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On the robustness of Fama and French Model: evidence from Italy

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Abstract

The purpose of this the article is to investigate if the Fama and French three-factor model is able to explain the variations in stock returns in Italian market. We choose Italian market as it is a weak equity market, characterized by small listed firms. Asset pricing literature believes that risk factors additional to beta are as more relevant as the market are smaller one, as in these contexts, beta differences are not able to explain return differences. We choose to achieve this aim through the tool of the literature review. In the sample of studies investigated, the relation between size and yield holds, while the empirical evidence related to the book-to-market ratio are mixed.

JEL classification numbers: G11, G12

Keywords: Fama and French model, Market risk, Stock returns, Italy, Financial markets

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1 Introduction

In 1993 Fama and French developed a three-factor model in response to accumulating empirical evidence that the CAPM performed poorly in explaining realized returns. The three-factor model includes two additional risk factors (*size* and *book-to-market*) to *beta* on the basis of empirical researches conducted by them on the US Market.

Despite the fact that the three-factor model is a benchmark in the asset pricing theory, few empirical researches have been conducted on market other than US.

Regarding small markets, few papers have been published, even if, according to the asset pricing literature, small stocks have higher beta, but differences in beta are not able to explain alone the returns differences.

Italian market is a *weak* equity market characterized by small quoted firms. Concerning the domestic market, only recently some surveys have been carried out on the empirical relevance of Fama and French three-factor model.

The purpose of this the article is to investigate if the Fama and French three-factor model is able to explain the variations in stock returns in Italian market. We choose to achieve this aim through the tool of the literature review.

In the sample of studies investigated, the relation between size and yield holds, meaning that the Italian investors seem to consider this factor in their risk analysis, while the empirical evidence related to the book-to-market ratio are mixed.

The remainder of the paper is as follows[3]. Section 2 briefly discusses the relevant literature on the Fama and French three-factor model; section 3 describes research hypotheses and research methodology. Section 4 describes the main features of the Italian market equity. Section 5 analyzes the main empirical

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[3] The contribution of the authors in this paper is presented as follows:
Sections 1; 2; 5 are credited to Antonella Silvestri.
Sections 3; 4; 6 are credited to Stefania Veltri.

researches extant testing the Fama and French model on the Italian context. Finally, Section 6 provides a critical analysis and interpretations of the main findings emerging by the review.

2 The Fama and French three-factor model

The main reference model that has theorized the risk-yield relationship is the Capital Asset Pricing Model (CAPM) elaborated independently by Sharpe [48] and Lintner [40]. The CAPM establishes a connection between the performance of a share and its riskiness, measured by a sole risk factor, known as *beta* (β), meaning the degree to which a stock's return covaries with the return on the market as a whole. In equilibrium the expected return of each security is measured by the risk free rate plus a premium for the additional risk proportional to the marginal contribution of the security to the risk of the market portfolio (*systematic risk*). This contribution measures the sensitivity of the security *ith* to the variations of the market portfolio through the ratio of the co-variance of the security and the market and the variance of the market.

The CAPM is based on a assumed efficient market in which there are many investors, each having the same information and expectations with respect to security. They are also risk-adverse, preferring higher returns and lower risks.
According to the CAPM, only systematic, non-diversifiable risk matters for investors, that can potentially eliminate the firm-specific risk by conveniently diversifying their stock portfolio [12].

The debate on the validity of the CAPM is not yet been solved [30]. By considering the empirical researches addressed to test the CAPM validity, Kothari et al. [33] have found a significant positive relationship between average return and *beta*. Researches carried out within the Italian context found mixed results. Cristini [22], Capparelli and Viviani [15], Attanasio and Rigotti [5] reject *beta* and CAPM, while Caprio [16] and Lamonica [37] confirm their validity.

