POST-EARNINGS ANNOUNCEMENT DRIFT: SPANISH EVIDENCE

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ABSTRACT

This paper analyzes whether earnings announcements in the Spanish stock market are followed in subsequent months by a return drift in the same direction as the earnings surprise. To do this study we use a sample of quarterly earnings for the period between January 1994 – December 2003. Two alternative earnings surprise measures have been used based on earnings time series and analysts' forecast, and both provide a strong post-earnings announcement drift. Moreover, these two measures have marginal explanatory power when they are controlled for each other. In order to look for an explanation to this anomaly we make several adjustments in addition to the CAPM: (i) the Fama-French (1993) three-factor model, (ii) control portfolios by size and book-to-market ratio, and (iii) control for the Jegadeesh and Titman (1993) momentum effect. Moreover, besides these unconditional adjustments, following the recent financial literature on asset pricing we have also studied whether this phenomenon can be explained through conditional models. In this way, we allow risks and returns time varying depending on the economic cycle. However, the Spanish post-earnings announcement drift seems to be robust to all this adjustments. These results make things more difficult for the market efficiency hypothesis, and give some support to the infra-reaction assumption.

Keywords: post-earnings announcement drift, conditional models, under-reaction.

JEL classification: G14, G11, M41

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1 INTRODUCTION

During recent decades, the market efficiency hypothesis has been one of the dominant topics in financial research. This hypothesis assumes that asset prices reflect all the relevant information, so, at any time, these can be considered as optimal estimations of assets' true value. Therefore, an immediate consequence of this hypothesis is the impossibility of obtaining abnormal returns on the basis of the available information.

Nevertheless, several studies in financial literature have demonstrated the existence of systematic behaviour in abnormal returns after the earnings announcements. Concretely, stock prices keep moving after the announcement in the same direction as the earnings surprise: positive (negative) surprises are followed by price increases (reductions). This failing of the efficiency hypothesis is known as the "post-earnings announcement drift" anomaly (hereafter PAD). This phenomenon, as Kothari (2001) suggests, provides a serious challenge to the market efficiency hypothesis because this anomaly has survived a rigorous verification over the last three decades, and cannot totally be explained through other documented anomalies.[1]

Ball and Brown (1968) and Jones and Litzenberger (1970) were the first to observe this PAD phenomenon in the US market. Since then, many researchers have extensively analysed the return drift after earning announcements in this market, among others: Foster, Olsen and Shevlin (1984), Bernard and Thomas (1989, 1990), Ball (1992) and Bernard (1993).

Finding an explanation for this abnormal return behaviour has caught the attention of many researchers. The three basic explanations offered are: (a) methodological problems, (b) misspecification of the asset-pricing model used to compute the abnormal

[1] Consistent evidence with the existence of return drifts has also been observed in other market contexts. In this sense, Jegadeesh and Titman (1993, 2001) find medium-term returns drift based on past returns information. Michaely and Womack (1999) find a lagged price response to the changes in analysts' recommendations. The prices drift evidence has also been demonstrated for other events like stock splits (Ikenberry and Ramnath, 2002), stock issues made by venture capital operators (Gompers and Lerner, 1998), initial public offerings (Ikenberry, Lakonishok and Vermaelen, 1995), or stock issues (Loughran and Ritter, 1995).

returns, and (c) incorrect prices reaction to the information contained in the earnings announcement.

Although the limitations and biases suffered by the first works developed in this area suggested that the two first explanations were the sources of this phenomenon, later studies have shown that once corrected for methodology and risk misspecification, the PAD phenomenon remains. Thus, for example, the work of Fama (1998), after a deep analysis of the robustness of the methodologies used in the analysis of the different market anomalies, concludes that only two remain under suspicion: PAD and momentum.

