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Is public information really public? The role of newspapers

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Abstract

Our paper offers evidence that printed media can affect stock prices by covering public news (nonevents) even without resorting to spin or emphasis. However, the price reaction is limited to small caps, suggesting that small investors still obtain public information mainly through newspapers. The absence of spin or emphasis is the core element that differentiates our study from existing evidence, making it unique, to the best of our knowledge, in the financial literature on the media and asset pricing.

Keyword: nonevent, market efficiency, small investors' trading, small caps

JEL Classification: G14

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1. Introduction and main findings

The financial markets feed on information. Investors set the intrinsic value (also known as the fair value) of financial assets, and consequently decide whether to buy or sell, on the basis of expectations on issuers' business fundamentals and the macroeconomic context; these expectations depend in turn on the quality and quantity of information available and the investor's ability to process it correctly. The role played by the information set is so important that one of the measurements of financial markets' efficiency is based on the kind and quantity of information contained in prices, as expressed in Fama's well-known three types of efficiency (Fama 1970): past prices only (weak efficiency), all the information in the public domain at the time of the evaluation (efficiency in semi-strong form), and all relevant information, whether public or confidential (efficiency in strong form). Information efficiency is an essential prerequisite for the efficiency of financial markets in valuing securities and allocating capital.

There are a large number of producers of information, and many channels through which it is made available to the market. With regard to information on firm-specific business fundamentals, as well as the primary producers (the securities issuers), there are also various secondary producers, including financial analysts, dealers, brokers and institutional investors, who contribute to the information set by conducting studies and issuing reports, but also as market players in their own right. Turning to the media themselves, the traditional press has been joined by radio, television, news agencies (e.g. Reuters and Bloomberg), data providers, the stock markets' own computerized information networks and the web.

The media are important in placing information in the public domain, in other words making it widely available to the market. The disclosure requirements enforced by rules on

transparency specify clear procedures with which listed companies must comply for the dissemination of regulated information.

The regulatory differences in the times and procedures required for the publication of continuous information (press release without delay for inside information) on the one hand and episodic and periodic financial reporting (filing of documents after approval by the Board of Directors or General Meeting) on the other, indicates an acknowledgement that the first category of information is more important than the other two for the efficiency of the financial markets. Inside, or price-sensitive, information consists of fresh news not yet reflected in the securities prices (or "events"), while periodic or episodic financial reports provide detailed information allowing a more in-depth analysis of events already substantially in the public domain as a result of continuous disclosure.

Speed is of the essence for price-sensitive news, which the market operators like to receive through the communications channels able to meet this requirement: stock exchange information systems, news agencies, on-line trading platforms, corporate web sites and specialist TV channels. Due to regulatory or cost factors, exchange information systems and the news agencies, the fastest channels, are only available to professional investors (intermediaries, institutional investors and sophisticated on-line traders), and the internet and TV, while reaching a wider audience, still involve costs for an internet connection or payment of a subscription charge, as well as requiring a certain degree of IT-literacy.

Traditional newspapers, definitely the most accessible form of media, publish news a day later, and thus only place their readers on a par, as regards information with those who have access to the other channels, when the company has issued its press release in the late afternoon, after the markets have closed. Not even interviews with key corporate figures can give the conventional press an information advantage in the area of events: price-sensitive information must be disclosed through the official stock market and news agency channels,

and a newspaper interview is no substitute, a point underlined by the CESR at the international level[1].

The press is not even necessarily a competitive news channel when it comes to rumors/gossip. For example, an empirical study on the Istanbul stock exchange has shown that the performances of the stocks mentioned in the *Heard on the Street* gossip column of *Ekonomik Trend* weekly are anomalous during the days prior to publication, but there is no significant effect on the day of publication itself, or on the following days (Kiymaz, 2002).

Even the publication of financial analysts' buying and selling advice is not always of use in enabling readers to achieve immediate extra returns by following the recommendations given: while on the US market the evidence points to a significant price reaction on the day of publication in the press (although only for "sell" recommendations)[2], in Italy Cervellati, Della Bina, and Pattinoni (2006) find significant abnormal returns on the day when the advice was passed to the narrow circle of clients (report date), but not on the day when the report is actually published on the Italian Stock Exchange (Borsa Italiana) website[3]. The authors note that the price reaction is not limited to the report date but lasts for at least two weeks; newspapers could therefore provide a useful service by previewing reports' contents before they are published on the Stock Exchange website. Similar findings are reported by Lidén (2004), who describes a significant reaction on the Swedish market on the date of publication of advice to investors in the press; the reaction is greater when the recommendations are provided by a journalist than for an analyst's opinion, but this is because in the case of analysts' recommendations there are reactions ahead of the publication date – in other words, some people are informed of the advice in advance - and

[1] CESR 06/562, Market Abuse Directive, Level 3 – second set of CESR guidance and information on the common operation of the Directive to the market, Public consultation, November 2006, point 1.9.

[2] See survey in Kiymaz (2002) and Lidén (2004). In general, "buy" recommendations generate significant immediate surges which then disappear (overreaction), while "sell" recommendations trigger a smaller initial drop which becomes more accentuated over time (underreaction).

[3] To be precise, Cervellati, Della Bina, and Pattinoni (2006) concentrate on changes in advice; also see the survey of the US empirical evidence supporting the information content of changes in advice.

this does not usually apply if the source is a journalist. The positive response to a "buy" recommendation on the day of publication rapidly evaporates, while the negative effect of a "sell" recommendation persists and becomes more accentuated over time, but only when the advice is given by a journalist.

The problem of speed aggravates the more general difficulties newspapers are experiencing in competition with the internet and TV, at least in the most developed countries. Some decisions taken by major publishers are emblematic in this area. In Sweden, the *Post-och Inrikes Tidningar*, the world's oldest newspaper founded in 1645, ceased paper publication and became available only on-line on January 2, 2007. The same has recently happened in the US to the *New York Times*; the *Washington Post* has announced that it intends to adopt the same strategy. Also in the United States, the historic publisher E.W. Scripps has decided to move out of the paper media business to focus on cable TV.

EU regulations intended to harmonize the transparency obligations on securities issuers listed on a regulated market (Directive 2004/109/EC), and above all the CESR, also seem to favor the internet and the new electronic media as channels for regulated financial disclosure. It is no coincidence that the ENPA (European News Publishers' Association) has described the CESR proposals as inadequate in relation to the aims of the Directive because they place investors who do not have internet access and are unable to pay the price of information at a disadvantage; they ask that the printed media should continue to be the cornerstone of corporate disclosure.

In view of all this, it is reasonable to wonder whether and in what terms newspapers still play a role as a channel for the transmission of information of importance for the pricing of listed stocks.

Huberman and Regev (2001) provide a macroscopic example proving that the press is able to influence prices even by publishing news which can be classified as nonevents.

The two authors note that in response to the publication in the *New York Times* of Sunday, May 3, 1998, of an article about the potential development of a new cancer drug, there was a significant, permanent growth in the stock price of the company concerned and, to a lesser extent, of the whole biotechnology sector, even though the news was far from fresh, since it had already been published months earlier, on November 27, 1997, by the scientific journal *Nature* and taken up on the very same day by the popular press (*Newsdays* and *New York Times*) and some television channels (*CNN's MoneyLine* and *CNBC's Street Signs*). The first articles also triggered a significant rise in the stock price of the company involved, but this was much lower than the surge generated by the May 3 article: +28.4% compared to +330%. The May article contained basically the same information as the November article, but it was given greater emphasis with regard to the spin, which was much more optimistic, and was also treated as front-page news (the previous article appeared on page A28).

Huberman and Regev (2001, p. 388), focusing on the efficiency of financial markets, appear to interpret these events as showing that by changing the emphasis, the press can trigger price reactions even by publishing "old" news: "Stock price may well be based on the market's expectations of future cash flows. But how are these expectations formed? To what extent do they reflect hard, solid information or spurious publicity?" We demonstrate that the latter may be just as important, and at times even more important, than the former"[4].