In 1993, Fama and French [26], based on a series of empirical results which highlighted the inadequacy of the CAPM, perfected a multidimensional model of risk (*three-factor model*) which takes into consideration, as well as the market *beta*, the other two variables, *size* and *book-to-market* (BV/MV) in explaining share performance. These last two variables have been selected as proxy of the market risk considering the results of a previous research [25] carried out on the shares of all companies, except financial ones, listed to the US NYSE, AMEX and NASDAQ stock exchanges for the 1962-1989 period. The 1992 Fama and French research, taking into consideration as risk proxies the *size* [7], *leverage*[11], *book-to-market* ratio [18, 46, 49], *earnings-price* ratio [6, 9], provided evidence that only the variables *size* and *book-to-market* ratio were able to explain the stock returns' variations.

Despite the fact that the three-factor model is a benchmark in the asset pricing theory, few empirical researches have been conducted on market other than US. Therefore, Fama and French model is still the object of empirical tests, aimed at ascertaining whether results that hold for the American market are valid also in different contexts and periods [1, 10, 29]. Among the countries investigated we can quote, for instance, Japan [18, 19, 23] UK [43, 50]; Australia [24, 29]; Sweden [4]; India [20]; Hong Kong [36]; Canada [34]; France, Germany and UK [42].

Summarizing, the risk proxies included in the Fama and French model are the market *beta*, the *size* and the *book-to-market* ratio. Sharpe, in 1964 [48], formalized the positive relation between *beta* and the expected returns; Banz, in 1981 [7], provide evidence of the negative relation between *size* and the expected returns; Fama and French, in 1998 [28], found evidence of a positive relation between expected returns and *book-to-market* ratio.

The economic reason to include *beta* as risk proxy is due to the key role played by beta in multidimensional models of risk assessment. Even if beta would have no effects on share returns, from a statistical point of view, to exclude it

would cause the likely probability to have biased estimated coefficients of the OLS regressions [11].

The debate on the role of *size* as a risk factor [7] finds its most important motivation in the observation that small firm's shares give greater returns than big firms do. One of the most persuasive explanations of the phenomenon, confirmed in different territorial contexts, is that the operators can take into consideration less consistent and less accurate flow of information when dealing with smaller firms. Financial markets translate this high level of uncertainty into a higher risk and, therefore, into higher demanded returns [17].

As regards the *book-to-market* effect, the most persuasive explanation of its relationship with stock returns is that investors overvalue growth opportunities. Firms with a low *book-to-market* ratio are considered by investors firms with high growth opportunities (*growth stocks*) and high earnings. On the contrary, firms with a high *book-to-market* ratio are undervalued by market (*value stocks*), who asks for a higher risk premium to hold this kind of stock in their portfolio [28].

3 Research question and methodology

The investigated literature underlines the existence of a portion of unsystematic risk that the investors cannot manage by opportunely diversifying their portfolio. In other words, even after the diversification of their portfolio, investors still have to bear a non-diversifiable firm-specific risk, that explain a significant portion of stock returns. Therefore, we share the idea that the market risk is not explainable only by the beta factor (*systematic risk* or *undiversifiable risk*), but that exist other firm specific risk factors which have a strong explicative power of the stock returns variations.

Among the others different models beyond CAPM, we share the Fama and French model [27] for two main reasons. Firstly, because it is a rigorous model

which derives risk proxies running cross-section regression which tested the fundamental efficiency of the US equities market on a long run series of returns and fundamentals. Secondly, for the existence of various empirical studies which have proved its validity worldwide [2, 17, 28, 42].

In this paper the authors want to verify if Fama and French model holds on the Italian market. The choice of Italian market derives from its main peculiarity as it is composed mainly by small companies. In fact, as explained by the asset pricing literature, stock of small companies appear to have risks not captured by CAPM [1, 12]. Therefore, it appear interesting to carry out the Fama and French model on a context scarcely investigated under this profile, often neglected by mainstream economists, because they are relatively much smaller and because few have long ready-.to-use time series.

