SPANISH POST-EARNINGS ANNOUNCEMENT DRIFT AND BEHAVIORAL FINANCE MODELS

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ABSTRACT

The aim of this paper is to check the robustness of the behavioural theories developed to explain the medium-term drift and long-term reversion in returns. Concretely, we realize an out-of-sample test of the models of Daniel et al (1998), Hong and Stein (1999) and Barberis, Shleifer and Vishny (1998) in two ways. First, by analysing the predictions of these models in the Spanish market and second, by examining the post-earnings announcement drift anomaly instead of the momentum anomaly. Our results show very little evidence in favour of the hypothesis used to test the validity of these models to explain this market anomaly in the Spanish market.

Keywords: post-earnings announcement drift, under-reaction, behavioural finance

JEL classification: G14, G11, M41

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1 INTRODUCTION

Several studies have shown the existence of systematic behaviour in abnormal returns after earnings announcements. Ball and Brown (1968) and Jones and Litzenberger (1970) find, in the US market, that post announcement stock prices continue to move in the same direction as the earnings surprise: positive (negative) surprises are followed by price increases (decreases). This return pattern is known as the "post-earnings announcement drift" anomaly (hereafter, PAD)[1] As Kothari (2001) suggests, this phenomenon provides a serious challenge to the market efficiency hypothesis because this anomaly has survived rigorous verification over the last three decades, and can not be totally explained through other documented anomalies.

Whether this phenomenon in stock returns reflects risk reward in an efficient market or the market's improper response to information is widely debated. Although the limitations and biases suffered by the first studies suggest that the risk explanation could be the source of this phenomenon, later studies show that once corrected for methodology and risk misspecification, the PAD phenomenon remains. For example, Fama (1998), after a deep analysis of the robustness of the methodologies used in the study of the different market anomalies, concludes that only two remain under suspicion: PAD and momentum.

The difficulty in explaining the PAD phenomenon with arguments consistent with the efficiency hypothesis has motivated a great amount of research that suggests a mispricing to earnings announcement information as

[1] For the UK market, Liu, Strong and Xu (2003) detect the presence of this phenomenon, even after controlling for risk and microstructure market effects. Dische (2002) observes the same phenomenon in the German market.

source of the PAD anomaly (Bernard and Thomas (1990), Bernard (1993), Ball and Bartov (1996), Soffer and Lys (1999), Bartov, Radhakrishnan and Krisky (2000) and Mikhail, Walther and Willis (2003)).

Several recent papers have developed market inefficiency (non-risk based) theories based on investors' information processing biases. This new paradigm, known as behavioural finance, is increasingly becoming a serious alternative to market efficiency in explaining many of the market anomalies observed over the past decades. Several models have been developed to give a consistent explanation to these anomalies, which can be condensed into: medium-term drift and long-term reversion in stock returns.

In the model of Barberis, Shleifer and Vishny (1998) investors show "conservative" bias, causing an initial under-reaction in prices, and the "representativeness" bias, according to which the returns finally experience over-reactions. According to the Daniel, Hirshleifer and Subrahmanyam (1998) model, investors suffer from the "overconfidence" and the "self-attribution" bias, which make them over-react to private information signals and under-react to public signals, so that on average, private news generates momentum in the medium term but the weight of public information finally produces a reversion in the long term. Hong and Stein (1999) propose a model where firm specific information is disclosed gradually among "informed investors", thus provoking an initial under-reaction. This under-reaction allows "momentum traders" to obtain profits following such trends. As more and more "momentum traders" enter the market, the initial under-reaction will cause a long-term overreaction.

Nevertheless, as Fama (1998) states, it is not surprising that these models explain the existing patterns they have been specifically designed to capture. It is necessary to generate new predictions or hypotheses based on these models and then test them empirically. Several studies have followed this suggestion. Daniel and Titman (1999) find, in the US market, that the momentum effect of Jegadeesh and Titman (1993) is higher in stocks with low BTM ratio. According to these authors this evidence supports the Daniel et al. (1998) model, given that the overconfidence bias will probably be higher when the pricing process is more ambiguous, as it could be with glamour or growth stocks. Hong, Lim and Stein (2000) test the gradual diffusion hypothesis of the

Hong and Stein (1999) model in the US market. Consistent with this hypothesis they find that the momentum effect is higher in small and low analyst coverage stocks.[2]

Although this evidence provides support for these two behavioural models[3], to assess the predictive ability of these models and rule out the possibility that these results are limited to the US market, it is necessary to check their robustness by confirming these results across other capital markets. In this sense, Doukas and McKnight (2005) find consistent results with the Hong and Stein (1999) model in an aggregate of European markets. Moreover, they demonstrate that the momentum effect is higher in stocks with low analyst forecast dispersion. They interpret this result as supportive of the Barberis et al. (1998) model. According to these authors, the effect of the "conservatism bias" should be greater when the weight (credibility) of the information is higher; this credibility could be measured by the analyst forecast dispersion.

Beyond the work of Doukas and Macknight (2005) there is little out-of-sample evidence regarding the robustness of these models. Given the high relevance reached recently by these theories in the financial literature, we think it could be interesting to provide extra evidence. The main contribution of this paper is to test the predictions of these three main behavioural finance models in the Spanish market and, additionally, check them with another of the most important and robust market anomalies: the post-earnings announcement drift.

Firstly, according to Chui, Titman and Wei (2005), the psychological biases could change from one country to another as a consequence of cultural differences, and this can have important implications in the explanation of the market anomalies. For this reason, we think that it is interesting to test these theories in different markets. Moreover, the Hofstede (2001) individualism index, used by Chui et al. (2005) to proxy for differences in psychological biases, shows important differences across European countries, thus advising against an aggregate countries test for these kind of models. In contrast to

[2] Also related with this line of study, Chan et al. (2004) test the conservatism and the representativeness biases using trends and consistency of accounting performance and find some evidence in support of the conservatism but not for the representativeness.

[3] Lee and Swaminathan (2000) show that past trading volume predicts both the magnitude and the persistence of momentum and suggest that the Daniel et al. (1998) and Hong and Stein (1999) model cannot explain their results.

Doukas and McKnight (2005), who focus on international return momentum strategies using an aggregate sample of 13 European countries, we address this issue by specifically focusing on the Spanish stock market.[4]

Secondly, this paper also contributes to the investigation into whether other pricing anomalies, instead of the momentum effect of Jegadeesh and Titman (1993), such as post-earnings announcement drift, support these behavioural finance models.[5] In this sense, Forner, Sanabria and Marhuenda (2006) find, for the period 1994-2003, significant evidence of post-earnings announcement drift in the Spanish market, highly robust to a risk-based explanation (including an economic conditional version of the CAPM and the Fama-French model in the style of Ferson and Harvey (1999)). This study also illustrates that, although momentum and PAD effects are related, the Spanish PAD phenomenon persists after a momentum effect control.[6]

We address this study using a sample that includes quarterly earnings. We have the exact announcement date which allows us a better location for the analysis window. We also include the following methodological issues. First, in addition to the earnings surprises measure based on the earnings time series, we use an alternative measure based on analysts' earnings forecasts. Second, following the line of several papers dedicated to the study of market anomalies, we focus on whether it is possible to implement an investment strategy that provides abnormal returns. In this sense, we use the portfolio calendar-time approach of Chan, Jegadeesh and Lakonishok (1996). The main advantage of this methodology over the traditional event-time scheme, commonly used in the studies on PAD, is that the proposed investment strategy can be implemented in real time.

The remainder of the paper is organised as follows. Section 2 provides the data, the earnings surprise measures used, and research design. Section 3

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[4] Moreover, they observe the pattern in stock returns is present in eight of the 13 analysed European markets but momentum profits do not occur in the Spanish market (Forner and Marhuenda (2006) also do not observe momentum in the Spanish market during the nineties)

[5] In this sense, we find some evidence that attribute this anomaly to information biases but it is limited to US market (Liang, 2003).

[6] There are previous studies in the Spanish market that analyse the effects of the earnings announcement on prices in the days around the announcement date (Arcas and Rees, 1999; Sanabria, 2005). Similar to the previous literature, they detect the stock prices react the earnings announcement day suggesting the informative content of them.

analyses the returns yielded by the PAD strategy. Section 4 is dedicated to test whether the behavioural models of Daniel et al. (1998), Hong and Stein (1999) and Barberis *et al.* (1998) are consistent with the PAD phenomenon in the Spanish market, and reviews the empirical results. And, Section 5 concludes.