Also on the subject of nonevents, Ho and Michaely (1988) reveal that journalists' negative comments on a specific stock[5], which the authors assess as the mere reworking of information already in the public domain, cause significant falls in the stock's price from the day before publication to the day afterwards, and these reductions are particularly large in the case of small companies. In this study, that the journalistic comments investigated are

[4] Huberman and Regev's bibliography does not refer to other studies on the impact of nonevents, and this leads one to believe that there is very little literature on the topic.
[5] The sample consists of 29 comments by journalists taken from Barron's and The Wall Street Journal.

actually nonevents is more an assumption than a proven fact; leaving this aside, the reaction observed might be the result not so much of media hype as of a lack of market knowledge of information already in the public domain.

Emphasis, or the capability to control the degree of importance to be given to a specific news item, is also viewed as important by Dick and Zingales (2003, pp. 2-3), who see this as the defining characteristic of the paper media: “Media coverage is different than other information disclosure by the firm in that space is at a premium and coverage is more selective. Newspaper editors inevitably provide a spin in their coverage, choosing whether to include or exclude a piece of news, positioning it on the first or last page, or in the first or the last paragraph”. They analyze the publication of earnings announcements in order to study the way in which the market reacts, allowing itself to be influenced more by the GAAP earnings or the pro-forma earnings depending on which the article states first. The degree of influence is stronger when investors have fewer alternative sources of information to the paper media (approximated by the number of financial analysts monitoring a specific company) and when the newspaper’s reputation is good. These findings suggest that, even if it has already been published or is available on other channels, the information conveyed by the paper media receives consideration from the investors and affects prices for various reasons: a) even in the Internet Age, sourcing information is expensive and the paper media broaden the audience of informed investors; b) the paper media enjoy greater credibility than the web; c) the paper media convey shared knowledge, since each reader acquires not only information but also the awareness that it has been provided to a large number of other people. The same authors find that the spin given to news by the press follows the lead of the sources themselves; in other words, the press releases of listed companies are probably

reported with positive spin to win favor with the issuers and thus obtain first-hand information more easily[6].

Pro-forma earnings are believed mainly to influence the trading of small investors, who are assumed to be too unknowledgeable to appreciate their real meaning, or the difference between them and GAAP earnings (Allee, Bhattacharya, Black and Christensen, 2003; Bhattacharya, Black, Christensen, and Mergenthaler 2007). However, it appears that the market does have some ability to filter news; Bhattacharya, Galpin, Ray, and Yu (2004, p.10), analyzing US IPOs for the 1996-2000 period, find that: "though the media hyped up the good news about internet IPOs in the bubble period and hyped up the bad news about internet IPOs in the post-bubble period, the market somewhat discounted the media hype, especially during the bubble period"[7].

Our intention here is to offer proof that the press may influence prices by publishing news already in the public domain even without adding emphasis to it or exercising a selective coverage, but simply by supplying the raw facts; this is because there are some investors for whom newspapers are the main means of acquiring information, and who play a key role in the pricing of some stocks, at least in Italy. It is this discounting of the emphasis or spin factor which differentiates our study from those of Ho and Michaely (1988), Huberman and Regev (2001) and Dick and Zingales (2003) and makes it unique, to the best of our knowledge, amongst studies of the relationship between the media and asset pricing. The study focuses on the Italian Stock Exchange, the European stock market with the lowest incidence of foreign investors and the highest incidence of individual/family investors in the ownership structure of the listed companies (FESE 2007).

[6] Dick and Zingales (2003) call this explanation for a positive spin "quid-pro-quo" theory. For other theories of media bias see Baron (2004), Besley and Prat (2004), Mullainathan and Shleifer (2005), Gentzkow and Shapiro (2006).

[7] For a theoretical model of the influence a journalist's reputation may have on the stock issue price, bearing in mind the relationship of collusion which may arise with the issuer company, see Huang (2006).

The triggering-point for the study is that, on March 1, 2002, the most widely-read Italian financial newspaper, *Il Sole 24 Ore*, started publication of the price-to-book value (PBV) ratio of the stocks listed on the Mercato Telematico Azionario (Telematic Stock Market) alongside the price-earnings, price-to-cash-flow and dividend yield multiples it had already been publishing for several years[8]. The multiples represent relative prices which may make it easier to compare the various stocks, especially within the same economic sector. By looking at the multiples, for example, the reader can distinguish between value and growth stocks, and thus draw up investment strategies focusing on one category rather than the other[9]. Some people consider that multiples are also an aid to stock picking, e.g. the identification of undervalued and overvalued stocks (there is partially favorable empirical evidence for large portfolios over lengthy time-frames[10]).

Since it is reasonable to assume that, thanks to the work of financial analysts and database providers, at least part of the market (securities brokers and professional and institutional investors) is already familiar with the multiples, regardless of whether or not they are published in the newspapers, it is fair to doubt whether publication of the PBV can be considered as a true event, capable of inducing any effects on stock prices.

However, the figures disprove this hypothesis. If we analyze the behavior of a portfolio of the fifty stocks with the highest PBV of all those quoted on the MTA and a portfolio of the fifty stocks with the lowest PBV, it emerges that during the 20 days prior to publication of the PBV, the two groups show very similar abnormal returns, statistically indistinguishable from zero. During the 20 days starting from the publication date, the 50

[8] On Il Sole 24 Ore's absolute leadership in the Italian financial daily press sector, see data provided in Argentesi, Lütkepohl, and Motta (2006, pp. 6-7). The multiples published by Il Sole 24 Ore are historic figures since they are based on the data in the last financial statement approved by the general meeting.

[9] For empirical evidence on the "value premium" see amongst others Basu (1977), Fama and French (1993), Davis (1994), Davis, Fama, and French (2000), Adrian and Franzoni (2004), Ang and Chen (2005).

[10] On the greater profitability of stocks with low PBV compared to stocks with high PBV and the precautions to be taken when using this multiple as a stock picking tool, see above all Damodaran (2004), chapter 4.

stocks with the lowest multiple achieve a considerable, statistically significant cumulative extra performance, up to 12.8%.

The broad time spread of the reaction (the variation in the prices was not immediate and lasted several days) and the possibility that the most sophisticated investors were already aware of the information, lead us to suppose that the effects on the prices were caused by the trading activities of small investors. If this were the case, we should observe effects which vary in relation to capitalization: little or no effect on the stocks of the largest firms, most of the trading in which is probably by institutional investors and financial intermediaries, and a pronounced effect on the stocks of the smallest firms, traded to a larger extent by small investors. The figures do not reject this assumption: the price trend observed appears to have been driven by the performances of those among the low-PBV fifty stocks which had the lowest market capitalization: for them, the average price growth ranged from 8.8% to 15.2%. The analysis of a control sample of small cap stocks revealed that, although a positive small-size trend during the period under consideration was likely to be at work, the growth of small PBV stocks cannot be reduced to it.

Our results are in line with the hypothesis given theoretical expression by Ho and Michaely (1988), that where there are costs involved in acquiring information, the prices of small stocks may fail to reflect all the information in the public domain[11].

The rest of the paper is organized as follows. Section 2 discusses the related literature. Section 3 details data and samples. Section 4 and the appendix describe the methodology. Section 5 shows our results. Conclusions close.

[11] The empirical evidence which the two authors offer to support their model is less convincing than ours since it leaves open the possibility that the price reaction could be due to media hype or spin rather than investors' lack of knowledge of published information.

2. Related literature

Apart from the literature already referred to on nonevents and the importance of media bias in influencing price reactions to news, our work is also linked to two other areas of study, partly correlated: studies in behavioral finance into the information acquisition process, and investigations of small investors' trading activities.

Traditional financial theory presupposes that, as far as the relative costs allow, investors aim to acquire as much information as possible. Conversely, according to various models in behavioral economics, psychological factors may cause investors to prefer not to acquire information, even if no costs are involved[12].