On the basis of the above considerations we posit the following research question:

"Is the Fama and French three-factor model able to explain the variations in stock returns in Italian market?"

In order to answer to the RQ we decide to arrange a literature review of the main existing empirical studies addressed to test the three- factor model in Italian context.

The method used in the present research is a literature review using both *narrative* and *vote-counting* method. In detail, *narrative* reviews are literature reviews that attempt to make sense of past finds verbally or conceptually; the *vote-counting* method refers to the tabulation of significant and non-significant finds [31, 38]. The aim of this literature review is to produce an interpretative synthesis of the finding's studies addressed to facilitate a fuller understanding of the phenomenon under consideration [47]. In detail we followed these main steps in carrying out our research:

I) Search for relevant studies;

II) Criteria for relevance;

III) Characteristics of selected studies.

In the first phase, the collection of pertinent articles took place using the metabib research engine, which includes many databases, such as EBSCO (Business Source Premier), Emeroteca Virtuale, ISI web of Knowledge, Jstor, etc. The key words put in the databases were the following: “Fama and French model” and “Italian context”; a parallel literature search was carried out via internet on Google Scholar, which provides additional references of scientific articles, supplying also references relative to papers presented to international conferences. In order to mitigate the publication bias limit, particularly acute in accounting literature [39, 45], also those unpublished findings have been included, as they can be equally as valuable as the published ones [41]. Then journal articles and papers have been retrieved. The bibliographical references of the articles retrieved have been examined to obtain additional references. The same kind of literature search has been carried out manually, in the scientific economic national and international reviews on accounting and finance journals of the university library.

In second phase, we decided the criteria to select the studies. The literature review took into consideration only quantitative empirical studies that complied with the following rules: 1) the stock price or stocks returns as the dependent variable; 2) the Fama and French as reference model; 3) the use of regression analysis to test quantitatively the association of stock returns and independent variables; 4) the Italian context as reference context. Because of the application of the inclusion criteria, the final sample includes 7 empirical studies.

In the third phase, we have listed in a table the most important study characteristics such as authors, date, sample, model employed and results.

4 The main features of Italian context

Italy is a law country, whose accounting system is conservative and tax

driven. The dimensions of Italian market, in equity terms are small: if data are deflated by the size of population or economy, it is nearly half the size of Germany, 1/3 of US and 1/4 of UK, and the weight of debt on equity is very high, nearly twice as much as the US debt [44].

In a recent work, Nobes and Parker [44] reviewed the traditional classification of Italy as European Continental market, developing a new kind of classification that, paying more attention to important discriminating features, included Italy in the *weak equity markets*, together with Belgium, French, Germany, Austria, and Japan. Conversely, the *strong equity markets* are countries such as UK, USA, Australia, Ireland, Holland.

Italian market is a less developed one and plays a minor role than the US and the British markets do [3]. Nowadays, even if grown up in the last decades, the number of listed firms remains exiguous with respect the benchmark markets.
The Italian manufacturing system is characterized, with few exceptions, by small and medium sized firms, in which banks take an active role as credit lender. Listed firms are mainly family owned, with a high ownership concentration.

One preliminary significant difference of the Italian market is that it is *bank-orientated*, whereas the US market is rather decisively *market-orientated*, allowing firms to have easier access to alternative sources of funding [12]. Further, the Italian regulation system has a legislative matrix, whereas in the Anglo-Saxon markets accounting regulations are drawn up by experts in the sector; moreover, whilst in the Italian market we see a substantial connection between ownership and control of firms, the Anglo-Saxon markets are characterized by a wider ownership of the share capital [21]. Further peculiarities of the Italian market are identifiable in the high concentration of shareholders and the limited diffusion of a managerial culture amongst investors [12].

The listed characteristics, together with the scarcity of empirical studies in the Italian context, have encouraged the authors to investigate the validity of the Fama and French model in this market.