2 DATA AND RESEARCH DESIGN

2.1 Data

The sample used for this study comprises 172 firms quoted on the Spanish capital market from January 1993 to December 2003. The available data are:

- Quarterly earnings announcement dates and the consolidated earnings data, or individual data when the consolidated are not available. Data obtained from the Records of Relevant Events as published on its website by the "Comisión Nacional del Mercado de Valores" (CNMV). This sample is composed of 5,283 firm-quarterly earnings announcements.
- Annual data of book value of firm's equity at the beginning of the year. These data are collected from the Records of Interim Financial Reports for all quoted Spanish firms, published by the CNMV. The firm's book equity is determined by consolidated earnings, subscribed capital, share premiums, reserves, revaluation reserves, consolidation reserves and results from previous years. We have deleted all negative data.
- Monthly data of analyst earnings consensus forecasts, number of analysts per firm, and the standard deviation of analysts' forecasts. They are collected from the database JCF Quant.
- Daily stock close prices for the Spanish market were obtained from the "Servicio de Interconexión de las Bolsas Españolas" (SIBE). Using this data, we calculate: (i) monthly stock returns adjusted by dividends, seasoned equity offerings and splits, and (ii) monthly value-weighted market returns, computed as the capitalization weighted average of the available stock returns in each month.

- We use one-month Treasury bill repo rates as a proxy of the return on the risk-free asset. This is calculated from the historical series of the "Boletin de la Central de Anotaciones" published by the Bank of Spain on its website.
- Monthly stock market capitalization, calculated as the number of shares issued multiplied by the stock price. The book-to-market ratio (BTM) is the book value of a firm's equity at the beginning of the year divided by the aforementioned market capitalization. Both variables are available from COMPUSTAT.

2.2 Measures of Earning Surprises

The PAD phenomenon assumes that, after an earnings announcement, returns show a drift with the same sign as the surprise in the earnings announcement. Consequently, it is necessary to define a measure of earnings surprise for each firm and announcement. We have used two different alternatives.

The first measure is the standardised unexpected earnings (SUE). The SUE for each company *i* and for each quarter *t* is given by,

$$SUE_{i,t} = \frac{X_{i,t} - E(X_{i,t})}{FP_{i,y}}, \qquad [1]$$

where $X_{i,t}$ is company *i*'s earnings for quarter *t*, $E\left(X_{i,t}\right)$ is expected earnings for quarter *t,* and $FP_{i,y}$ is the book value of the firm's equity at the beginning of the reported earnings year.[7] As expected earnings for the current quarter, $E\left(X_{i,t}\right)$, we use the earnings reported in the same quarter in the previous year: $X_{i,t-4}$.[8] In the Spanish market Reverte (2002) finds that, although additional variables improve the two- and three-year earnings predictions, for one-year predictions the current earnings are enough.

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[7] Rangan and Sloan (1998) and Narayanamoorthy (2003) use unexpected earnings based on a model of time-series data scaled by their market capitalization. We have checked our results to the use of other alternatives in the denominator of equation [1]: total assets, market capitalization and the standard deviation of unexpected earnings, instead of the book-value, and the results are quite similar.

[8] Foster, Olsen and Shevlin (1984) find that the random walk model performs as well as other more complex models.

The second measure of earnings surprise is based on revisions in analyst consensus earnings forecasts. As noted by Schipper (1991) and Lang and Lundholm (1996), analyst earnings forecasts are probably a good proxy of the information available to investors. In this sense, we measure earnings surprise as the change in analyst earnings forecasts divided by the absolute value of the prior consensus forecast[9]:

$$REV_{i,t} = \frac{FY_{i,t} - FY_{i,t-1}}{\left|FY_{i,t-1}\right|} \qquad [2]$$

where $FY_{i,t}$ is firm *i*'s consensus forecast of current fiscal year earnings (FY1) in month *t*. If the change of fiscal year (normally January) occurs in month *t,* the revision in analyst forecast will be the current year forecast (FY1) at month *t* minus the two-year forecast (FY2) at month *t-1*. [10]

An advantage of this measure is that it allows us to have monthly data, whereas with the previous measure we only have quarterly data. However, it has a possible disadvantage. As Chan et al. (1996) show, the analyst earnings forecasts can be affected by incentives such as the wish to encourage investors to trade and generate brokerage commissions.

2.3 Descriptive Analysis

Panel A of Table 1 shows, for both SUE and REV surprise measures, the mean, maximum and minimum number of stocks per month for each year of the sample period. It also reports the number of months without earnings surprises (0) or with a low number (between 1 and 10) throughout that year. To calculate the measure of surprise *SUE*, we need the data corresponding to the quarterly earnings announcement of the previous year. Accordingly, we only can

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[9] Hennessey (1995) and Doukas and McKnight (2005) use the same measure. Chan et al. (1996) scale the revisions in analyst consensus forecast by the stock's book value. Our results using this alternative denominator are quite similar.

[10] We have also used a third measure based on the prices immediately surrounding earnings announcements. Specifically, we have used the cumulative market-adjusted return in a four-day period around the announcement. This expression gives an indirect measure of earnings surprise, since it captures the earnings news reflected in stock prices immediately around the earnings announcement. However, returns are not significant when we use this measure. This result is consistent with Foster et al. (1984), who find that whereas standardized unexpected earnings (SUE) help to predict future returns, the abnormal returns around the earnings announcement do not have such power. Nevertheless they are opposed to the results of Liu, Strong and Xu (2003). These results are available for all interested readers.

compute this measure from 1994 onwards so we have decided to calculate the two measures from 1994 in order to present results for an analogous period.

As expected, the average number of earnings surprises by month is much greater with the *REV* measure, since this has a monthly periodicity whereas the other measure is quarterly. In addition, the average number of *SUE* surprises is quite reduced in the first year (1994) with 2 months without surprise data.

Panel B of Table 1 reports the average number of surprises for each of the 12 months of the year. On the one hand, we observe that the monthly number of *SUE* surprises is not homogenous, rejecting the hypothesis of equality throughout the different months of the year. In particular, we detect a significant concentration of surprises in the following months: February and March, tied to earnings of the fourth quarter; May, results of the first quarter; August, tied to the earnings of the second quarter, and November, results of the third quarter. On the other hand, the analyst forecasts measure has a stable monthly distribution. In fact, in this case, the hypothesis of equality among the number of surprises between the different months of the year is accepted.

2.4 Research Design: portfolio construction

In order to analyse the PAD, we construct portfolios based on earnings surprises, and test whether the best earnings surprise portfolios outperform, on average, the worst earnings surprise portfolios. Following the study of Chan *et al*. (1996) for the US market, these portfolios are constructed by calendar-time (at the beginning of every month) instead of event-time (that is, using the exact announcement date). This calendar-time approach has the advantage of providing an easy to implement investment strategy, since it resolves the problem of "look-ahead bias" (all the necessary information is available on the portfolio formation date). Moreover, it facilitates the construction of a self-financed portfolio (the buying and selling positions are made simultaneously).

The process of portfolio construction is as follows. First, at the beginning of every calendar month t (formation date) all the stocks with current return data and earnings surprises in the previous three months[11] are selected and ranked according to earnings surprise. In cases in which there are more than one earning surprises in the three previous months, we take the most recent. Next, three equally-weighted portfolios with the same number of stocks are constructed:[12] portfolio P1 corresponds to the 1/3 low surprises, portfolio P2 to the 1/3 medium surprises, and portfolio P3 to the 1/3 high surprises. These portfolios are held for the next 3, 6, 9 and 12 months (holding period). Then, a zero-cost investment strategy that buys the P3 portfolio and short-sells the P1 portfolio is formed (PAD strategy).

Since we require earning surprise data for the previous three months, along with the small number of available observations of *SUE* surprises in the first months of year 1994, we have chosen the beginning of January 1995 as the first formation date for all cases.

