	0,249	0,964
2009	60	0,708	0,764	0,146	0,355	0,964
2010	56	0,707	0,765	0,148	0,357	0,964

Table 10: X-efficiencies estimates over the sample of AMCs in the period 2004-2010. Restricted sample.

Model A

X-eff	AMC	Average	Median	Std dev	Min	Max
Total	54	0,723	0,787	0,151	0,296	0,964
X-eff	AMC	Average	Median	Std dev	Min	Max
2004	40	0,661	0,708	0,162	0,255	0,957
2005	39	0,658	0,703	0,157	0,267	0,943
2006	45	0,679	0,712	0,154	0,280	0,960
2007	42	0,694	0,719	0,152	0,292	0,962
2008	43	0,734	0,793	0,147	0,305	0,963
2009	43	0,763	0,826	0,128	0,533	0,964
2010	40	0.772	0.834	0.128	0.544	0.966

Model B

X-eff	AMC	Average	Median	Std dev	Min	Max
Total	54	0,637	0,663	0,171	0,349	0,954
X-eff	AMC	Average	Median	Std dev	Min	Max
2004	40	0,641	0,686	0,156	0,351	0,958
2005	39	0,625	0,671	0,64	0,341	0,957
2006	45	0,634	0,681	0,167	0,332	0,955
2007	42	0,637	0,675	0,165	0,323	0,954
2008	43	0,658	0,700	0,173	0,313	0,953
2009	43	0,643	0,690	0,178	0,304	0,952
2010	40	0.643	0.685	0.185	0.295	0.951

Model C

X-eff	AMC	Average	Median	Std dev	Min	Max
Total	54	0,341	0,402	0,251	0,122	0,938
X-eff	AMC	Average	Median	Std dev	Min	Max
2004	40	0,331	0,401	0,213	0,138	0,938
2005	39	0,311	0,374	0,203	0,134	0,814
2006	45	0,321	0,386	0,235	0,131	0,936
2007	42	0,319	0,389	0,232	0,128	0,935
2008	43	0,343	0,443	0,249	0,125	0,935
2009	43	0,345	0,447	0,247	0,121	0,934
2010	40	0.338	0.438	0.249	0.118	0.933

Table 11: Stochastic frontier parameters estimated with model A

Model A

Variable	coefficient	standard-error	t-ratio
interc	0.041	1.472	0.028
Alpha(Y1)	1.069	0.175	6.123
Beta(W1)	0.257	0.313	0.823
Beta(W2)	0.104	0.117	0.886
Delta(Y1*Y1)	0.112	0.007	15.425
Lambda(W1*W1)	0.207	0.024	8.801
Lambda(W1*W2)	-0.087	0.008	-11.243
Lambda(W2*W2)	0.109	0.006	18.777
Rho(W1*Y1)	0.002	0.015	0.135
Rho(W2*Y1)	0.05	0.007	7.484
Xi(K)	0.211	0.319	0.663
Tao(K*K)	0.229	0.046	4.956
BetaK(W1*K)	-0.013	0.041	-0.322
BetaK(W2*K)	-0.005	0.014	-0.316
AlphaK(K*Y1)	-0.182	0.021	-8.506
sigma-squared	0.275	0.065	4.254
gamma	0.89	0.029	30.469
log likelihood function =			26.962
LR test of the one-sided error =			168.108

Table 12: Stochastic frontier parameters estimated with model B

Model B

Variable	coefficient	standard-error	t-ratio
interc	-3.19	2.559	-1.246
Alpha(Y1)	0.31	0.238	1.299
Beta(W1)	-0.65	0.432	-1.506
Beta(W2)	0.239	0.156	1.526
Delta(Y1*Y1)	0.031	0.019	1.641
Lambda(W1*W1)	0.292	0.024	11.915
Lambda(W1*W2)	-0.114	0.011	-10.215
Lambda(W2*W2)	0.132	0.008	16.294
Rho(W1*Y1)	-0.046	0.019	-2.466
Rho(W2*Y1)	0.03	0.012	2.483
Xi(K)	1.599	0.433	3.694
Tao(K*K)	0.012	0.059	0.202
BetaK(W1*K)	0.166	0.056	2.98
BetaK(W2*K)	-0.008	0.021	-0.397
AlphaK(K*Y1)	-0.07	0.026	-2.688
sigma-squared	1.205	0.288	4.184
gamma	0.956	0.012	80.244
log likelihood function =			-78,420
LR test of the one-sided error =			255,707