The most recent research suggests that the PAD source is close to the third explanation[2], concretely, that investors initially infra-react to the earnings information and then correct this mistake, thus originating the drift in prices. Consequently, if the initial price reaction to the earning announcement is not sufficient, this reaction is not totally reflecting the information contained in the earnings publication, and in this way it must have a post-earning announcement price adjustment, hence originating the PAD effect. On the other hand, the financial literature also suggests that this initial infra-reaction could be followed by a lagged overreaction that prolongs the drift caused by the previous infra-reaction. Finally, there is also the possibility that the post-earnings drift source was only a lagged overreaction.[3] These explanations would be closer to the behavioural finance literature that states, unlike the efficient market hypothesis arguments, that investors are not absolutely rational but they present several psychological biases that would explain their incorrect reaction to the information contained in the earnings announcement.

Notwithstanding, the explanation of the PAD effect is a controversial issue and a full understanding of its origin is far from be definitely. In this sense, the more recent research in asset pricing suggests that the origin of most of the anomalies found in the market could be merely the result of using unconditional instead of conditionals asset pricing models when the abnormal returns are estimated. Curiously, to our knowledge, the power of the conditional models to explain the PAD phenomenon has not yet been studied, despite this is becoming a required adjustment in the anomalies literature (see for example Wu (2002) for the momentum effect).

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[2] See for example Bernard and Thomas (1990), Bernard (1993), Ball and Bartov (1996), Soffer and Lys (1999), Bartov, Radhakrishnan and Krisky (2000) and Mikhail, Beverly, Walter and Willis (2003).

[3] The idea of a drift in the returns originated, totally or partially, by a lagged overreaction is consistent with the evidence of long term reversions in returns (DeBondt and Thaler, 1985).

In spite of the great interest that this anomaly has raised in the US market, this phenomenon has been scarcely studied in other markets. 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.

The aim of this paper is to present additional evidence by analysing the existence of the post-earning announcement drift in the Spanish stock market, since this phenomenon has not been studied yet in this country.[4] To do this study we use a larger sample that includes quarterly earnings; we also have the exact announcement date, which allows us a better location for the analysis window.

We address the study of the PAD effect including the following methodological issues. First, in addition to the earnings surprises measure based on the earnings time series, we also use an alternative measure based on analyst forecasts. Second, following the line of several works 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 et al. (1996). The main advantage of this methodology regarding the traditional event time scheme, commonly used in the studies on PAD, is the fact that the proposed investment strategy can be implemented in real time. Third, we make several adjustments besides the CAPM: (i) the Fama-French (1993) three-factor model, (ii) control portfolios by size and book-to-market ratio (henceforth BTM ratio) and (iii) control for the Jegadeesh and Titman (1993) momentum effect.

In addition to the previously mentioned adjustments, following the recent financial literature on asset pricing we have also studied whether the PAD strategy profits can be explained through conditional models. In this way, we allow time varying risks and returns depending on the available information at every moment. In our opinion, this last adjustment is an important contribution, not only for the Spanish market, but also for all

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[4] 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.

the PAD literature. As we have said before, to our knowledge, the power of the conditional models to explain the PAD phenomenon has not yet been studied.

Our results show that there is significant evidence of post-earning announcement drift. In addition, we observe that both surprise measures show marginal explanation power once they are controlled for each other. These results remain when we use diverse unconditional risk controls: (i) by CAPM, (ii) by the Fama-French (1993) three-factor model and (iii) size and BTM ratio control portfolios. Moreover the PAD phenomenon persists after a momentum effect control. Finally, we also find that the conditional version of the CAPM and a Fama-French (1993) three-factor model can not explain this phenomenon.

The study has the following structure. In the second section we present the data, the earnings surprise measures used and the methodology. The results of the post-announcement drift analysis are in the third section. In the fourth we analyze the marginal power between the two surprise measures used. Next, we test the PAD robustness to different adjustments: (i) CAPM, (ii) Fama-French (1993) three-factor model, (iii) size and BTM ratio control portfolios, (iv) momentum effect and (v) conditional models. In the sixth section we made a sub-period analysis. Finally, we present the conclusions.