In order to study the PAD strategy behaviour, we analyse its average cumulative return throughout the 12 months after its formation date. We use the buy-and-hold procedure. This method allows us to obtain the actual return that an investor would obtain if he invested in the portfolio and kept it during the whole holding period without making any adjustment[13],

$$CR_{p,T} = \frac{\sum_{i=1}^{n_c}\left[\left(\prod_{t=1}^{T}(1+R_{i,t})-1\right)\right]}{n_c}; \quad p = P1, P2, P3; \quad T = 1,2,\ldots,12 \qquad [3]$$

where $CR_{p,T}$ represents the cumulative return of portfolio *p* in the *T* months after the formation date and n_p is the number of stocks in the portfolio.

[11] Given the unequal monthly distribution of the *SUE* surprises, forming the portfolios according to the previous month's surprise will result in very low diversified portfolios in some formation dates.

[12] Given the small cross section of the Spanish stock market, we consider it more appropriate to work with three portfolios instead of quintiles or deciles, in order to improve the portfolio diversification.

[13] Two alternative procedures exist to calculate a portfolio cumulative return: the additive and the rebalancing. The former does not exactly measure the portfolio cumulative return throughout the analysed period but its average monthly return. The second one implicitly involves an investment strategy that changes the portfolio composition month by month in order to keep the portfolio equally-weighted throughout the holding period. In any case, the buy-and-hold procedure has mainly been used in the financial literature for diverse reasons. Among them, the price spread bias seems to have less impact on the buy-and hold procedure and, the rebalancing procedure looks less attractive in terms of transaction costs and, perhaps, less fitted for a medium/long investment horizon.

Throughout the period 01/95-12/03 a total of 108 portfolios are constructed, as these are formed at the beginning of each calendar month. Therefore, we have a series of 108 cumulative returns:

$$\left\{CR_{p,T,f}; \quad f=1,2,3,...,108\right\}; \quad p=P1, P2, P3; \quad T=1,2,...,12 \qquad [4]$$

where $CR_{p,T,f}$ is the cumulative return throughout the T months after the formation date f of portfolio *p*. The first formation date $f=1$ is the beginning of January 1995, the second $f=2$ is the beginning of February 1995, and so on.

The PAD cumulative returns are the difference between the high earnings surprise and low earnings surprise portfolio cumulative returns,

$$\left\{CR_{PAD,T,f}, \ f=1,2,...,108\right\}; \quad CR_{PAD,T,f}=CAR_{P3,T,f}-CAR_{P1,T,f}; \quad T=1,2,...,12 \qquad [5]$$

For last formation dates, it is not possible to calculate all the cumulative returns. For the portfolios constructed on the last formation date $f=108$ (beginning of December 2003), only the cumulative return in the first month of the holding period can be calculated, for the portfolio constructed on the second to last formation date $f=107$ (beginning of November 2003), only the cumulative return along the first two months can be calculated, and so on. Therefore, only the series of cumulative returns for the first month of the holding period, $T=1$, will have 108 observations. This number reduces for longer time horizon cumulative returns, $T>1$. Moreover, for $T>1$, the series of cumulative returns are overlapping and therefore they have an autocorrelation problem that must be considered in the statistical tests.

Along with this first approach, which allows us to know how the portfolio return performs on average in the months following the formation date, we also apply a second alternative approach. It consists of calculating the return an investor would have obtained in every calendar month, if he had followed the sequence of purchases and sales of the PAD strategy at the beginning of each month, and had held these positions for h=3, 6, 9, 12 months. This return is computed as the average return of all stocks implied in the strategy that month. It is important to understand that in calendar month *t*, the PAD strategy is formed by the high earnings surprise portfolio (*P3*) and low earnings surprise portfolio (*P1*) constructed in the last *h* formation dates. Therefore, every calendar month we will have *h* portfolios *P3* and *P1*, reviewing *1/h* of their stocks at the beginning of each month. For example, in calendar month *t*, the PAD strategy with a holding period of *h=3* will be formed by portfolios *P3* and *P1* constructed at the beginning of months *t-2*, *t-1* and *t*. At the beginning of the next calendar month, *t+1*, the position hold on portfolios *P3* and *P1* constructed in the month *t-2* will be eliminated and replaced by the new portfolios.

Following this procedure we obtain a return for each calendar month and for each portfolio:

$$\left\{R_{p,t};\quad t = 01/95, 02/95, ..., 12/03\right\};\quad p = P1, P2, P3 \qquad [6]$$

where $R_{p,t}$ is the return in calendar month *t* of portfolio *p*.

As before, the PAD return each calendar month is the difference between the high and low earnings surprise portfolios,

$$\left\{R_{PAD,t} = R_{P3,t} - R_{P1,t};\quad t = 01/95, 02/95, ..., 12/03\right\} \qquad [7]$$

The return for each calendar month *t* can be calculated as an equally-weighted average of the returns of the portfolio stocks that month. In this case, we are assuming that the portfolios rebalance their composition each month throughout the holding period to keep the initial equal-weight: rebalancing portfolios. Another alternative consists of keeping the portfolios throughout the holding period without making any readjustment: buy-and-hold portfolios. In this case, since the portfolios lose their initial equal-weight as their stocks returns differ, it is first necessary to obtain the weight of each stock inside the portfolios each calendar month. As in the previous approach, we have decided to use buy-and-hold portfolios given their advantages over rebalancing portfolios, mainly from the point of view of transaction costs. These weights are also used when we calculate the size and BTM characteristics of the portfolios.

Finally, an important question to consider is what happens when a stock is de-listed during the holding period. We have decided to replace the de-listed stock return by the average return of the remaining stocks in the portfolio. If the

PAD effect really exists, the most logical strategy is to invest the amount obtained by the liquidation of the de-listed stock in the remaining titles in the portfolio.

3 POST-ANNOUNCEMENT DRIFT PROFITS

In this section we study price behaviour after the earnings announcement, analysing the average returns provided by the PAD strategy.

Table 2 shows the average cumulative return throughout the twelve months after the formation date, equation [5]. The autocorrelation consistent Newey-West p-values are in brackets. For both earnings surprise measures, the PAD strategy yields positive and statistically significant cumulative returns for almost every month of the holding period. However, the highest returns are obtained when portfolios are constructed according to the *SUE* measure.

Table 3 shows the average monthly returns that an investor would have obtained if he had made the sequence of monthly purchases and sales of the PAD strategy with holding periods of 3, 6, 9 and 12 months, equation [7]. The second row of each panel shows the t-standard p-values.

The results obtained with this second approach are consistent with those observed in the previous analysis. The PAD strategy yields positive and statistically significant returns, for all the holding periods, both with *SUE* and *REV* measures. Moreover, higher return levels are obtained, in general, with the first surprise measure. Therefore, this evidence suggests that the PAD phenomenon has a longer time effect when we use earnings series than when we use analyst forecasts. In addition, the results show the existence of a decreasing relationship between the PAD return and the holding period length.[14]

Given that the Jarque-Bera test broadly rejects the normality hypothesis for most of the strategy returns series, we have checked the robustness of the previous results by using a bootstrap analysis to compute the p-values. Concretely, we have used the procedure proposed by Lyon, Barber and Tsai

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[14] In order to check the robustness to the possible effect of the bid-ask bounce and lead-lag effects, we have replicated the analysis with a month skip between the ranking period and the holding period. The results are quite similar and are available to any interested parties.

(1999), who apply the bootstrap methodology to the asymmetry adjusted t-statistic developed by Johnson (1978). This methodology has been applied using 10,000 repetitions with replacement and *bootstrap* samples with the same size as the original sample, that is 120 observations. P-values obtained with these two alternative procedures are quite similar.

As Forner, Sanabria and Marhuenda (2006) demonstrate, Spanish PAD returns are robust to a large number of adjustments: unconditional and conditional versions of the CAPM and the Fama-French three factor model, control portfolios and momentum. In the next section, we will analyse this phenomenon in the context of the behavioural models. To simplify the presentation of results, we only analyse the 6 month holding period.

Figure 1 shows the evolution of the PAD strategy cumulative average return calculated using the event-time return series, $\overline{CR}$, for the 3 years following formation date.[15] The PAD strategy with SUE measure continues yielding significant profits until 26 months after the formation date and the PAD strategy with REV measure until 18 months. However, from this moment, the payoffs of both strategies revert sharply.