In this direction, Argentesi, Lütkepohl, and Motta (2006) find that the Italian stock market index and the number of copies of Il Sole 24 Ore sold, not including subscriptions (monthly data from 1978 to 2003) follow the same trend, and that the former is the causal factor, thus backing up the cognitive dissonance hypothesis. Non-professional investors tend to buy newspapers when stock prices are high and not buy them when they are low: if prices are low, there is dissonance between owning the stock and seeing its quotation drop, and to overcome this dissonance the investor ignores the information by not buying the newspaper, while if the prices rise the investor buys the paper because he is expecting good news about his stocks[13]. Conversely, the data do not support the theory that investors buy information for use in stock market trading: there is no relationship between newspaper sales and either stock trading numbers (rational models would suggest that investors buy information to

[12] According to Rabin and Schrag (1999) the risk that those reporting information may suffer from confirmatory bias affects the way in which the recipient uses the information concerned; Carrillo and Mariotti (2000) argue that investors may decide not to acquire all the information available because they are afraid that they may have to revise their convictions and thus their future behavior; Akerlof and Dickens (1982), Köszegi (2000) and Yariv (2002) state that agents with utility functions dependent on their beliefs may prefer less information to more when the latter might cast doubt on those beliefs; Karlsson, Loewenstein, and Seppi (2004) suggest a model in which agents switch to "ostrich" mode, ceasing to gather further information, when the context is not favourable.

[13] This inaction when stock prices are low also appears in Karlsson, Loewenstein, and Seppi (2004), who note that investors tend to check their portfolios more often when stock prices are rising than when they are falling.

improve their trading activities or the composition of their portfolios, and this might lead to an increase in trading levels), or the volatility of the stock market (rational models also predict that the proportion of informed individuals rises with price noise, because the more noise increases the less informative the price system is, and thus the value of information to traders rises).

Like our own, the findings of Argentesi, Lütkepohl, and Motta (2006) indicate that for non-professional investors, the printed media are the main means of acquiring information. However, our results reveal that even small investors do use information for trading purposes, to the point where their actions modify the stock prices of the small cap firms to which the news refers. This discrepancy might point to the existence of a "hard core" of non-professional investors who see the *Il Sole 24 Ore* newspaper as a systematic channel of information for their investment decisions, alongside a body of occasional non-professional readers whose numbers follow the trend of the stock index itself, in accordance with a cognitive dissonance model.

Failure to pay attention may be another source of distortions in investors' information gathering. Della Vigna and Pollet (2006) find that the price and trading reaction to announcement of earnings different from expectations occurs later when the news appears on a Friday than on the other days of the week; the fact that the data published on Fridays refer to companies with average size smaller than that of the companies which issue their earnings statements on other days, and that the delay loses significance when this size difference is eliminated, may indicate that this attention gap mainly affects small investors, if we assume that the incidence of trading by professional investors tends to decrease with the issuer's size. Attention levels were also found to be lower on days when a large number of companies publish their figures (Hirshleifer, Lim, and Teoh, 2006), if figures are published

when the markets are closed (Francis, Pagach, and Stephan, 1992; Bagnoli, Clement, and Watts, 2005), and during periods when markets are falling (Hou, Peng, and Xiong, 2006)[14].

Therefore, the delayed reaction to PBV publication and the post-announcement drift which appear in our findings may be due to a lack of attention. The fact that the impact on prices did not affect the stocks of large firms, whose investors were probably already aware of the PBV, but only involved those of small companies, is in line with the hypothesis that lack of attention means that the speed at which information is reflected in the prices of small stocks is slower than for those of larger firms (Peng, 2005), also supported by the finding that the distracting effect of a large number of announcements mainly affects small stocks (Hirshleifer, Lim, and Teoh, 2006, p.6).

Conversely, several studies document differences in reactions to news between retail and institutional and professional investors, identified on the basis of order size, and the fact that the former have more influence on the prices of the shares of small companies[15].

In earnings announcements, the reaction shown by small orders is slower than that of larger orders (Cready, 1988); in addition, whilst amongst large orders, purchases prevail over sales during the first half hour after the announcement if the news is good, and the opposite if it is bad, small orders show a persistent prevalence of purchasers regardless of the nature of the news[16], more accentuated in the case of small stocks with low trading levels (Lee, 1992). Also according to Lee (1992, pp.266-267) "This surprising proclivity of small trades to be buys around earnings announcements does not seem fully explained by existing

[14] Peng and Xiong (2006) supply a theoretical model concerning the effects of attention on stock price trends; in particular, attention limits and overconfidence lead investors to make more use of market and sectorial than firm-specific information, with repercussions on the correlation of performances and the extent to which they can be forecast. Hirshleifer and Teoh (2003) present a behavioral model for corporate financial reporting when investors' attention is limited. On the attention, or lack of it, paid to information relating to the distant future, see Della Vigna, and Pollet (2005).

[15] On the relationship between the investor's wealth, the information set used and buy/sell order sizes, see Bhattacharya (2001) and the bibliography already mentioned. To sum up the concept, Bhattacharya (2001, p. 222) states: "On average, wealthier and more informed investors are likely to make larger trades, whereas less wealthy and less informed investors are likely to make smaller trades". The author also notes that small orders refer above all to the stocks of firms with only a limited amount of public information, such as small firms.

[16] Behavior in line with the attention-grabbing hypothesis put forward by Barber and Odean (2006).

theories. One interpretation of these findings is that small individual investors and professional/institutional traders differ systematically in their reaction to earnings news. The evidence on individual and institutional trades suggest a link between trade size and trader type. <...> This study posits that small traders will respond differently from large traders to the same earnings signal. The evidence is consistent with this hypothesis". Battalio and Mendenhall (2005), analyzing investors' net buying activity in response to earnings announcements, not only confirm that most small investors' deals are buys even if the news is discouraging, but also demonstrate that the various behaviors may derive from the fact that small traders form their earnings expectations using less sophisticated models than large investors[17]. Differences also emerge when the announcements are viewed over time: Shanthikumar (2006) shows that the small investors' reaction is reinforced by a succession of all-positive or all-negative announcements, while there is little change in the larger investors' response between the first and last announcements in the series. Frazzini and Lamont (2006) also focus on the dynamics and discover that the price reaction (or rather the earnings announcement premium, the added performance generated by the investment in stocks which will be announcing their earnings during the next month and the sale of other stocks with no announcements pending) is strongly correlated to the trades triggered by the previous announcements: when an announcement generates a large growth in volumes, the reaction to the next announcement will be greater, due above all to the pressure of buys by small investors.

Further differences emerged in trading behaviors in response to seasoned equity offerings and the publication of analysts' recommendations. Huh and Subrahmanyam (2004) illustrate that small investors, unlike their large counterparts, tend to be net buyers of the shares to which the offerings refer even after the announcement, in spite of these stocks'

[17] On this subject see also Bhattacharya (2001).

underperformance after the issue, and only change their attitude late in the day. Malmendier and Shanthikumar (2005) find that small traders follow analysists' recommendations (e.g. buy/hold/sell) to the letter, while large investors give more importance to earnings forecasts than to advice, and their response varies depending on whether the analyst is affiliated or independent (similar results also appear in Mikhail, Walther, and Willis, 2005). Small investors' trading decisions seem to be even more easily influenced by advertising, with pronounced net buying activity on the stocks advertised most strongly during the commercial breaks in the Super Bowl (Fehle, Tsyplakov, and Zdorovtsov, 2005). Small investors also seem to be attracted by the drop in price generated by stock splits: on the split date and during the following days there is a net increase in small orders (Muscarella and Vetsuypens, 1996; Kryzanowski and Zhang, 1996; Desai, Nimalendran, and Venkataraman, 1998; Schultz, 2000; Jiang and Kim, 2002; Kamara and Koski, 2001; Jiang, Kim, and Wood, 2002), especially for buys.