The choice to analyze a single country helps avoid the problems and biases that are likely to arise from any comparison of countries having a different institutional environment [32].

5 The Fama and French model: empirical evidence from Italian context

In Italy, as in other European countries [42], very little evidence has been published on the Fama and French three-factor model as they are smaller markets with shorter historical time series of financial data, not often ready-to-use with respect to the US market.

One of the main criticism to the Fama and French model was that the model was developed in US market, so the findings may arguable be relevant only in US setting. Notwithstanding Fama and French, in a following research [28], found evidence that the model holds also in an international context by using data from several international markets, it has been underlined that their data set was dominated by a small number of large firms. Therefore, the Italian context, for its peculiar features (small firms), could be an interesting setting to investigate.

So far the main published Italian studies on this topics are the following: Barontini [8], Beltratti and Di Tria [10]; Bruni et al. [14], Brighi and D'Addona [13], Alesii [2], Aleati et. al.[1], Cavaliere and Costa [17].
All studies consider all listed companies in Milan Stock Exchange.

The Barontini's study [8] is focused on the period 1950-1995. In this study the author provide evidence of a clear relationship between stock returns and respectively earning/price, dividend yield and cash flow yield. Conversely, are not found positive evidence of statistically significant relationship between stock returns and respectively beta, size and book-to-market. Summarizing, Fama and French model seems do not hold in Italian context; the author himself justifies

these results assigning the responsibility to the use of non adequate econometric methods.

The research of Cavaliere and Costa [17] is focused on the period 1986-1995 and reduce Fama and French model to just two factors: *beta* and *size*. The study found that the two-factor model used in the work seems suggest that the return generating process cannot be properly described by a single-factor, CAPM like model, but it is needed a multifactor pricing models which explicitly consider the firm size among the risk factors.

The article of Aleati et al. [1] investigates the period 1981-1993. Unlike Barontini [8], this research has been conducted on individual security returns rather than on returns of groups of securities, as is often done in the empirical asset pricing literature. This choice is justified by the small number of listed securities which distinguishes the Italian Stock Market. The research aim is whether the influential role of the size and book-to-market equity factors in explaining average stock returns can stand up well when competing with some macroeconomic factors (market index, changes in oil prices, default premium, changes in interest rates). In the choice of macroeconomic variables the authors considered also country specific ones. Results for the Italian market reveal that both macroeconomic variables and equity risk factors are relevant for pricing stock returns. In detail, with reference to the Fama and French risk factors, the study show that beta factor significantly and systematically explain Italian average stock returns and this result is robust across different econometric methods used. On the contrary, the significance of the size and book-to-market equity factors, seem related to the estimation procedure. Summarizing, the research findings suggest that both size and book-to-market may have a role for pricing Italian stocks, but they do not subsume the relevance of other risk factors.

Beltratti and Di Tria [10] research investigates the period 1990-2000. The study compares the performance of four models on Italian Stock Market: 1) CAPM; 2) extended Fama and French model including the *momentum* portfolio;

3) multi-factor model including sectors; 4) multi-factor model including the changes in short-term interest rates. The findings depend on the typology of econometric test utilized: time-series or cross-section. In fact, while the Fama and French model behave rather well in time series test, in the cross-section regressions no coefficient is significant. The authors explain the sensitivity of the results to the type of statistical analysis with the unstable history of the Italian economy in the sample period considered, due to the large negative shocks to returns that happened in Italian economy from the mid-1990s. In fact, unlike cross-sectional analysis, time-series analysis is less sensitive to shocks to returns as both dependent variables and independent variables are subject to the same shocks to returns, and therefore the estimated coefficients are unbiased.