Therefore, the behaviour detected in the PAD strategy during the post-holding period, instead of being consistent with a risk-based explanation, seems to be closer to the inefficient market explanations. On the one hand, if PAD profits are originated by a market under-reaction, we should expect that once prices reach their intrinsic value, the PAD strategy will stop giving profits. On the other hand, if the PAD source is a delayed overreaction of the market, we should expect that, once the market realises that the stocks are over-priced, their prices will drop to their intrinsic value, and therefore, the PAD strategy will generate negative returns. Notwithstanding, a post-holding reversion of PAD profits is also consistent with the combined PAD profits source, i.e. initial under-reaction and later over-reaction.

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[15] I.e., returns are calculated as in equation [3] but with a 36 month holding period:

$$CR_{p,\lambda} = \frac{\sum_{i=1}^{n_p} \prod_{z=1}^{\lambda} (1 + R_{i,z})}{n_p} - 1; \quad \lambda = 1, ..., 36$$

Given the results shown in Figure 1, the reversion observed by the PAD strategy seems to point to either a delayed market overreaction or an under-reaction followed by a posterior overreaction.[16]

4 TESTING BEHAVIORAL MODELS

So far the detected evidence suggests the explanation of the PAD effect could be near the behavioural models thesis. In this section we test the behavioural models of Daniel et al. (1998), Hong and Stein (1999) and Barberis et al. (1998). All the tests shown in this section follow a calendar-time approach.

4.1 PAD versus BTM

The model of Daniel et al. (1998) is based on investors' "overconfidence" bias. According to Daniel and Titman (1999), this confidence excess will probably have a greater effect when ambiguity is high, as it could be with stocks with a low BTM ratio (growth stock). Therefore, it is possible to check this model by testing whether PAD is stronger in growth than in value stocks.[17]

In order to test that possibility we set up nine portfolios by classifying stocks according to a double criterion: the last earning surprise and its BTM ratio at the end of the formation period. More specifically, in each formation date three portfolios are created on the basis of past earnings surprise (P1, P2 and P3), and independently and simultaneously we create 3 portfolios based on BTM ratio (BTM1, BTM2 and BTM3). In both cases we use the 1/3 and 2/3 percentiles as the breaking points, so portfolio P1(BTM1) is made up of the 1/3 of stocks with lower past earning surprise (lower BTM ratio) and portfolio P3 (BTM3) by the 1/3 of stocks with greater earning surprise (higher BTM ratio). When we match the previous portfolios, we obtain a total of nine portfolios. For example, portfolio P1 x BTM1 will be made up by the stocks that belong

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[16] This reversion observed in Spanish PAD profits is consistent with the results obtained by Forner and Marhuenda (2003). They demonstrate that the contrarian strategy provides abnormal positive returns when using five-year time horizons, evidence consistent with a market overreaction.

[17] In order to construct portfolios based on size and BTM ratio characteristics in all this section, we require this kind of data to be available in the last month of the formation period and at least in the first month of the holding period. PAD strategies using this new restricted database continue to be highly significant and are quite similar to those results obtained in Tables 2 and 3 with the non-restricted sample. This data is available for all interested readers.

simultaneously to portfolios P1 and BTM1. This procedure allows us to properly analyse each of the variables by controlling for the other.

Table 4 shows the average return and CAPM and Fama&French alphas for each of the previous nine portfolios as well as the portfolios resulting from buying the upper percentile and selling the lower. The last two rows show the size and the BTM characteristics of the three size partitions. For the *SUE* measure, Panel A, the PAD returns increase monotonously with the BTM level, with significant profits only in the medium and high BTM levels (although at 10% significance for the medium level). Moreover, these results remain when we adjust for risk. So, this evidence is opposed to what is expected if the PAD phenomenon had its origin in the arguments proposed by the Daniel et al (1998) model. For the *REV* measure, Panel B, the PAD strategy yields significant profits (raw and risk-adjusted) for all the BTM levels. Hence, these results are also not supportive of the arguments proposed by the Daniel et al. (1998) model.

4.2 PAD versus Size

According to the Hong and Stein (1999) model, the returns trend is originated by a slow diffusion of firm-specific information across investors. Hong et al. (2000) tested this model using two proxies of the diffusion speed: size and analyst coverage. Following these authors, in this section we use the size variable as a first proxy of diffusion speed. It seems plausible that information on smaller firms disseminates more slowly. It would occur if for example, small investors face fixed costs in information acquisition, and therefore decide to spend a greater effort to improve their knowledge on those stocks in which they may take a large position. Based on this model, PAD should be stronger in small firms. In order to test this assumption, we proceed as in the previous case but using firm size instead of BTM ratio. In this way we obtain a total of nine portfolios on the basis of the twofold past earning surprise and size criterion.

Table 5 shows the results for these portfolios. For the *SUE* measure, Panel A, we observe that the only significantly positive returns (raw and risk-adjusted) are those of the small firms. This evidence is consistent with the model proposed by Hong and Stein (1999). However, for the *REV* measure, Panel B, we observe that PAD profits, both raw and risk-adjusted, are significant in each one of the size levels. Therefore, we do not observe stronger PAD returns in small stocks, result that is initially inconsistent with the Hong and Stein (1999) model.

4.3 PAD versus analyst coverage

As indicated by Hong et al. (2000), although size is indeed a useful measurement of the information diffusion degree, it can also account for other aspects, and could introduce confusion into the conclusions drawn. In this sense, Merton (1987) and Grossman and Miller (1988) argue that the market makers' or arbitrageurs' ability may be smaller in stocks with lower market capitalisation. For example, if there is any supply shock it may lead to a greater trend towards reversions (i.e. negatively correlated returns) in small stocks, which would confuse the effect of the gradual information diffusion we are interested in testing here.

For this reason, Hong et al. (2000) propose an alternative measurement of the information diffusion degree: analyst coverage. This is measured as the number of analysts following a particular firm at a given time. The idea is that the stocks with less analyst coverage should be those in which firm-specific information disseminates more slowly across investors. Our objective in this section is to test whether the PAD strategy works better in stocks with less analyst coverage. However, due to the high correlation between the size and analyst coverage (0.4151), it is necessary to control for the size impact on analyst coverage. Therefore, instead of ranking stocks directly according to the number of analysts following a firm, we will do it on the basis of residual analyst coverage calculated with the following regression residuals:[18]

$$Log(1+number\ of\ \ analysts)=cte+Log(size)+e \qquad [8]$$

Table 6 shows average return and CAPM and Fama-Frech three-factor model adjusted returns of each of the nine portfolios resulting from sorting

[18] A regression is made for the cross-section of each calendar month. We have also included as explanatory variable in equation (8) the log(BTM) and the results are quite similar.

stocks according to the earnings surprise and residual analyst coverage, using the same procedure as the previous sections. The last two rows show the size and the analyst coverage characteristics of the three coverage partitions.

For the SUE measure the PAD strategy is only profitable in the middle coverage partition, while for the REV measure the PAD strategy is profitable for the different levels of residual analyst coverage. These results remain when we use risk-adjusted returns. Therefore, we do not observe a stronger PAD in stocks with a lower coverage, as we should expect according to the model of Hong and Stein (1999).

4.4 PAD versus analyst forecast dispersion

In the model of Barberis et al. (1998) investors show the conservative bias identified by Edwards (1968), under-reacting to information that has a high weight when they adjust their beliefs. Following Doukas and McKnight (2005), in this section we test this model using the dispersion in analyst earnings forecast as a proxy for the weight (credibility) of information. The dispersion is defined as the standard deviation of analysts' current year annual earnings per share forecasts scaled by the absolute value of the mean earnings forecast at the beginning of the forecast year. The larger (smaller) the dispersion in earnings forecasts among analysts, the lower (higher) the credibility of the forecast (i.e. the weight of new information). So, according to this approach, we should expect to find higher PAD profits in the stocks with low analyst forecast dispersion.

Table 7 shows average return and CAPM and Fama-Frech three-factor model adjusted returns of each of the nine portfolios resulting from sorting stocks according to the earnings surprise and analysts' earnings forecast dispersion, in a similar way to the previous sections. The last two rows show the size and the forecast dispersion characteristics of the three dispersion partitions.