From all these studies, it appears that small investors are rather naive, lacking in sophistication in their analytical approaches, their inattention overcome more by form (emphasis in the press, analysts' advice, advertising, price jumps due to splits, growth in volumes and prices) than substance (changes in firms' fundamentals).

However lacking in rationality, these investors' trading activity is large enough in scale to affect stock prices and be the possible cause of price anomalies: for example, small traders are believed to be responsible for the momentum effect in stock performances on horizons of 3-12 months (Hvidkjaer, 2006b), caused by an initial underreaction to news and the consequent overvaluation of their chosen stocks (Hvidkjaer, 2006a)[18], the January effect,

[18] Shanthikumar (2004) also finds that small investors have an initial underreaction followed by an overreaction totally derived from a sequence of positive or negative announcements. For theoretical models capable of generating under- and overreaction to news, both phenomena which have been observed empirically, see Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998) and Hong and Stein (1999). Some studies dispute the idea that price anomalies are generated only by individual investors: Lehavy and Sloan (2006) highlight that the variation in the proportion of large investors who hold a given stock (proxy

or the overperformance of small stocks in the month of January (Ritter, 1988), the weekend effect, or the tendency for markets to fall on Mondays (Lakonishok and Maberly, 1990), post earnings announcement drive, or the tendency for prices to rise not just at the time of the announcement but also during the following days (Battalio and Mendenhall, 2005), the trend of the discount on the net asset value at which closed funds are quoted and the small firm effect, or the overperformance of small stocks (Lee, Shleifer, and Thaler, 1991). Our findings are in line with the hypothesis that small investors' trades mainly affect the prices of small stocks[19].

3 Data and samples

In order to form our two portfolios of the stocks with the highest and lowest PBV ratios, we considered all common shares quoted on the Borsa Italiana Spa telematica market (MTA) the PBV ratio of which appeared for the first time in the *Il Sole 24 Ore* newspaper of Friday March 1, 2002, the day of the event, with reference to the price of February 28, 2002. The 231 stocks which met this criterion, out of a total of 237 listed common stocks, were arranged in decreasing order of PBV. The top 50 stocks in the table formed the high PBV portfolio (*Top50*) and the bottom 50 the low PBV portfolio (*Bottom50*). To reduce the risk of abnormal performance not linked to the event investigated, the stocks delisted within the 12 months after the end of the event period (March 28, 2002) were eliminated: this led to the

for investor recognition) is positively correlated to the trend in the price of the stock in the short term, with negative correlation in the long term, and see this as a possible explanation of the momentum effect; they find that changes in investor recognition are at least as important for stock pricing as earnings news, and actually more important for stocks with high idiosyncratic risk (e.g. small caps); Dasgupta, Prat, and Verado (2006) propose a conformist behavioral model for institutional investors, deriving from their managers' career strategies, leading to the under- or overvaluation of stock prices and indicating that the stocks bought most persistently by institutional investors subsequently tend to perform less well than the stocks they sell most persistently, a prediction confirmed by the data, since a strategy based on buying the stocks sold by institutional investors for five consecutive quarters and selling the stocks they have bought, also for five quarters, generates a cumulative performance 8% higher than that of the market after one year, and 17% higher after two years.

[19] According to Baker and Wurgler (2007), small company size is one of the typical features of stocks most affected by investor sentiment and thus by behavioral biases. Other typical characteristics of such stocks are the youth of the firm, low profitability, high volatility, failure to distribute dividends, membership of the growth stocks category and financial stress.

replacement of two stocks in the *Top50* (Italgas and Ferretti replaced by Banca Intermobiliare and RAS) and one stock in the *Bottom50* (Marangoni replaced by Caltagirone)[20]. Table 1 contains the statistics describing the two samples with regard to multiples, market capitalization and order size.

Table 1

Descriptive statistics of cross-sectional data of top and bottom PBV portfolios, as of 2.28.2002

Stocks are sorted by price-to-book value ratio in decreasing order. Two portfolios are formed grouping the first and the last 50 stocks of the ranking. Source: Il Sole 24 Ore of March 1, 2002.

	Mean	Median	Min	Max	St_dev	Obs	T-test	Z-score
Panel A: Portfolio of top 50 stocks (Top50)								
Price-earnings	59.47	27.63	6.72	696.96	116.07	45	1.40	-1.13
Price-cash flow	17.31	12.40	6.17	67.91	12.80	42	4.89 *	-5.96 *
Price-to-book value	4.50	3.70	2.36	13.56	2.48	50	10.85 *	-8.62 *
Dividend yield (%)	1.93	1.54	0.13	6.71	1.45	38	-3.87 *	-3.85 *
Market cap (mln€)	8,215	1,447	30	63,718	14,707	50	3.57 *	-5.85 *
Order size (€)	10,867	6,581	800	63,469	12,491	50	4.35 *	-5.55 *
Panel B: Portfolio of bottom 50 stocks (Bottom50)								
Price-earnings	30.20	13.72	0.96	387.24	67.82	34		
Price-cash flow	6.52	4.86	0.87	35.68	6.26	40		
Price-to-book value	0.68	0.71	0.21	0.89	0.16	50		
Dividend yield (%)	3.47	3.09	1.03	8.90	1.85	33		
Market cap (mln€)	729	93	9	11,999	1,975	50		
Order size (€)	2,902	1,471	308	14,467	3,408	50		

*Indicates statistical significance at the 0.01 level. Z score: approximation of Mann-Whitney U.

There are significant differences between the *Bottom50* and the *Top50* not only with regard to the mean PBV level (0.68x compared to 4.50x) but also in two other multiples: a price-to-cash-flow of 6.52x compared to 17.31x and a dividend yield of 3.47% compared to 1.93%[21]. There is also a difference in price-earnings, with a mean value of 30.2x compared to 59.47x; however, because of this multiple's high cross section variability, this difference is not statistically significant[22]. With regard to size, the mean capitalization of the low PBV companies is statistically lower than that of the high PBV firms: €729 million compared to

[20] The replacements are the stocks immediately below and above the first 50 and the last 50 places in the table. For the *Top50* the two replacement stocks were in the 52nd and 53th places, since the time series for the stock in 51st place (Sias) was too short.

[21] The last two columns in the table contain the T-test about the difference between means and the Z-score based on the Mann-Whitney U.

[22] If only the stocks in the two groups for which all four multiples were available are considered, the difference in price-earnings also becomes statistically significant.

€8,215 million; the gap between the median capitalization values is even greater, with €93 million compared to €1,447. The mean order size is also lower: €2,902 compared to €10,867. Therefore, in general terms the *Bottom50* stocks belong to firms which are on average smaller (mainly small and micro caps given the median capitalization of just €93 million), they attract small investors and their low PBV is representative of other features typical of value stocks.

Since the *Bottom50* stocks also differ in terms of size, we decided that it might be useful to form more portfolios in order to investigate the role played by size in greater depth.

On the one hand, it is possible that the information content of the publication of the PBV is not the same for the various types of investors: it could be of little or no value for professionals but contain a great deal of new information for small traders. Since security brokers and professional and institutional investors have easy access to financial analysists' reports and pay-to-use databases, they should be familiar with all the individual stocks' multiples, including the PBV, regardless of whether or not they appear in the newspapers: in other words, for these investors publication of the PBV would seem not to be real news. If this were the case, within the *Bottom50* sample we should find that there no effects on the stocks with the highest capitalization, a larger proportion of the trades in which are by institutional investors and financial intermediaries, and pronounced effects on the stocks with the lowest capitalization, traded to a larger extent by small investors.

The existence of the small firm effect, widely proven in the literature, also makes it necessary to distinguish between the "size" effect and the "PBV" effect. If no such distinction is made, any anomalous performance on the part of the *Bottom50* portfolio might be a reaction to publication of the PBV, but it might equally well be a reflection of a market context favorable to investment in small cap firms.