Table 13: Stochastic frontier parameters estimated with model C

Model C

Variable	coefficient	standard-error	t-ratio
interc	2.146	1.03	2.084
Alpha(Y1)	0.099	0.039	2.507
Alpha(Y2)	0.882	0.188	4.69
Alpha(Y3)	0.082	0.045	1.839
Beta(W1)	0.363	0.285	1.273
Beta(W2)	0.114	0.124	0.92
Delta(Y1*Y1)	0.03	0.004	7.733
Delta(Y1*Y2)	-0.028	0.006	-4.743
Delta(Y1*Y3)	-0.001	0.001	-0.997
Delta(Y2*Y2)	0.11	0.021	5.333
Delta(Y2*Y3)	-0.014	0.006	-2.53
Delta(Y3*Y3)	0.014	0.004	3.641
Lambda(W1*W1)	0.195	0.021	9.07
Lambda(W1*W2)	-0.082	0.008	-10.006
Lambda(W2*W2)	0.101	0.006	16.018
Rho(W1*Y1)	-0.001	0.006	-0.022
Rho(W1*Y2)	-0.007	0.013	-0.572
Rho(W1*Y3)	-0.002	0.007	-0.291
Rho(W2*Y1)	-0.001	0.003	-0.334
Rho(W2*Y2)	0.048	0.009	5.226
Rho(W2*Y3)	-0.001	0.003	-0.479
Xi(K)	-0.123	0.263	-0.469
Tao(K*K)	0.173	0.05	3.426
BetaK(W1*K)	-0.005	0.04	-0.135
BetaK(W2*K)	-0.009	0.015	-0.581
AlphaK(K*Y1)	0.011	0.008	1.474
AlphaK(K*Y2)	-0.127	0.025	-5.009
AlphaK(K*Y3)	0.005	0.008	0.652
sigma-squared	0.163	0.039	4.165
gamma	0,871	0,031	27,903
eta	0.865	0.037	23.128
log likelihood function =			79.028
LR test of the one-sided error =			124.86

Aigner, D., Lovell, C., Schmidt, P., 1977. Formulation and estimation of stochastic frontier production function models. Journal of Econometrics (6), 21 – 37.

Amel, D., 2004. Consolidation and efficiency in the financial sector: A review of the international evidence. Journal of Banking and Finance 28 (10), 2493 – 2519.

Anolli, M., Resti, A., 1996. L'efficienza nell'industria dei servizi mobiliari. Il caso delle SIM di negoziazione. Il Mulino, Bologna.

Banca d'Italia, 2009. Istruzioni per la redazione dei bilanci degli intermediari finanziari iscritti nell'elenco speciale, degli IMEL, delle SGR e delle SIM.

Banca d'Italia, 2011. Relazione per l'anno 2010.

Basili, M., Fontini, F., 2007. Cost efficiency of italian investment firms. Studi e Note di Economia 12 (2), 171 – 181.

Battese, G., Coelli, T., 1995. A model for technical inefficiency effect in a stochastic frontier production function for panel data. Empirical Economics (20), 325 – 332.

Bauer, P., Berger, A., Ferrier, G., Humphrey, D., 1997. Consistency conditions for regulatory analysis of financial institutions, a comparison of frontier efficiency methods. Finance and Economics Discussion Series, Federal Reserve Board (50).

Beccalli, E., 2004. Cross-country comparisons of efficiency: Evidence from the uk and italian investment firms. Journal of Banking and Finance 28 (6), 1363 – 1383.

Berger, A., DeYoung, R., Genay, H., Udell, G., 2000. Globalization of financial institutions:comments and discussion. evidence from cross-border banking performance. Brookings-Wharton Papers on Financial Services, 23 – 120.

Berger, A., Humphrey, D., 1991. The dominance of inefficiencies over scale and product mix economies in banking. Journal of Monetary Economics (28), 117 – 148.

Berger, A. N., Humphrey, D. B., April 1997. Efficiency of financial institutions: International survey and directions for future research. European Journal of Operational Research 98 (2), 175 – 212.

Berger, A. N., Mester, L. J., 1997. Inside the black box: What explains differences in the efficiencies of financial institutions?. Journal of Banking and Finance 21 (7), 895 – 947.

Berkowitz, M. K., Qiu, J., 2003. Ownership, risk and performance of mutual fund management companies. Journal of Economics and Business 55 (2), 109 – 134.

Bianchi, M., Miele, M., Febbraio 2011. I fondi comuni aperti in italia: performance delle società di gestione del risparmio. Tech. rep., Temi di discussione. Banca d'Italia.

Bolt, W., Humphrey, D., 2010. Bank competition efficiency in europe: A frontier approach. Journal of Banking and Finance 34 (8), 1808 – 1817.