For the *SUE* measure, the PAD returns increase monotonously with the dispersion level, and the PAD strategy is only significantly profitable in the high dispersion level. These results remain when we adjust for risk. So, this evidence is opposed to what is expected if the PAD phenomenon had its origin in the arguments proposed by the Barberis et al. (1998) model. For the *REV* measure, the PAD strategy yields significant profits (raw and risk adjusted) for all the dispersion levels. Consequently, these results are also not supportive of the arguments proposed by the Barberis et al. (1998) model. [19]

4.5 A cross-sectional regression analysis

In this section we test the previous hypothesis using a cross-sectional regression approach. The PAD phenomenon states that the post-earnings announcement returns are positively correlated with the disclosed earnings surprise. Therefore, we can test the previous hypothesis by analysing the cross-sectional relation between this correlation and the different characteristics of the stocks (BTM, size, analyst coverage, and forecast dispersion).

Specifically, at the beginning of each year *t* we collect all stocks with complete return and *REV* data through year *t+3*. Then, we estimate for each stock *i* the serial correlation between the six-month excess returns (relative to the risk-free return) and the *REV* data in the previous month, using 30 overlapping observations over the three-year period from *t* to *t+3*:

$$R_{i,[\tau+1:\tau+6]} = c_i + \theta_i \cdot SUE_{i,\tau} + e_{i,\tau} \qquad \tau = 1,2,3,...,30 \qquad [9]$$

Next, for each year *t* we perform a cross-sectional regression, running $\theta_{t,i}$ against log(BTM), log(Size), log(1+number of analysts) and earnings forecast dispersion. All the right-hand-side variables are measured at the beginning of the year *t*.

Table 8 shows the coefficients of these cross-sectional regressions estimated each year over the 9 years from 1995 to 2001. We stop in 2001 because we require three years of data after year *t* to estimate $\theta_{t,i}$. We also aggregate the annual information using the Fama-MacBeth (1973) time-series averages of the coefficients.

[19] In order to construct portfolios based on analyst dispersion characteristics, we require this kind of data to be available in the last month of the formation period and at least in the first month of the holding period. PAD strategies using this new restricted database continue to be highly significant and are quite similar to those results obtained in Tables 2 and 3 with the non-restricted sample. This data is available for all interested readers.

The results of this cross-sectional analysis confirm the evidence observed for the *REV* measure in the previous sections with the two-fold-rank portfolio approach. The coefficients are not statistically significant, so the PAD phenomenon does not seem to be stronger in stocks with some particular characteristics of BTM, size or analyst coverage. The exception is the forecast dispersion coefficient, which is statistically significant, but with the sign opposed to the expected according to the Barberis et al. (1998) model. Therefore, the results of this alternative analysis provide extra evidence against these behavioural models explaining the PAD phenomenon in the Spanish stock market.

5 CONCLUSIONS

In this paper we conduct an out-of-sample test of three of the main behavioural models, those of Daniel et al. (1998), Barberis et al. (1998) and Hong and Stein (1999), checking these theories with the post-earnings announcement phenomenon in the Spanish market.

Previous evidence on the PAD effect in the Spanish stock market shows that neither the unconditional CAPM and Fama-Frech (1993) models nor a conditional version of these models can explain this phenomenon. This means that the reasoning based on assumed risk level fails to explain PAD profits.

Moreover, the findings that the PAD profits do not remain in a post-holding period, but on the contrary show a reversion, seem to suggest an overreaction or under-reaction followed by an overreaction as sources for this effect, as defended by behavioural finance theories. With regard to this evidence, it is interesting to test the previously mentioned behavioural models in the Spanish market.. Following the studies of Daniel and Titman (1999), Hong et al. (2000) and Doukas and McKnight (2005), we study whether the PAD effect is located or is stronger for stocks with a particular BTM ratio, size, analyst coverage and analyst earnings forecast dispersion.

The results show little evidence in favour of the hypothesis used to test the validity of these models to explain the PAD effect in the Spanish market. Except for the evidence of PAD profits concentrated in small firms when the

SUE measure is used (which is consistent with the information diffusion hypothesis of the Hong and Stein model), all the other results are not consistent with the expectations of the behavioural models. Moreover, some results are in the opposite sign to the expected.

These results do not support the evidence found in the US market, as well as in the aggregate of several European countries. In our opinion, this discrepancy could be explained because these behavioural theories are constructed on the basis of psychological biases, which could be different across countries as a consequence of cultural differences. In this sense, the "individualism" index of Hofstede (2001) is markedly lower in Spain than in the US as well as the other European countries analysed by Doukas and McKnight (2005). So, if we consider this index as a good proxy of the cognitive biases, Chui et al (2005), this could be a reason why these models do not work in the Spanish market.

We consider this evidence is important for the behavioural finance literature since it highlights that the good performance of these behavioural models can depend on the cultural characteristics of each specific market.

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TABLE 1

Descriptive analysis of the number of earnings surprises.

PANEL A: Average. maximum. and minimum number of monthly observations for each year of the sample period and for both earnings surprise measures - *SUE* and *DOUKAS*- as well as the number of months with a low number of surprises (between 1-10) or without surprises (0). *SUE* is the difference between the current quarter earning and the earning reported in the same quarter of the previous year. divided by the book value of firm's equity at the beginning of the current year; *REV* is the change monthly in the mean consensus analysts forecast in expected earnings scaled by the absolute mean value of prior earnings consensus forecast. PANEL B: Average number of stocks with earnings surprises for each of the 12 months of the year.

PANEL A

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Mean	17.1	29.1	39.8	40.3	40.0	38.8	39.2	40.0	37.7	35.6
	Min.	0	1	1	4	2	2	1	1	1	0
SUE	**Max.**	65	99	99	98	91	84	97	96	89	86
	0	2	0	0	0	0	0	0	0	0	1
	1-10	6	5	3	2	2	2	2	2	3	1
	Mean	25.2	34.8	44.1	66.3	76.1	88.4	94.4	98.5	98.1	97.4
	Min.	24	32	37	55	72	79	93	96	94	94
REV	**Max.**	31	37	55	73	79	93	96	100	103	100
	0	0	0	0	0	0	0	0	0	0	0
	1-10	0	0	0	0	0	0	0	0	0	0

PANEL B

	Month of the year												
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	χ^2
SUE	9.8	**59.3**	**48**	18.2	**74.5**	2.4	35.4	**49.9**	26.8	23.6	**79.2**	1.7	4215.3*
REV	69.3	70.1	71.1	71.5	72.2	72.3	72.8	73.8	74.8	76.2	75.9	72.7	0.939

TABLE 2

PAD average cumulative return throughout the twelve months after the formation date.

Average cumulative return of the cost-zero investment strategy that buys the best earnings surprise portfolio (P3) and sells the worst surprises portfolio (P1) throughout the 12 months after the formation date [$\overline{CR}$], as well as the Newey-West and *bootstrap* p-values. 1995-2003

		Month after formation date											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
PANEL A: *SUE*													
$\overline{CR}_{PAD}$ %		1.044	1.648	2.557	3.257	3.800	4.065	4.449	4.662	4.786	4.939	5.251	6.041
P-val.	***N-W***	[0.002]	[0.001]	[0.000]	[0.000]	[0.000]	[0.003]	[0.007]	[0.015]	[0.030]	[0.051]	[0.057]	[0.043]
	Boot	[0.000]	[0.000]	[0.000]	[0.000]	[0.007]	[0.029]	[0.058]	[0.105]	[0.166]	[0.195]	[0.131]	[0.082]
PANEL B: *REV*													
$\overline{CR}_{PAD}$ %		0.875	1.308	2.268	2.625	3.409	3.612	3.689	3.775	4.221	4.288	4.231	4.381
P-val	***N-W***	[0.004]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.000]	[0.001]	[0.000]
	Boot	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

TABLE 3

PAD average monthly return for different holding periods.