With regard to the relationship between size and the information-significance of PBV publication, the stocks in the *Bottom50* were arranged in order of capitalization as of February 28, 2002 (the day before the event) and subdivided into two subgroups: the first, containing the firms with capitalization of more than €200 million (*BottomPBVbig*), consisted of 15 stocks, and the second, containing firms with capitalization of less than €200 million (*BottomPBVsmall*), of 35 stocks. The €200 million cut-off point was chosen to provide two subgroups with a statistically significant difference in mean capitalization, but without too great an imbalance in sample size terms. As table 2 shows, the two subgroups only show statistically significant differences with regard to size, in the mean order size, e.g. in the type of trader, and partially in the price-earnings[23].

Table 2

Descriptive statistics of cross-sectional data of the Bottom50 portfolio, as of 2.28.2002

The last 50 stocks of the price-to-book value ranking (Bottom50) are sorted by market cap in decreasing order and grouped in two portfolios according to a threshold of €200 million. Source: Il Sole 24 Ore of March 1, 2002.

	Mean	Median	Min	Max	St_dev	Obs	T-test	Z-score
Panel A: Portfolio of stocks with mkt cap > €200 mln (BottomPBVbig)								
Price-earnings	9.98	9.13	0.96	24.39	7.25	11	-1.75	-3.37 *
Price-cash flow	7.30	5.21	0.87	35.68	9.91	11	0.34	-0.83
Price-to-book value	0.71	0.73	0.21	0.89	0.18	15	0.75	-1.30
Dividend yield (%)	3.82	3.39	1.03	8.90	2.20	12	0.76	-0.49
Market cap (mln€)	2,270	1,220	231	11,999	3,164	15	2.69 *	-5.56 *
Order size (€)	6,436	4,944	1,231	14,467	4,298	15	4.48 *	-4.86 *
Panel B: Portfolio of stocks with mkt cap < €200 mln (BottomPBVsmall)								
Price-earnings	39.88	18.09	1.98	387.24	81.08	23		
Price-cash flow	6.23	4.51	1.28	18.17	4.37	29		
Price-to-book-value	0.67	0.69	0.33	0.87	0.15	35		
Dividend yield	3.27	3.09	1.16	6.03	1.64	21		
Market cap (mln€)	69	67	9	192	47	35		
Order size (€)	1,388	1,125	308	6,455	1,122	35		

*Indicates statistical significance at the 0.01 level. Z score: approximation of Mann-Whitney U.

In order to identify any small firm effect, we selected those of the 131 stocks with middle-ranking PBV which had capitalization of less than € 200 million at February 28 2002. Six of the 54 stocks which met this criterion were eliminated: one (Centenari &

[23] If only the stocks in the two samples for which all four multiples were available are considered, the difference in the price-earnings loses its significance.

Zinelli) because the data required to calculate the daily returns were not available, one (Actelios) because its time series began only a few days before the event and four (Esaote, Gildemeister, Calp and Rotondi Evoluzione) because they were delisted within the 12 months after the end of the event window (March 28, 2002). The other 48 stocks were arranged in ascending order of capitalization, and the top 37 were selected to form a sample of small cap firms with middle-ranking PBV (*MiddlePBVsmall*) as similar as possible in mean capitalization to the *BottomPBVsmall* sample.

Table 3

Descriptive statistics of cross-sectional data of middle and bottom PBV portfolios of small stocks, as of 2.28.2002

Stocks are sorted by price-to-book value ratio in decreasing order. The Top50 portfolio includes the first 50 stocks of the ranking. The Bottom50 portfolio includes the last 50 stocks of the ranking. The Middle portfolio groups all the other stocks. The stocks of the Bottom50 portfolio with a market cap lower than €200 million compose the BottomPBVsmall portfolio. The stocks of the Middle portfolio with a market cap lower than €200 million are sorted by market cap in decreasing order and the last 37 compose the MiddlePBVsmall portfolio. Source: Il Sole 24 Ore of March 1, 2002.

	Mean	Median	Min	Max	St_dev	Obs	T-test	Z-score
Panel A: Portfolio of 37 Middle PBV stocks with mkt cap < €200 mln (MiddlePBVsmall)								
Price-earnings	27.26	18.34	6.25	133.86	24.46	33	-0.72	-1.01
Price-cash flow	9.29	6.99	2.58	38.02	7.42	34	2.03 ^	-2.28 ^
Price-to-book value	1.35	1.28	0.90	2.26	0.36	37	10.49 *	-7.30 *
Dividend yield (%)	3.14	2.62	0.95	7.44	1.51	23	-0.28	0.20
Market cap (mln€)	68	65	8	132	31	37	-0.05	-0.48
Order size (€)	1,841	1,444	67	7,667	1,522	37	1.44	-1.62
Panel B: Portfolio of Bottom PBV stocks with mkt cap < €200 mln (BottomPBVsmall)								
Price-earnings	39.88	18.09	1.98	387.24	81.08	23		
Price-cash flow	6.23	4.51	1.28	18.17	4.37	29		
Price-to-book-value	0.67	0.69	0.33	0.87	0.15	35		
Dividend yield	3.27	3.09	1.16	6.03	1.64	21		
Market cap (mln€)	69	67	9	192	47	35		
Order size (€)	1,388	1,125	308	6,455	1,122	35		

*Indicates statistical significance at the 0.01 level. ^Indicates statistical significance at the 0.05 level.
Z score: approximation of Mann-Whitney U.

As the data in table 3 reveal, there is no statistical difference between the mean capitalization of the companies in this further sample and that of the firms in the *BottomPBVsmall* sample, but they do differ significantly in having a greater mean price-to-cash-flow (9.29x compared to 6.23x) and above all in their higher mean PBV (1.35x

compared to 0.67x)[24]. If anomalous performances were to emerge in the *BottomPBVsmall* sample but not in the *MiddlePBVsmall* sample, it would be possible to rule out any small firm effect and attribute the performance of the *BottomPBVsmall* portfolio to publication of the PBV.

The daily returns from February 5, 2000 to March 28, 2002 were calculated for each of the four portfolios described, giving a total of 290 observations, 270 before the event date and 19 afterwards[25]. The daily performance of each portfolio was calculated as the simple mean of the daily performances of its component stocks.

4. Research Method

In order to ascertain whether PBV publication produced effects on quotations, we used the event study method. The period of analysis consists of the 20 stock market trading days prior to the event date (from February 1st to 28th, 2002), the event date (March 1st, 2002) and the 19 stock market trading days after this date (from March 2nd to 28th, 2002). Under the null hypothesis of absence of any impact of the press release of PBV figures, abnormal returns on the event date and over the following trading month are not significantly different from zero.

For the sake of robustness, several definitions of abnormal return (AR) were adopted. The simplest definition of AR is the difference between a portfolio's return on a given day and the corresponding return of the market. Market returns are represented in two ways. First, by the Comit Global Price Index, that is a well known value-weighted index of all stock traded on the Italian Stock Exchange; second, by its equally-weighted counterpart, computed by the authors.

[24] If only the stocks in the two groups for which all four multiples were available are considered, significance is lost for the price-cash flow difference but retained for the difference in PBV.

[25] The *Top50* portfolio includes four shares with less than 270 pre-event observations: Juventus (46), Amplifon (170), Air Dolomiti (181), Lottomatica (200). The *MiddlePBVsmall* portfolio includes four shares with less than 270 pre-event observations: Negri Bossi (78), Giacomelli (166), Biesse (174), Viaggi del Ventaglio (191).

We also computed AR's by the Market Model method (MacKinlay, 1997), estimating alpha and beta parameters on a 250 trading days period ending on January 31st 2002. Since the estimation sample included September 2001, Market Model regressions were augmented by dummy variables spanning all days from the terrorist attack on the World Trade Centre to the end of the month: this in order to isolate the examination of the impact of PBV publication on prices from any possible contamination of that period of extreme market volatility on AR's estimation and testing.