2 DATA AND METHODOLOGY

2.1 DATA

The sample used for this study comprises 169 quoted stocks on the Spanish capital market in the period January 1992 to December 2003. The final sample is composed by 5.283 firm-quaterly earnings announcements. The available data is:

- Quarterly earnings announcement dates and the consolidated earnings data, or the individual one whether the consolidated is not available. Data obtained from the Records of Relevant Events as published on its website by the “Comisión Nacional del Mercado de Valores” (CNMV).
- Annual data of book value of firm’s equity and total assets at the beginning of the year. This data is 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 analyst earnings consensus forecasts from the period analyzed. They are collected from the database JCF Quant.
- Daily stock close prices and dividends for the Spanish market were obtained from the "Servicio de Interconexión de las Bolsas Españolas" (SIBE). Using this data, we calculate: (i) daily stock returns adjusted by dividends, seasoned equity offerings and splits, and (ii) monthly dividend yield, calculated as the ratio between the sum of the last twelve months dividends and the stock price at the end of the last month.
- We use one-month Treasury bill repo rates as a proxy of the risk-free stock return. This is calculated from the historical series of the "Boletin de la Central de Anotaciones" published by the Bank of Spain in its website.
- The Internal Rates of Return of 10 year government bonds (securities), as proxy of the long-term interest rate. This data was provided by the "Boletín Estadístico" of the Bank of Spain journal.
- 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 EARNINGS SURPRISE

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, broadly used in the PAD literature, is the standardised unexpected earnings (SUE). The SUE for each company *i* and for each quarter *t* is given by,

$$SUE_{i,t} = \frac{X_{i,t} - E\left(X_{i,t}\right)}{STD_{i,t}} \quad (1)$$

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 $STD_{i,t}$ is the standard deviation of unexpected earnings ($X_{i,t} - E\left(X_{i,t}\right)$). To determinate $E\left(X_{i,t}\right)$, we use a time-series model of earnings, so expected earnings for the current quarter are the earnings reported in the same quarter in the previous year, $X_{i,t-4}$.[5]

To obtain a trustworthy estimation of standard deviation, eight quarterly observations are required (current quarter plus the seven previous). This restriction results in a reduction of the final number of earnings surprises we can calculate. Therefore, we have decided to use an alternative measure[6], dividing by book value of firm's equity at the beginning of the reported earnings year ($FP_{i,y}$).[7] The measure used, UE, is defined as,

$$UE_{i,t} = \frac{X_{i,t} - X_{i,t-4}}{FP_{i,y}}, \quad (2)$$

The second measure of earnings surprise is based on revisions in analyst earnings consensus 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. They have an important role as information intermediates on capital markets.

In this sense, we approach earnings surprise by the change in analyst earnings forecasts divided by the book value of firm's equity at the beginning of the earnings announcement year[8], and defined as,

$$REV_{i,t} = \frac{FY_{i,t} - FY_{i,t-1}}{FP_{i,y}} \quad (4)$$

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

[6] However, we have also calculated the results with the *SUE* measure for the sub-period 1999-2003.

[7] Rangan and Sloan (1998) and Narayanamoorthy (2003) use unexpected earnings based on a model of time-series data scaled by their market capitalization.

[8] Similarly, Chan and Jegadeesh and Lakonishok (1996) scale the revisions in analyst consensus forecast by the stock's book value, and Hennessey (1995) scales by earnings forecast for the month before.

where $FY_{i,t}$ is firm *i*'s consensus forecast of current fiscal year earnings (FY1) on 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*.[9]

An advantage of this measure is that it allows us to have monthly data, whereas with the previous one 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.[10]

2.3 DESCRIPTIVE ANALYSIS

Panel A of Table 1 shows the mean, maximum and minimum number of observations by month for each earnings surprise and for each year of the sample period. It also reports the number of months without earnings surprises (0) or with a low number (between 1-10) throughout that year. To calculate the measure of surprise *UE*, we need the data corresponding to the quarterly earnings announcement of the previous year. In this sense, we only can compute this measure as of 1993. We have decided to calculate the two measures as of that year to present analogous period results.