Average monthly calendar-time returns, $\overline{R}$ **,** of the cost-zero investment strategy that buys the best earnings surprise portfolio (P3) and sells the worst surprise portfolio (P1), and keeps these positions during the next *h* months. P-values are calculated with OLS as well as with bootstrap. 1995-2003

	PANEL A: *SUE*				**PANEL B:** *REV*			
	h				*h*			
	3	**6**	**9**	**12**	**3**	**6**	**9**	**12**
$\overline{R}$%	0.7292	0.6386	0.5248	0.4926	0.7461	0.5824	0.4450	0.2928
OLS p-value	[0.003]	[0.009]	[0.027]	[0.023]	[0.000]	[0.003]	[0.010]	[0.055]
Bootstrap p-value	[0.003]	[0.004]	[0.022]	[0.019]	[0.000]	[0.004]	[0.014]	[0.066]

TABLE 4

PAD strategies sorting by BTM ratio.

Average return [$\overline{R}$], CAPM and Fama&French alpha of the calendar returns of the strategies formed by earning surprise [P1, P2 and P3] and BTM ratio [BTM1, BTM2 and BTM3], as well as the zero investment strategies resulting from selling and buying the extreme portfolios. The portfolios are constructed using the 1/3 and the 2/3 percentiles. Holding periods of 6 month. The BTM ranking has been made with the data at the end of the formation period. 1995-2003 period. The last two rows show the averaged Size and BTM characteristics.

PANEL A: SUE

		BTM			
		BTM1	**BTM2**	**BTM3**	**BTM3-BTM1**
P1 (Worst)	**R %**	1.5569 [0.031]	1.0171 [0.053]	1.0711 [0.069]	-0.4857 [0.286]
	Alfa-CAPM %	0.2758 [0.562]	-0.1066 [0.703]	-0.0748 [0.840]	-0.3506 [0.441]
	Alfa-F&F%	0.4957 [0.282]	-0.1469 [0.590]	-0.3277 [0.311]	-0.8234 [0.061]
P2	**R %**	1.2519 [0.020]	1.3842 [0.003]	2.0517 [0.000]	0.7998 [0.018]
	Alfa-CAPM %	0.0938 [0.723]	0.3495 [0.172]	0.9713 [0.003]	0.8775 [0.010]
	Alfa-F&F%	0.3693 [0.133]	0.3858 [0.144]	0.7179 [0.014]	0.3486 [0.205]
P3 (Best)	**R %**	1.2469 [0.033]	1.6292 [0.005]	2.6924 [0.000]	1.4455 [0.000]
	Alfa-CAPM %	0.0447 [0.887]	0.5310 [0.163]	1.3837 [0.004]	1.3390 [0.001]
	Alfa-F&F%	0.2179 [0.480]	0.4984 [0.167]	1.1075 [0.010]	0.8896 [0.011]
P3-P1	**R %**	-0.3100 [0.518]	0.6121 [0.084]	1.6212 [0.000]	1.1355 [0.045]
	Alfa-CAPM %	-0.2310 [0.634]	0.6376 [0.077]	1.4586 [0.000]	1.1080 [0.054]
	Alfa-F&F%	-0.2778 [0.578]	0.6454 [0.081]	1.4352 [0.001]	0.6118 [0.275]
	Mean Size	4244.38	2832.54	784.73	-3459.65
	Mean BTM	0.3306	0.6131	1.1591	0.8286

PANEL B: REV

		BTM			
		BTM1	**BTM2**	**BTM3**	**BTM3-BTM1**
P1 (Worst)	**R %**	0.7166 [0.234]	1.1558 [0.050]	1.4852 [0.016]	0.7686 [0.026]
	Alfa-CAPM %	-0.5451 [0.069]	-0.0946 [0.728]	0.2732 [0.448]	0.8183 [0.020]
	Alfa-F&F%	-0.4471 [0.135]	-0.1527 [0.552]	0.1195 [0.712]	0.5666 [0.090]
P2	**R %**	1.3652 [0.014]	1.6226 [0.002]	1.9268 [0.001]	0.5616 [0.063]
	Alfa-CAPM %	0.1961 [0.484]	0.5372 [0.080]	0.7852 [0.021]	0.5892 [0.055]
	Alfa-F&F%	0.3874 [0.166]	0.4561 [0.137]	0.6491 [0.043]	0.2617 [0.340]
P3 (Best)	**R %**	1.506 [0.012]	1.6993 [0.001]	2.1523 [0.001]	0.6463 [0.105]
	Alfa-CAPM %	0.2651 [0.386]	0.5821 [0.035]	0.9346 [0.010]	0.6695 [0.099]
	Alfa-F&F%	0.5189 [0.088]	0.6122 [0.024]	0.7718 [0.022]	0.2529 [0.482]
P3-P1	**R %**	0.7894 [0.009]	0.5435 [0.026]	0.6671 [0.005]	1.4357 [0.000]
	Alfa-CAPM %	0.8102 [0.008]	0.6767 [0.004]	0.6614 [0.006]	1.4797 [0.000]
	Alfa-F&F%	0.966 [0.002]	0.7649 [0.002]	0.6523 [0.009]	1.2189 [0.002]
	Mean Size	4691.37	3577.92	1289.69	-3401.69
	Mean BTM	0.3050	0.5738	1.0168	0.7118

TABLE 5

PAD strategies sorting by Size.

Average return [$\overline{R}$], CAPM and Fama&French alpha of the calendar returns of the strategies formed by earning surprise [P1, P2 and P3] and Size [S1, S2 and S3], as well as the zero investment strategies resulting from selling and buying the extreme portfolios. The portfolios are constructed using the 1/3 and the 2/3 percentiles. Holding periods of 6 month. The Size ranking has been made with the data at the end of the formation period. 1995-2003 period. The last two rows show the averaged Size and BTM characteristics.

PANEL A: SUE

		Size							
		S1		**S2**		**S1**		**S2**	
P1 (Worst)	**R %**	1.0336	[0.144]	1.2236	[0.021]	1.0921	[0.063]	0.0585	[0.916]
	Alfa-CAPM %	-0.1964	[0.694]	0.1378	[0.667]	-0.1245	[0.683]	0.072	[0.898]
	Alfa-F&F%	-0.2036	[0.605]	0.0928	[0.775]	-0.2819	[0.363]	-0.0783	[0.860]
P2	**R %**	1.7517	[0.003]	1.3717	[0.004]	1.6004	[0.002]	-0.1513	[0.716]
	Alfa-CAPM %	0.6372	[0.114]	0.3852	[0.190]	0.4483	[0.052]	-0.1889	[0.655]
	Alfa-F&F%	0.4349	[0.200]	0.4524	[0.132]	0.5939	[0.011]	0.159	[0.635]
P3 (Best)	**R %**	2.303	[0.001]	1.401	[0.012]	1.3188	[0.017]	-0.9843	[0.024]
	Alfa-CAPM %	1.0485	[0.027]	0.2547	[0.418]	0.1668	[0.579]	-0.8817	[0.044]
	Alfa-F&F%	0.9543	[0.025]	0.26	[0.397]	0.2369	[0.447]	-0.7174	[0.047]
P3-P1	**R %**	1.2694	[0.004]	0.1774	[0.560]	0.2266	[0.562]	0.2852	[0.589]
	Alfa-CAPM %	1.2449	[0.006]	0.1169	[0.704]	0.2913	[0.462]	0.3633	[0.497]
	Alfa-F&F%	1.158	[0.011]	0.1673	[0.599]	0.5188	[0.199]	0.4406	[0.296]
	Mean Size	125.01		592.39		7388.62		7263.61	
	Mean BTM	0.9441		0.6327		0.5189		-0.4252	

PANEL B: REV

		Size							
		S1		**S2**		**S1**		**S2**	
P1 (Worst)	**R %**	1.0634	[0.109]	1.2574	[0.030]	1.1215	[0.057]	0.0581	[0.895]
	Alfa-CAPM %	-0.1596	[0.714]	0.0564	[0.852]	-0.1742	[0.413]	-0.0146	[0.974]
	Alfa-F&F%	-0.2735	[0.445]	0.0257	[0.932]	-0.1392	[0.525]	0.1343	[0.698]
P2	**R %**	1.6027	[0.017]	1.7267	[0.002]	1.5466	[0.002]	-0.0562	[0.900]
	Alfa-CAPM %	0.4164	[0.368]	0.6064	[0.060]	0.427	[0.058]	0.0106	[0.981]
	Alfa-F&F%	0.3677	[0.375]	0.6246	[0.059]	0.493	[0.034]	0.1252	[0.741]
P3 (Best)	**R %**	1.7196	[0.011]	1.7865	[0.001]	1.707	[0.003]	-0.0126	[0.980]
	Alfa-CAPM %	0.4902	[0.269]	0.6603	[0.022]	0.4929	[0.056]	0.0027	[0.996]
	Alfa-F&F%	0.4639	[0.252]	0.6693	[0.022]	0.5788	[0.027]	0.1149	[0.798]
P3-P1	**R %**	0.6562	[0.015]	0.5291	[0.023]	0.5855	[0.016]	0.6436	[0.196]
	Alfa-CAPM %	0.6498	[0.017]	0.6039	[0.009]	0.6671	[0.006]	0.6525	[0.198]
	Alfa-F&F%	0.7374	[0.008]	0.6436	[0.007]	0.718	[0.005]	0.8523	[0.036]
	Mean Size	173.29		789.85		8732.03		8558.74	
	Mean BTM	0.8334		0.5841		0.4642		-0.3692	

TABLE 6

PAD strategies sorting by residual analyst coverage.