Market Model regression were first estimated by OLS, against both the Value- and the Equally-Weighted index; robust, although possibly inefficient, inference versus serially correlated or heteroscedastic shocks was sought for by adopting Newey&West consistent covariance matrix estimator[26]. By the diagnostic tests on the residuals of these regressions, we could not reject that conditional volatility is indeed an issue in our data, while serial correlation seemed not of any concern. Therefore a second estimation run was conducted, adding a GARCH specification for the idiosyncratic innovation process. Except for some minor differences, this approach did not produce results that differed in any relevant way from OLS. We will therefore limit our exposition to the evidence from the GARCH-augmented Market Model[27].

5. Results

Table 4 shows cumulated abnormal returns (CAR) of the *Top50* and *Bottom50* portfolios against the VW-Index for the pre-event trading month, the event day and periods of five, ten and twenty trading days starting from the event date; marginal probability values (P-Values) of the corresponding two-sided significance tests are also reported.

[26] A more detailed description of this and all other inference methods we followed is relegated to the appendix.
[27] The results of OLS estimates and tests are available upon request from the authors.

For either portfolios and with both the Index Adjusted and the Market Model methods, there is not any evidence of abnormal returns over the pre-event month[28]. However, from the day of publication of the PBV, large and positive anomalous performances are observed in the *Bottom50* portfolio. The CAR's based on the Market Model are strongly significant for each time interval, adding up to close to 13% over a month. While also economically strong, CAR's from the Index Adjusted method are almost a half in size than the former and have very poor significance tests. This is not surprising, given an estimated beta of the Bottom 50 portfolio against the VW-Index of 0.50, and also because the volatility of the Index Adjusted AR's is affected by the hectic September 2001 price dynamics that, on the contrary, are controlled for in Market Model estimation.

Table 4

Event study of Top 50 and Bottom 50 PBV portfolios vs. VW-Index

The Top 50 (Bottom 50) portfolio includes the first (last) fifty stocks by PBV ranking. The Value-Weighted Index is the Comit Global Index of all stocks traded on Borsa Italiana. "Index Adjusted" abnormal returns are simple day-by-day differeces from the market index. "Market Model" abnormal returns are computed according to the market model parameters estimates based on a window of 250 trading days ending a month before the event date; the model is adjusted for GARCH-type shocks. All abnormal returns are cumulated for any period but for the event day.

Period	Index Adjusted		Market Model (GARCH)	
	CAR	P-Value	CAR	P-Value
a. Top 50 PBV portfolio				
−20 to −1	1.25%	0.5828	0.55%	0.3370
0 (event day)	-0.12%	0.8183	0.01%	0.7460
0 to +4	1.25%	0.2681	1.74%	0.0000
0 to +9	0.73%	0.6459	1.21%	0.0002
0 to +19	2.86%	0.2053	3.42%	0.0000
b. Bottom 50 PBV portfolio				
−20 to −1	-2.18%	0.5897	-0.46%	0.4381
0 (event day)	-0.34%	0.7043	0.21%	0.0000
0 to +4	1.50%	0.4540	3.81%	0.0000
0 to +9	4.77%	0.0942	7.96%	0.0000
0 to +19	7.54%	0.0613	12.83%	0.0000

The anomalous price growth of the Bottom 50's corroborates the assumption that the press release of PBV data was indeed news for (at least some) market participants. Also, it is

[28] Similar tests were run on sub-intervals of the pre-event period that also confirmed the absence of any anomalies in excess returns.

worth remarking that the price effect is not an instantaneous shock, as full market efficiency would require, but takes place over a month with more or less constant magnitude. This evidence is not at odds with the hypothesis that the information about the multiple was only news for small traders, whose reactions are documented in the literature to be more sluggish than for institutional investors. This explanation is also supported by the prevalence of small size stocks in the *Bottom50* portfolio; these are often neglected by large professional investors and, consequently, their pricing is more affected by the decisions of small traders.

The *Top50* portfolio performance against the market is of a notably lesser size than the *Bottom50*'s: the maximum CAR is 3.4% over twenty days with the Market Model. While evidence from the Market Model is statistically significant – except for the event day – any Index Adjusted CAR is not different from zero. Quite unexpectedly, price reactions of large PBV stocks are positive, although on the ground of common investor's wisdom a price decline would be predicted. Furthermore, since most Top 50's are large-caps, evidence of any reaction is strongly at odds with market efficiency, since the pricing of these stocks is unlikely to be affected by small traders in any relevant way.

More insight about the reaction of the two sets of stocks is gained by measuring AR's against the Equally-Weighted Index. As is shown in Table 5, the reaction of the smallest PBV stocks over the event period remains both statistically and economically significant, despite a reduction in the size of CAR's; furthermore, even with the Index Adjusted method the performances over the two longer post-event periods are now strongly significant.

On the contrary, the switch of the market benchmark to the EW-Index produces dramatic effects on the AR's of the *Top50* portfolio that are considerably lower than with the VW-Index. All Market Model CAR's are now negative, and strongly statistically significant over the event month and its sub-periods.

Table 5

Event study of Top 50 and Bottom 50 PBV portfolios vs. EW-Index

The Top 50 (Bottom 50) portfolio includes the first (last) fifty stocks by PBV ranking. The Equally-Weighted Index is the simple average of prices of all stocks traded on Borsa Italiana. "Index Adjusted" abnormal returns are simple day-by-day differeces from the market index. "Market Model" abnormal returns are computed according to the market model parameters estimates based on a window of 250 trading days ending a month before the event date; the model is adjusted for GARCH-type shocks. All abnormal returns are cumulated for any period but for the event day.

Period	Index Adjusted		Market Model (GARCH)	
	CAR	P-Value	CAR	P-Value
a. Top 50 PBV portfolio				
−20 to −1	0.77%	0.7266	-0.16%	0.7067
0 (event day)	0.22%	0.6531	-0.02%	0.5109
0 to +4	0.96%	0.3851	-0.67%	0.0005
0 to +9	-0.70%	0.6531	-3.27%	0.0000
0 to +19	-0.94%	0.6676	-5.61%	0.0000
b. Bottom 50 PBV portfolio				
−20 to −1	-2.66%	0.0641	-1.24%	0.0014
0 (event day)	0.00%	0.9920	0.09%	0.0008
0 to +4	1.21%	0.0904	1.69%	0.0000
0 to +9	3.33%	0.0011	4.22%	0.0000
0 to +19	3.74%	0.0093	5.47%	0.0000

The reduction in abnormal returns for both small and large PBV stocks when measured with respect to the EW-Index rather than the VW-Index suggests that a confounding small cap effect may be present; this suspicion is aggravated by the fact that, from the event day onwards, the first index, where small and large firms have the same weight, outperformed the second by 4.2%.

Distinguishing the (presumed) PBV effect from an autonomous small size effect requires, in the first place, separating large and small caps within the *Top50* and the *Bottom50*. Unfortunately, this is feasible for the *Bottom50* portfolio only, since just a handful of top PBV stocks are really small and the resulting sample would therefore be unreliable[29]. The resulting portfolios, previously described in Section 3, consist, respectively, of 35 small caps (*BottomPBVsmall*) and 15 medium-to-large caps (*BottomPBVbig*).

[29] The *Top50* portfolio includes only eight firms with market capitalization less than €200 million.

The results of the event study analyses for these portfolios are displayed in Tables 6 and 7. While Index Adjusted abnormal returns are almost always not significant, the results from the Market Model offer a quite clear picture. For both the *BottomPBVsmall* and *BottomPBVbig* portfolios, performances after the event day are always significant, both in magnitude and statistically, when measured against the VW-Index; in most instances, small caps AR's are larger than those of the medium-and-large caps. The same pattern is observed with the EW-Index benchmark but, as already shown for the whole *Bottom50* portfolio, the average magnitude of the effects is halved[30].