Bonin, J. P., Hasan, I., Wachtel, P., 2005. Bank performance, efficiency and ownership in transition countries. Journal of Banking and Finance 29 (1), 31 – 53.

Bos, J. W. B., Schmiedel, H., 2007. Is there a single frontier in a single european banking market? Journal of Banking and Finance 31 (7), 2081 – 2102.

Boscia, V., 1997. An analysis of the impact of EU investment services directive on sim's.

Cihak, M., Hesse, H., 2007. Cooperative banks and financial stability., working Paper.

Coelli, T., 1992. A computer program for frontier production function estimation - frontier, version 2.0. Economic Letters (39), 29 – 32.

Cole, R. A., Mehran, H., 1998. The Effects of Changes in Ownership Structure on Performance: Evidence from the Thrift Industry. Journal of Financial Economics, Vol. 50, 1998.

Consob, 2008. Rapporto del gruppo di lavoro sui fondi comuni italiani: Fondi comuni italiani: situazione attuale e possibili linee di intervento. Tech. rep., Consob.

De Siano, R., Jan 2002. Approccio stocastico alla frontiera efficiente del sistema bancario italiano: Una stima dell'inefficienza tecnica e delle sue determinanti. Tech. rep., D.E.S. (Department of Economic Studies), University of Naples ""Parthenope"", Italy.

Dietsch, M., Lozano-Vivas, A., 2000. How the environment determines banking efficiency: A comparison between french and spanish industries. Journal of Banking and Finance 24 (6), 985 – 1004.

Esho, N., 2001. The determinants of cost efficiency in cooperative financial institutions: Australian evidence. Journal of Banking and Finance 25 (5), 941 – 964.

Ferris, S. P., Yan, X. S., 2009. Agency costs, governance, and organizational forms: Evidence from the mutual fund industry. Journal of Banking and Finance 33 (4), 619 – 626.

Garcia-Marco, T., Robles-Fernandez, M. D., 2008. Risk-taking behaviour and ownership in the banking industry: The spanish evidence. Journal of Economics and Business 60 (4), 332 – 354.

Geretto, E., Morassut, R., 2010. La valutazione delle performance economico - operative delle società di gestione del risparmio. Banche e banchieri (6), 452 – 470.

Hannan, T. H., Hanweck, G. A., 1988. Bank insolvency risk and the market for large certificates of deposit. Journal of Money, Credit, and Banking 20 (2), 203 – 211.

Havrylchyk, O., 2006a. Efficiency of the polish banking industry: Foreign versus domestic banks. Journal of Banking and Finance 30 (7), 1975 – 1996.

Havrylchyk, O., 2006b. Efficiency of the polish banking industry: Foreign versus domestic banks. Journal of Banking and Finance 7 (30), 1975 – 1996.

Iannotta, G., Nocera, G., Sironi, A., 2007. Ownership structure, risk and performance in the european banking industry. Journal of Banking and Finance 31 (7), 2127 – 2149.

Jensen, M. C., Meckling, W. H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3 (4), 305 – 360.

Kauko, K., 2009. Managers and efficiency in banking. Journal of Banking and Finance 33 (3), 546 – 556.

Konishi, M., Yasuda, Y., 2004. Factors affecting bank risk taking: Evidence from japan. Journal of Banking and Finance 28 (1), 215 – 232.

Lensink, R., Meesters, A., Naaborg, I., 2008. Bank efficiency and foreign ownership: Do good institutions matter? Journal of Banking and Finance 32 (5), 834 – 844.

Liu, H., Molyneux, P., Wilson, J. O., 2010. Competition and stability in european banking: A regional analysis. SSRN eLibrary.

Molyneux, P., Altunbas, Y., Gardener, E., 1996. Efficiency in European banking. John Wiley and Sons, Chichester.

Otten, R., Schweitzer, M., 2006. A comparison between the european and the u.s. mutual fund industry. Managerial Finance 28 (1).

Resti, A., 1997. Evaluating the cost-efficiency of the italian banking system: what can be learned from the joint application of parametric and non-parametric techniques. Journal of Banking and Finance (21), 221 – 250.

Riahi-Belkaoui, A., Pavlik, E., 1991. Asset management performance and reputation building for large u.s. firms. British Journal of Management (1), 231 – 238.

Scherer, B., 2010. A note on asset management and market risk. Financial Markets and Portfolio Management 24 (3), 309 – 320.

Spong, K., Sullivan, R., DeYoung, R., 1995. What make a bank efficient? a look at financila characteristics and bank management and ownership structure. Tech. rep., Financial Industry Perspective, Federal Reserve Bank of Kansas City.

Varian, H., 1990. Intermediate Economics, A Modern Approach. Second edition, Norton, New York.