Average return [$\overline{R}$], CAPM and Fama&French alpha of the calendar returns of the strategies formed by earnings surprise [P1, P2 and P3] and residual analyst coveraged [Cov1, Cov2 and Cov3], as well as the zero investment strategies resulting from selling and buying the extreme portfolios. The portfolios are constructed using the 1/3 and the 2/3 percentiles. Holding periods of 6 month. The residual analyst coveraged ranking has been made with the data at the end of the formation period. 1995-2003 period. The last two rows show the averaged Size and residual analyst coverage characteristics.

PANEL A: SUE

		Residual Analyst Coverage			
		Cov1	**Cov2**	**Cov1**	**Cov2**
P1 (Worst)	**R %**	1.0757 [0.016]	1.4207 [0.044]	1.2928 [0.051]	0.2171 [0.591]
	Alfa-CAPM %	0.1349 [0.644]	0.1649 [0.727]	-0.0501 [0.877]	-0.1849 [0.575]
	Alfa-F&F%	0.0804 [0.788]	0.1862 [0.634]	-0.2445 [0.438]	-0.3249 [0.334]
P2	**R %**	1.7736 [0.000]	1.4954 [0.007]	1.4096 [0.009]	-0.364 [0.242]
	Alfa-CAPM %	0.8184 [0.005]	0.3563 [0.251]	0.2313 [0.334]	-0.5872 [0.041]
	Alfa-F&F%	0.7982 [0.009]	0.3827 [0.200]	0.2841 [0.242]	-0.5141 [0.083]
P3 (Best)	**R %**	1.2218 [0.025]	2.2273 [0.001]	1.6128 [0.014]	0.391 [0.333]
	Alfa-CAPM %	0.1444 [0.682]	1.0207 [0.016]	0.3667 [0.349]	0.2222 [0.576]
	Alfa-F&F%	0.0282 [0.934]	1.0628 [0.006]	0.4944 [0.219]	0.4662 [0.239]
P3-P1	**R %**	0.1461 [0.665]	0.8066 [0.068]	0.32 [0.462]	0.5371 [0.194]
	Alfa-CAPM %	0.0096 [0.977]	0.8559 [0.057]	0.4167 [0.342]	0.2318 [0.537]
	Alfa-F&F%	-0.0522 [0.876]	0.8765 [0.057]	0.7389 [0.093]	0.414 [0.283]
	Mean Size	1456.41	3024.94	3533.40	2076.99
	Mean BTM	-1.2849	0.2951	1.2126	2.4975

PANEL B: REV

		Residual Analyst Coverage			
		Cov1	**Cov2**	**Cov1**	**Cov2**
P1 (Worst)	**R %**	1.3398 [0.021]	1.1625 [0.036]	0.9212 [0.169]	-0.4186 [0.237]
	Alfa-CAPM %	0.174 [0.610]	-0.0421 [0.864]	-0.4134 [0.243]	-0.5873 [0.089]
	Alfa-F&F%	0.1438 [0.635]	-0.0614 [0.800]	-0.4805 [0.163]	-0.6243 [0.080]
P2	**R %**	1.7279 [0.001]	1.4833 [0.007]	1.5153 [0.011]	-0.2125 [0.506]
	Alfa-CAPM %	0.6613 [0.051]	0.3028 [0.257]	0.2836 [0.350]	-0.3777 [0.223]
	Alfa-F&F%	0.605 [0.060]	0.302 [0.273]	0.2922 [0.350]	-0.3128 [0.309]
P3 (Best)	**R %**	1.9535 [0.000]	1.6404 [0.004]	1.5906 [0.013]	-0.3629 [0.394]
	Alfa-CAPM %	0.8452 [0.008]	0.4237 [0.109]	0.3378 [0.351]	-0.5074 [0.232]
	Alfa-F&F%	0.9511 [0.002]	0.4567 [0.091]	0.4255 [0.253]	-0.5257 [0.228]
P3-P1	**R %**	0.6138 [0.014]	0.4779 [0.008]	0.6694 [0.073]	0.2508 [0.543]
	Alfa-CAPM %	0.6712 [0.008]	0.4658 [0.010]	0.7512 [0.047]	0.1638 [0.694]
	Alfa-F&F%	0.8073 [0.001]	0.5181 [0.006]	0.906 [0.018]	0.2817 [0.493]
	Mean Size	2753.59	4549.61	2197.11	-556.48
	Mean BTM	0.3019	0.9769	1.3332	1.0313

TABLE 7

PAD strategies sorting by analyst earnings forecast dispersion.

Average return [$\overline{R}$], CAPM and Fama&French alpha of the calendar returns of the strategies formed by earning surprise [P1, P2 and P3] and earnings forecast dispersion [Dis1, Dis2 and Dis3], as well as the zero investment strategies resulting from selling and buying the extreme portfolios. The portfolios are constructed using the 1/3 and the 2/3 percentiles. Holding periods of 6 month. The dispersion ranking has been made with the data at the end of the formation period. 1996-2003 period. The last two rows show the averaged Size and residual analyst coverage characteristics.

PANEL A: SUE

		Analyst dispersion							
		Dis1		Dis2		Dis3		Dis3-Dis1	
P1 (Worst)	R %	1.8633	[0.001]	1.1011	[0.095]	0.8263	[0.322]	-1.037	[0.070]
	Alfa-CAPM %	0.8359	[0.014]	-0.1104	[0.755]	-0.5586	[0.274]	-1.3945	[0.010]
	Alfa-F&F%	0.7746	[0.028]	-0.2194	[0.533]	-0.8751	[0.070]	-1.6497	[0.002]
P2	R %	1.5518	[0.007]	1.0797	[0.082]	1.785	[0.010]	0.2332	[0.564]
	Alfa-CAPM %	0.4333	[0.120]	-0.0912	[0.775]	0.5942	[0.151]	0.161	[0.694]
	Alfa-F&F%	0.5662	[0.048]	-0.0048	[0.988]	0.5471	[0.164]	-0.0191	[0.961]
P3 (Best)	R %	1.6322	[0.007]	1.7204	[0.007]	2.266	[0.004]	0.6337	[0.181]
	Alfa-CAPM %	0.5375	[0.134]	0.5567	[0.112]	0.9876	[0.055]	0.4501	[0.334]
	Alfa-F&F%	0.6858	[0.063]	0.6543	[0.072]	1.1453	[0.029]	0.4594	[0.343]
P3-P1	R %	-0.2311	[0.557]	0.6193	[0.174]	1.4397	[0.021]	0.4026	[0.441]
	Alfa-CAPM %	-0.2984	[0.454]	0.6671	[0.150]	1.5462	[0.014]	0.1517	[0.764]
	Alfa-F&F%	-0.0888	[0.827]	0.8736	[0.063]	2.0204	[0.001]	0.3706	[0.472]
	Mean Size	5434.27		5083.56		2324.22		-3110.05	
	Mean BTM	0.0934		0.2711		1.2414		1.1480	