Table 6
Event study of the Bottom 50 PBV Small Caps sample

The sample comprises the 35 stocks of the Bottom50 portfolio with market value less than or equal to € 200 mln. The VW-Index is the Comit Global Index of all stocks traded on Borsa Italiana; the EW-Index is its equally-weighted counterpart. "Index Adjusted" abnormal returns are simple day-by-day differeces from the market index. "Market Model" abnormal returns are computed according to the market model parameters estimates based on a window of 250 trading days ending a month before the event date; the model is adjusted for GARCH-type shocks. All abnormal returns are cumulated for any period but for the event day.

Period	Index Adjusted		Market Model (GARCH)	
	CAR	P-Value	CAR	P-Value
a. Against VW-Index				
−20 to −1	-2.21%	0.6531	-0.30%	0.6070
0 (event day)	-0.73%	0.5035	-0.07%	0.1396
0 to +4	0.78%	0.7492	3.54%	0.0000
0 to +9	4.86%	0.1598	8.67%	0.0000
0 to +19	8.96%	0.0684	15.23%	0.0000
b. Against EW-Index				
−20 to −1	-2.69%	0.2125	-0.93%	0.0676
0 (event day)	-0.39%	0.4187	-0.21%	0.0000
0 to +4	0.48%	0.6531	1.60%	0.0000
0 to +9	3.42%	0.0260	5.32%	0.0000
0 to +19	5.16%	0.0176	8.75%	0.0000

[30] In this case, the *BottomPBVbig* portfolio has a negative CAR from day –20 to –1 and over the event month, although the statistical significance of these results is, at best, feeble.

Table 7
Event study of the Bottom 50 PBV Medium&Large Caps sample

The sample comprises the 15 stocks of the Bottom50 portfolio with market value greater than € 200 mln. The VW-Index is the Comit Global Index of all stocks traded on Borsa Italiana; the EW-Index is its equally-weighted counterpart. "Index Adjusted" abnormal returns are simple day-by-day differeces from the market index. "Market Model" abnormal returns are computed according to the market model parameters estimates based on a window of 250 trading days ending a month before the event date; the model is adjusted for GARCH-type shocks. All abnormal returns are cumulated for any period but for the event day.

Period	Index Adjusted		Market Model (GARCH)	
	CAR	P-Value	CAR	P-Value
a. Against VW-Index				
−20 to −1	-2.10%	0.5491	-1.57%	0.0540
0 (event day)	0.58%	0.4540	0.84%	0.0000
0 to +4	3.20%	0.0670	4.26%	0.0000
0 to +9	4.56%	0.0655	5.98%	0.0000
0 to +19	4.23%	0.2236	6.51%	0.0000
b. Against EW-Index				
−20 to −1	-2.58%	0.4187	-1.52%	0.0308
0 (event day)	0.92%	0.1948	0.81%	0.0000
0 to +4	2.91%	0.0684	2.01%	0.0000
0 to +9	3.12%	0.1658	1.89%	0.0001
0 to +19	0.43%	0.6676	-1.66%	0.0767

The joint interpretation of the evidence from the analyses of the size-segmented Bottom 50 stocks suggests that, although an autonomous small size driver is likely to be at work, the PBV press release had also an impact on quotations. This claim is supported by the consistency of positive and significant AR's across different sizes and for both the VW- and EW-Index. Indeed, if the performance of Bottom 50's were simply driven by a pure size effect, we would not be likely to observe positive and significant AR's for small caps against the EW-Index and for medium-to-large caps with respect to both benchmarks.

A second piece of evidence from our analyses is that, particularly over the longer periods, the *Bottom50* performance is mainly to be attributed to the small-cap component. When the CAR over twenty days against the VW-Index is considered, the overall portfolio figure is 12.8%, to be compared with 15.2% for smaller stocks; the same comparison using the EW-Index is 5.5% and 8.8%. While a relevant source of this difference is the documented outperformance of the EW-Index over the VW-Index, the possibility that the

actions of small traders responding to the PBV release pushed up the prices of what would be considered “bargain” stocks is worth considering. To this end, we performed a second check with the purpose to assess the entity of the plausible pure small-caps effect. This task was accomplished by running the event study on a control portfolio of stocks with mid-range PBV and similar in size to the *BottomPBVsmall’s*: Table 8 contains the result of this experiment.

The Market Model abnormal returns are significant over the entire period of analyses, further documenting that (small) size matters. Depending on which benchmark we look at, from the event day onwards AR’s are of an order of magnitude that ranges from 20 to 50 basis points per day for the first two weeks; then, most of the growth dynamics fades away.

Table 8
Event study of the Middle PBV Small Caps control sample

The sample comprises the 37 stocks with market value less than € 200 mln. not included in the Bottom 50 or Top 50 sets. The VW-Index is the Comit Global Index of all stocks traded on Borsa Italiana; the EW-Index is its equally-weighted counterpart. "Index Adjusted" abnormal returns are simple day-by-day differeces from the market index. "Market Model" abnormal returns are computed according to the market model parameters estimates based on a window of 250 trading days ending a month before the event date; the model is adjusted for GARCH-type shocks. All abnormal returns are cumulated for any period but for the event day.

Period	Index Adjusted		Market Model (GARCH)	
	CAR	P-Value	CAR	P-Value
a. Against VW-Index				
−20 to −1	2.78%	0.5760	2.70%	0.0000
0 (event day)	-0.11%	0.9204	0.52%	0.0000
0 to +4	0.10%	0.9681	2.37%	0.0000
0 to +9	0.18%	0.9602	4.14%	0.0000
0 to +19	0.81%	0.8730	6.60%	0.0000
b. Against EW-Index				
−20 to −1	2.30%	0.3231	2.10%	0.0000
0 (event day)	0.23%	0.6531	0.40%	0.0000
0 to +4	-0.19%	0.8651	0.60%	0.0004
0 to +9	-1.26%	0.4420	1.06%	0.0003
0 to +19	-2.99%	0.8975	0.57%	0.3134

A comparison of Table 8 with Table 6 reveals that, whichever the benchmark, the AR’s of the control experiment fall short of those of the Bottom 50 small caps over the post-event period; with the Market Model, the difference over twenty days is larger than 8%,

about 4.5% over ten days and one percent during the first trading week. The examination of Market Model estimates shows that this difference cannot be attributed to larger beta coefficients of the *BottomPBVsmall* with respect to either market benchmark: indeed, betas for this and the control portfolio are very close: 0.38 and 0.37 for the VW-Index and 0.82 against 0.78 for the EW-Index. Performance differences may therefore be safely attributed to differences in the average behavior of the stocks that form the two portfolios. The same conclusion is reached by the raw comparison of the Index Adjusted AR's from the two tables, where beta estimates do not play any role.

Having controlled for size by construction, the difference in PBV among the two portfolios is an obvious candidate for motivating the larger AR recorded for *BottomPBVsmall*: as shown in Table 3, its multiple of 0.67 is half that of the control portfolio's, which is 1.35. Albeit admittedly in an indirect way, these results are not against the assumption that the low-PBV price effect was largely conveyed by small traders.

6. Conclusions

With effect from March 1, 2002 *Il Sole 24 Ore,* Italy's leading economic and financial newspaper, started to publish the price-to-book value ratio of the stocks listed on the Italian Stock Exchange on a daily basis. In principle, the publication of these data in the paper media should not have had any significant effect on stocks' performance. The multiple is based on public information (the net book value and market price) easily accessible to professional investors, and is also normally distributed to them amongst the services offered by specialist data providers, or contained in the reports they receive from financial analysts. Therefore, the stock prices of an information-efficient market should have already reflected any significant information contained in the PBV figures: stock prices should not have reacted to the publication of the multiple in the newspaper in any way.

However, our research reveals an average increase in the price of the fifty stocks with the lowest PBV that cannot be reduced to market dynamics only: depending on the method of analysis, the extra performance ranges from 5.5% to 12.8%. This variation, which proves to be strongly statistically significant, is in line with the theory that investors considered that the published figure provided valuable information, and increased their demand for the stocks concerned in the belief that they were, on average, undervalued.