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 *UE* surprises is quite reduced in the two first years: 1993 and 1994, with 3 and 2 months respectively, where there is no surprise data.

[Insert Table 1]

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[9] 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) helps 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).

[10] Recent studies use the average of analyst forecasts as a proxy of the market expectations of earnings. They show that the post-earnings announcement drift is related to the aforementioned forecast (Abarbanell and Berbard, 1992; Alford and Berger, 1997; Liu, 1998; Wu, 1998; Shane and Brous, 2001).

Next, in Panel B of Table 2 we report the average number of surprises for both earnings surprise measures and for each of the 12 months of the year. We observe that the monthly number of surprises *UE* is not homogenous, rejecting the equality hypothesis 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.

Regarding the analyst forecasts measure, it has a stable monthly distribution. In fact, in this case, the equality hypothesis of the number of surprises between the different months of the year is accepted.

2.4 METHODOLOGY: PORTFOLIO CONSTRUCTION

In order to analyze the PAD, we construct portfolios based on earnings surprises, and analyze whether the more favourable earnings surprise portfolios overperform, on average, the less favourable 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)[11] instead of event-time (that is, setting with 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) and 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 (el THE lo quitaria) stocks with current return data and earnings surprises in the previous three months[12] are selected and ranked according to earnings surprise. In cases in which there were more than one earnings surprise in the three previous months, we take the most recent. Next, three equally-

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[11] Liu, Strong and Xu (2003) also used this methodology in the UK market.

[12] Given the unequal monthly distribution of the *UE* surprise, to form the portfolios according to the previous month surprise will suppose the presence of very low diversify portfolios in some formation dates.

weighted portfolios with the same number of stocks are constructed:[13] the first (third), corresponding to the 1/3 low (high) surprises, is called low, L, (high, H) surprise portfolio. These portfolios are held during the next 3, 6, 9 and 12 months (holding period). Then, a zero-cost investment strategy that buys the H portfolio and short-sells the L portfolio is formed (PAD strategy).

Since we require earnings surprise data in the last three months, along with the small number of available observations of UE surprises in the first months of year 1993, we have chosen the beginning of January 1994 as the first formation date for all the cases.

In order to study the PAD strategy behaviour, first we analyze its average cumulative return throughout the 12 months after its formation date. To do this, we use the buy-and-hold procedure, which 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[14],

$$CR_{c,T} = \frac{\sum_{i=1}^{n_c}\left[\left(\prod_{t=1}^{T}(1+R_{i,t})-1\right)\right]}{n_c}; \quad c=1(L),\, 2,\, 3(H); \quad T=1,2,...,12 \tag{5}$$

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

Throughout the entire analyzed period (01/94-12/03) a total of 120 portfolios are constructed, since these are formed at the beginning of each calendar month. Therefore, we have a series of 120 cumulative returns:

$$\left\{CR_{c,T,f}; \quad f=1,2,3,...,120\right\}; \quad c=1(L),\, 2,\, 3(H); \quad T=1,2,...,12 \tag{6}$$

[13] 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.

[14] 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 analyzed 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.

where $CR_{c,T,f}$ is the cumulative return throughout the T months after the formation date f of portfolio c. The first formation date $f=1$ is the beginning of January 1994, the second $f=2$ is the beginning of February 1994, and so on.

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

$$\left\{CR_{PAD,T,f},\ \ f=1,2,...,120\right\};\quad CR_{PAD,T,f}=CAR_{H,T,f}-CAR_{L,T,f};\quad T=1,2,...,12 \qquad (7)$$

For the last formation dates is not possible to calculate all the cumulative returns. For the portfolios constructed on the last formation date $f=120$ (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 $f=119$ (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 120 observations, this number going down for longer time horizon cumulative returns $T>1$. Moreover, for $T>1$ these series of cumulative returns are overlapping and, therefore, they have a problem of autocorrelation 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. This 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 during *h=3, 6, 9, 12* months. This return is computed as the average return of all the stocks implied in the strategy that month. It is important to understand that during calendar month *t*, the PAD strategy is formed by the high earnings surprise portfolio (*H*) and low earnings surprise portfolio (*L*) constructed in the last *h* formation dates. Therefore, every calendar month we will have *h* portfolios *H* and *L*, reviewing *1/h* of its stocks at the beginning of each month. For example, during calendar month *t*, the PAD strategy with a holding period of *h=3* will be formed by portfolios *H* and *L* 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 *H* and *L* constructed in the month *t-2* will be eliminated and replaced by the new portfolios.