PANEL B: REV

		Analyst dispersion							
		Dis1		Dis2		Dis3		Dis3-Dis1	
P1 (Worst)	R %	1.2203	[0.022]	1.0982	[0.067]	1.0152	[0.123]	-0.2051	[0.565]
	Alfa-CAPM %	0.0796	[0.768]	-0.1699	[0.537]	-0.3047	[0.380]	-0.3843	[0.267]
	Alfa-F&F%	0.1159	[0.674]	-0.1627	[0.551]	-0.4084	[0.218]	-0.5243	[0.131]
P2	R %	1.676	[0.001]	1.4269	[0.011]	1.9587	[0.004]	0.2827	[0.451]
	Alfa-CAPM %	0.5708	[0.025]	0.2195	[0.386]	0.7271	[0.093]	0.1563	[0.675]
	Alfa-F&F%	0.5934	[0.025]	0.2567	[0.330]	0.6791	[0.101]	0.0857	[0.809]
P3 (Best)	R %	1.7885	[0.001]	1.839	[0.002]	1.6663	[0.007]	-0.1222	[0.700]
	Alfa-CAPM %	0.6634	[0.012]	0.6302	[0.028]	0.3924	[0.201]	-0.271	[0.382]
	Alfa-F&F%	0.7426	[0.006]	0.6787	[0.023]	0.4542	[0.129]	-0.2884	[0.360]
P3-P1	R %	0.5682	[0.008]	0.7408	[0.007]	0.6511	[0.025]	0.446	[0.185]
	Alfa-CAPM %	0.5837	[0.007]	0.8002	[0.004]	0.6971	[0.018]	0.3128	[0.345]
	Alfa-F&F%	0.6266	[0.005]	0.8414	[0.002]	0.8625	[0.004]	0.3383	[0.321]
	Mean Size	4970.85		4243.80		2022.73		-2948.12	
	Mean BTM	0.0841		0.2071		1.1023		1.0182	

TABLE 8

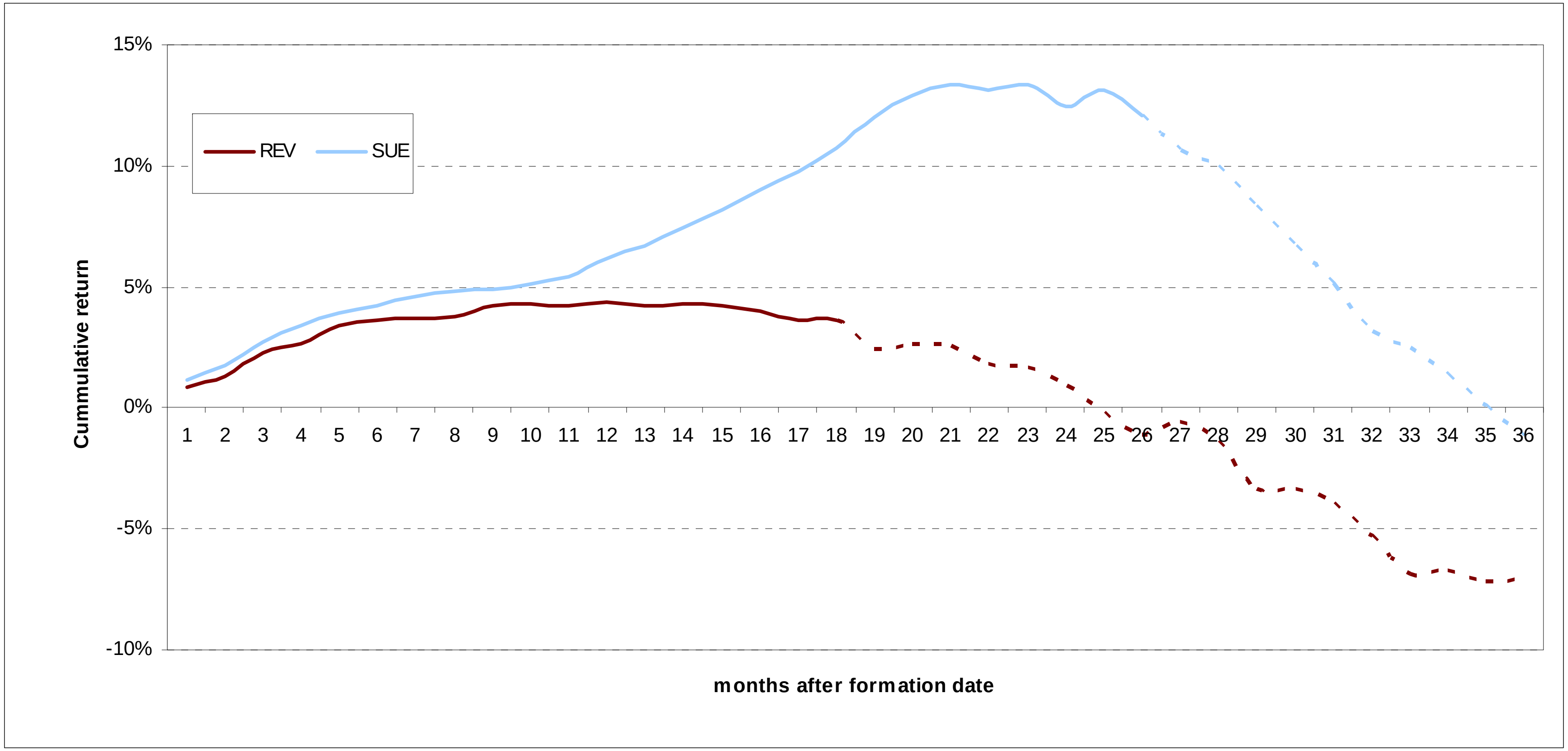
Cross-sectional regressions

The dependent variable is the regression coefficient of six-month returns (net of risk-free rate) on earnings surprise. P-values in brackets. For the Fama-MacBeth test the p-values are adjusted for serial correlation.

	Year							
	1995	1996	1997	1998	1999	2000	2001	Fama-MacBeth
PANEL A: Daniel et at (1998) model								
Log[BTM]	-0.289	-0.818	0.233	0.131	0.156	-0.113	-0.161	-0.123
	[0.634]	[0.504]	[0.781]	[0.785]	[0.626]	[0.509]	[0.356]	[0.352]
PANEL B: Hong and Stein (1999) model								
Log[Size]	-0.572	-1.441	-0.571	-0.032	0.212	-0.011	-0.031	-0.349
	[0.084]	[0.002]	[0.037]	[0.858]	[0.109]	[0.901]	[0.699]	[0.209]
Coverage	-0.282	-0.959	-0.274	0.753	0.281	0.02	0.273	-0.027
Log(1+nº analysts)	[0.748]	[0.572]	[0.741]	[0.112]	[0.442]	[0.940]	[0.170]	[0.901]
PANEL C: Barberis *et al*. (1998) model								
Forecast dispersion	1.688	2.171	-0.014	2.093	1.461	-0.137	-0.094	1.024
	[0.668]	[0.743]	[0.991]	[0.356]	[0.464]	[0.618]	[0.870]	[0.021]
PANEL D: All								
Log[BTM]	-1.044	-0.822	-0.59	0.248	0.146	-0.214	-0.114	-0.342
	[0.151]	[0.440]	[0.511]	[0.609]	[0.680]	[0.294]	[0.525]	[0.168]
Log[Size]	-0.869	-1.409	-0.672	-0.113	0.194	-0.004	-0.03	-0.415
	[0.030]	[0.003]	[0.031]	[0.541]	[0.154]	[0.965]	[0.707]	[0.181]
Coverage	0.698	-0.309	-0.379	0.898	0.393	0.016	0.246	0.223
Log(1+nº analysts)	[0.554]	[0.901]	[0.670]	[0.066]	[0.329]	[0.954]	[0.232]	[0.060]
Forecast dispersion	3.323	2.94	-0.624	3.242	1.295	-0.316	-0.069	1.399
	[0.470]	[0.717]	[0.622]	[0.178]	[0.536]	[0.339]	[0.906]	[0.041]

FIGURE 1
Persistence of PAD profits

Average cumulative return along the 36 months after the formation date (returns accumulated in event time) for the PAD strategy that buys the buys the best earning surprise portfolio (P3) and sells the worst surprise portfolio (P1). The values that are statistically significant at the 5% level (Newey-West) are shown In continuous line.



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