Another important empirical finding is that the price trend observed appears to have been driven by the performances of those among the fifty stocks which had the lowest market capitalization: for them, the average price growth ranged from 8.8% to 15.2%. The analysis of a control sample of small cap stocks revealed that, although a positive small-size trend during the period under consideration was likely to be at work, the growth of small PBV stocks cannot be reduced to it. These findings suggest that the anomaly observed is mainly the result of the combination of two circumstances: the publication of a low PBV ratio and the fact that the stocks concerned were small caps.

The size factor therefore appears to have played a role in triggering the extra performance after publication of the multiple in the newspaper. Why? In our opinion, it is reasonable to believe that the reason lies in the relatively important role of small traders on the market for small-cap stocks. These stocks normally receive only limited attention from institutional investors and often feature low liquidity, a low rate of trades and small order sizes; in these circumstances, small investors' activities can have a vital impact on market prices. This explanation is backed up by two factors. First, it is probable that most small traders did not know the PBV figures before their publication in the newspaper, due to the cost barrier to access to the channels through which these data are normally available to professional investors. Therefore, for these investors, the values for the multiple published in the paper media constituted genuine news. The second factor is that the price reaction

observed after the first publication date occurred a few days late, and was then protracted over a couple of weeks. On the basis of previous research, this is a strong pointer to the importance of small traders on the market since, unlike professional investors, they normally show some inertia in their reaction to news, causing a momentum effect in price variations.

The results of our research supply empirical evidence supporting the hypothesis that newspapers can influence prices by publishing information which is already known, but effectively distributed only amongst some market participants. It should be noted that our study differs from previous work on the subject in showing that the role played by the paper media in relation to stock prices does not necessarily derive from the reworking of information, or the emphasis or spin with which it is presented to readers: even the simple publication of a raw figure like the PBV ratio can have significant effects on prices. The results obtained reinforce the theory previously put forward by various authors that newspapers continue to be a significant channel for financial information in spite of the growing importance and greater speed of radio, television, the electronic media and the internet, due to their low costs and wide distribution.

Appendix

The event studies presented in this paper were based on two methods for calculating abnormal returns: the Index Adjusted approach and the Market Model.

With the Index Adjusted method, abnormal returns (AR's) over the time window $t \in [T_1, T_2]$ surrounding the event date $t = 0$ are defined as the simple difference of the value relatives of the given portfolio and the appropriate market benchmark, represented by either the Value- or the Equally-Weighted index:

$$AR_t = R_t - R_{m,t}$$

In order to avoid possible contamination of anomalous price variations over the event window, the standard deviation of AR's (σ_{AR}) is estimated by its sample analogue over a 250 days period ending the day before the beginning of the event period itself – also known as the "estimation window". When, as in our case, one is interested in evaluating the impact of the event over time, cumulated abnormal returns (CAR's) are used:

$$CAR_{t_0,t_1} = \sum_{t=t_0}^{t_1} AR_t$$

where $T_1 \geq t_1 \geq t_0 \geq T_2$. Under the maintained assumption of Gaussian i.i.d. price relatives, the hypothesis of absence of any effect of the event on the price level can be verified using the Portfolio Test Statistics (Aharony, Saunders and Swary, 1988)[31]

$$\frac{CAR_{t_0,t_1}}{\sigma_{AR}\sqrt{t_1 - t_0 + 1}} \sim N(0,1)$$

With the Market Model method, abnormal returns are computed as:

$$AR_t = R_t - (\hat{\alpha} + \hat{\beta} R_{m,t})$$

[31] On tests on the significance of abnormal returns, also see Brown and Warner (1985, p. 28), Mikkelson and Partch (1986, p. 41), Hannan and Wolken (1989, p. 8) and DeLong (2001, p. 235). For a survey of the event studies methodology, see MacKinley (1997).

where the alpha and beta coefficients are estimated as the parameters of a simple linear regression run over the estimation window. In the traditional approach, this is done by OLS, and the standard deviation of AR's is estimated as the regression standard error. Unfortunately, when daily data are used, serial correlation or heteroscedasticity in the residuals are likely to bias AR's standard errors, and thus to hinder correct inference about the consequences of the event.

An easy patch to this problem is to use a heteroscedasticity and autocorrelation consistent (HAC) estimator of standard errors, like the well known Newey&West (1987) solution, but this comes at the cost of losing estimation efficiency. A less robust but potentially more efficient approach is to fully specify the innovation structure of the Market Model idiosyncratic shocks as an ARMA-GARCH type process.

Since common diagnostics of OLS regressions revealed pervasive evidence of conditional volatility in the residuals, we performed our analyses with both approaches. To this end, we specified our basic regression equation as:

$$R_t = \alpha + \beta R_{m,t} + \sum_{i=1}^{N} \gamma_i D_i + u_t$$

where the *D*'s are $N = (T_1 - T_0) + 1$ dummy variables, one for each day of the event study period. This regression was estimated on the whole data set (*i.e.* estimation window and event window), since the dummies warrant that estimates of α and β are not affected by the values of any event-related return. Then, CAR's can easily be computed as sums of the appropriate γ's estimates, and hypothesis testing on the event effects conducted with the usual asymptotic F-Test approach (Greene, 2003).

In order to control for the influence of extreme September 2001 volatility, we augmented our basic regression equation by dummying-out all September days from Tuesday 11th onwards.

With the HAC approach, the final equation parameters were estimated via OLS, assuming i.i.d. innovations, and the Newey&West correction to standard errors was adopted. As an alternative, Market model regressions with asymmetric GARCH gaussian shocks (Glosten, Jagannathan and Runkle, 1993) were also estimated by Maximum Liklelihood, using QML robust covariance matrix estimates (Bollerslev&Woolridge, 1992) to conduct inference. The model specification process was performed from general to specific, starting from GARCH(2,2) with first order asymmetry and eliminating parameters according to standard significance test results to improve the Bayes-Schwarz Information Criterion value while passing standard white-noise residuals tests. In almost all cases, except for two small-caps portfolios against the VW-Index, idiosyncratic shocks were represented by GARCH(1,1) processes without any leverage effect. Table 9 summarizes the main models' estimation results. We omit to present OLS results, since they were very close to ML's both in beta coefficients estimates, CAR's and hypothesis testing.

Table 9

Features of estimated Market Models vs. VW- and EW-Index

For each portfolio the following informations are displayed. Beta coefficients and p-values of their significance tests (in italics) are in the second column. Engle's ARCH(5) test results on each models' residuals are in the third column. The fourth column shows coefficients of determination and the values of the Bayes-Schwarz Criterion. The number of stocks in each portfolio are in the fifth column. GARCH specifications are described in the last column.

Portfolio	Beta	Engle Test	R^2 / BIC	N. Stocks	GARCH
		a. VW-Index			
Top50	0.82	4.19	0.921	50	(1,1) No leverage
	0.0000	*0.5227*	-7.2573		
Bottom50	0.49	2.48	0.809	50	(1,1) No leverage
	0.0000	*0.7789*	-6.8192		
BottomPBVsmall	0.38	7.20	0.712	35	(1,1) No leverage
	0.0000	0.206	-6.6202		
BottomPBVbig	0.75	1.98	0.829	15	(1,1) No leverage
	0.0000	*0.8529*	-6.2513		
MiddllePBVsmall	0.37	9.12	0.801	37	(2,2) Leverage
	0.0000	*0.1044*	-6.9194		
		b. EW-Index			
Top50	1.36	2.15	0.937	50	(1,1) No leverage
	0.0000	*0.8287*	-7.5218		
Bottom50	0.97	2.45	0.934	50	(1,1) No leverage
	0.0000	*0.7841*	-7.8575		
BottomPBVsmall	0.82	2.99	0.860	35	(1,1) No leverage
	0.0000	0.7018	-7.3478		
BottomPBVbig	1.31	3.03	0.873	15	(1,1) No leverage
	0.0000	0.6947	-6.6115		
MiddllePBVsmall	0.78	5.34	0.921	37	(1,1) No leverage
	0.0000	*0.3759*	-7.8203		

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