The research of Bruni et al. [14] test CAPM model conjointly with Fama and French model. Coherently with Fama and French, in this research the authors divided the security sample in four portfolios on the basis of size, than for each group derives four portfolios on the basis of book value/market value, obtaining sixteen portfolios. The authors found a very weak relation between beta and stock returns; conversely, referring Fama and French model provide evidence of a inverse relationship between size and stock returns, while do not found linear relationship between book-to-market and stock returns. The study of Alesii [2] adopts a predictive regression approach in order to test fundamental efficiency of the Italian equities market on a new long run (1913 to 1999) time-series of returns and fundamentals (dividend price, earnings price and price to book).

The author tests the predictability of these fundamentals by univariate and vector auto regression by Monte Carlo and bootstrapping simulation methods. Results show some predictability of stock market returns using fundamentals, and the price to book ratio seems to have the most predictive ability. Brighi and D'Addona [13] investigate Fama and French model in Italian Stock market including the *momentum* factor using the generalized methods of moments (GMM).

The authors find that the size factor is related with stock returns for the Italian investors, while they do not found evidence of a relation between book-to-market ratio and stock returns. Finally, the inclusion of the *momentum* factor in Fama and French model does not improve the explanation of the stock returns variations. Table 1 summarizes the main features of the investigate studies.

Table 1: Main features of the investigated studies

Authors/ Year	Sample/Period	Models	Results
Barontini (1997)	All companies listed at the Italian Stock Exchange 1950-1995	Fama and French model modified to include these fundamentals: E/P (EPS/P); Dividend Yield (D/P); Cash Flow yield (CF/P).	It is not verified the relation between beta, size and book-to-market from one hand and stock returns from other hand.
Cavaliere and Costa (1999)	All companies listed at the Italian Stock Exchange 1986-1995	Two-factor model inclusive of beta and size factors.	It is found a relation between beta and size from one hand and stock returns from other hand.
Aleati, Gottardo and Murgia (2000)	All companies listed at the Italian Stock Exchange 1981-1993	Fama and French model modified to include macroeconomic factors (market index, changes in oil prices, default premium, changes in interest rates).	The relationship between beta and stock returns is robust to the different econometric procedures. The relationship between size and book-to-market from one hand and stock returns from the other hand is dependent of estimation procedures.
Beltratti and Di Tria (2002)	All companies listed at the Italian Stock Exchange 1990-2000	Four models tested: 1) CAPM; 2) extended Fama and French model including the momentum portfolio; 3) multi-factor model including sectors; 4) multi-factor model including the changes in short-term interest rates.	The findings of Fama and French extended model (model 2) are sensitive to the type of statistical analysis: the model holds when time series are employed, while no coefficient is significant when cross-sectional regressions are used.
Bruni, Campisi and Rossi (2006)	All companies listed at the Italian Stock Exchange 1973-2005 for CAPM model 1989 -2004 for the Fama and French model	Two model tested: 1) CAPM model; 2) Fama and French model.	It is confirmed the relation between size and stock returns; it is not confirmed the relation between book-to-market and stock returns.
Alesii (2006)	All companies listed at the Italian Stock Exchange (1913-1999)	A three-factor model including dividend price, earnings price and price to book to test the predictive ability of these fundamentals.	The price to book ratio seems to have the most predictive ability of future returns.
Brighi and D'Addona (2007)	All companies listed at the Italian Stock Exchange (1986-2002)	Two model tested: 1) Fama and French model; 2) Fama and French model extended to include the momentum factor.	It is confirmed the relation between size and stock returns; it is not confirmed the relation between book-to-market and stock returns.

6 Concluding considerations

In this paper we have investigated the three-factor Fama and French model applied to the Italian Stock Market by a literature review of the main extant empirical researches on this context.

All the studies analyzed focused on Italian Stock Market. This market is characterized mainly by small quoted firms. Small stocks have higher beta but beta differences are not enough to explain returns differences [12]. Therefore the above studies investigated how these differences could be explained by other factors employing the Fama and French model or a multi-factor model which considers at least one of the equity factors included in the Fama and French model (size, book-to-market).

The first observation that we can draw from our sample of studies is the high level of heterogeneity with reference to: 1) period examined; 2) model employed; 3) econometric method employed.

With reference to the period, it has to be underlined that the time-periods investigated by different studies are very heterogeneous, going to a minimum of 9 years [17] to a maximum of 86 years [2]. This element reflects on the number of observations considered in different studies; notwithstanding all studies consider the all Italian listed firms, the samples analyzed are really different. In turn, this has also a reflection on the modalities of conducting the research, as the division of the entire sample in subsamples (portfolios), as in the Fama and French research [26] is not possible with a small number of observations [1]. Moreover, considering different time-periods implies that the data analyzed did not suffer by the same economic shocks.

Then, we can notice the same differences about the models employed in different studies. In fact, each author modifies the model in accordance with the research aim. For instance, Aleati et al. [1] in order to verify if the influential role of the size and book-to-market equity factors in explaining average stock returns can stand up well when competing with some macroeconomic factors, used a

modified Fama and French model which included these. Among the studies analyzed, two research employed a general multifactor model [2, 8], the majority of the authors used a more complex Fama and French model that is adding other factors (i.e. momentum factor, sector, etc.) except for Bruni et al. [14] and Cavaliere and Costa [17]. Only two studies compare Fama and French model with CAPM model.

As regard econometric methods, authors themselves assign a great relevance to this element, both applying different methods which conduct to different results and attributing to the econometric methods the failure or the success in providing evidence of the model applied [1, 8, 10]. In detail the study of Beltratti and Di Tria [10] found opposite evidence according to use cross-sectional rather than time-series regression. Moreover, the more recent research use more sophisticated econometric models with obvious impact on the estimated coefficients.

All these elements contribute to explain the mixed results deriving from the empirical literature examined.

As regard to the risk factor size and book-to- market, only the size factor is undoubtedly related to the stock returns, while for book-to-market ratio there are mixed evidences of its significance.

In detail, the equity factor size seems to be the explanation factor, jointly with beta, of the stock returns variations. In fact, it is confirmed the relation between size and stock returns in the studies of Cavaliere and Costa [17], Bruni et al. [14], Brighi and D'Addona [13]; the relation is confirmed as well if are considered more advanced estimation procedures [1, 10]. The luck of significance of the relationship investigated in the study of Barontini [8] could be related to the estimation procedures used.

These findings are consistent with our research hypothesis that is that Stock Market characterized by small quoted firms recorded higher beta, but beta differences are not able to explain returns differences.

The book-to-market ratio in the Fama and French [25] empirical evidence

was the most important firm-specific risk factor in explaining stock returns' variations. This relevance has been confirmed in the majority of empirical researches focused on the US context [33].

In our sample, we found mixed evidence as regard the existence of a relationship between book-to-market and stock returns variations. In detail, some studies (Barontini [8, 13, 14] do not found evidence of the book-to market factor relevance; while other studies [1, 2, 10] found it.

The probably explanation of this puzzling result is that the market's expectations of future growth can be proxied by various measures of profitability to price such as, according to the Gordon's formula, dividend to price ratio (D/P), cash-to-price ratio (C/P) and earning-to-price ratio (E/P).

As suggested by Lakonish et al. [35] and Fama e French [28], to estimate stocks value researches can choose among their regressors the ratios BV/MV, D/P, E/P and C/P indifferently. Therefore, further researches are needed to prove the significance of book-to-market ratio in measuring stock value in the Italian context.

Of course, the critical considerations about the studies surveyed have to be considered carefully for several reasons. Firstly, for the exiguous number of examined studies and for the limited span of time (1997-2007). Secondly, for the main features of the Italian market, that is characterized by small quoted firms and shorter time series ready-to-use data with reference to the US and the UK benchmark market. Finally, because of our sample of studies is heterogeneous under different profiles: sample analyzed, model employed, econometric method used, etc.

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