This way we obtain a return for each calendar month and for each portfolio:

$$\left\{R_{c,t}; \quad t = 01/94, 02/94, ..., 12/03\right\}; \quad c = 1(L), 2, 3(H) \qquad (8)$$

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

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

$$\left\{R_{PAD,t} = R_{H,t} - R_{L,t}; \quad t = 01/94, 02/94, ..., 12/03\right\} \qquad (9)$$

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 necessary to first 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 with respect to the rebalancing portfolios, mainly from the point of view of transaction costs. These weights are also used when we calculate the size and book-to-market characteristics of the portfolios.

This last approach, which will be most used throughout the work, will allow us to easily analyze the risk adjusted returns.

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 perform an initial study of price behaviour after the earning announcement, analyzing the average returns provided by the PAD strategy.

Table 2 and Figure 1 show the cumulative average return for each of the surprise measures, throughout the twelve months after the formation date, equation [7]. In brackets are the autocorrelation consistent Newey-West p-values.

[Insert Table 2]

For both earnings surprise measures, the PAD strategy yields positive and significant cumulative returns in almost every month of the holding period. In addition, the higher returns are obtained, in any month of the holding period, when portfolios are constructed according to the UE measure.

[Insert Figure 1]

In Table 3 we show the average monthly return 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 [9]. The second column of each panel shows the t-standard p-values.

[Insert Table 3]

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 the UE and the REV measures. However, higher return levels are obtained, for any holding period, 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 the analyst forecasts. In addition, we have to emphasize the existence of a decreasing relationship between the return, linked to these two surprise measures, and the holding period.[15]

[15] When we use the total asset to deflate the UE measure, we observe similar results, although the return levels are some what (no entiendo bien esto, pero yo pondria o "some" or "somewhat" junto) lower than the detected ones when we use firm's equity. In the Appendix, panel A from Table A1 and A2. We have also calculated the PAD strategy profits using SUE as a surprise measure, equation [1], although the requirements of a previous estimation period limit it to the 1999-2003 sub-period. The obtained results are in the line of those obtained with the UE measure. Panel B from Tables A1 and A2 in the Appendix.

3.1 NO-NORMALITY ROBUSTNESS

The Jarque-Bera test broadly rejects the normality hypothesis for most of the strategy returns series. Therefore, the standard t test can be biased. In order to verify the no-normality robustness results, two alternatives are used to obtain the p-values: the Generalized Moment Method methodology (GMM)[16] and a bootstrap analysis.

Regarding the *bootstrap* analysis, we have used the procedure proposed by Lyon, Barber and Tsai (1999), who apply the bootstrap methodology to the asymmetry adjusted t statistic developed by Johnson (1978).[17] Firstly, we calculate the asymmetry adjusted t statistic,

$$t_a = \sqrt{\Gamma}\left[\frac{\overline{R}}{\hat{\sigma}} + \frac{1}{3}\hat{\gamma}\left(\frac{\overline{R}}{\hat{\sigma}}\right)^2 + \frac{1}{6\cdot\Gamma}\hat{\gamma}\right] \tag{10}$$

where $\overline{R}$, $\hat{\sigma}$ and $\hat{\gamma}$ are the mean, standard deviation and asymmetry coefficient estimation, of the cumulative returns, equation [7], or the monthly calendar-time returns series, equation [9], and Γ is the time series size, ($121-T$) and 120 respectively.

Next, we select with replacement B sub-samples of size η from the original return series and for each of the B sub-samples we calculate the following statistic,

$$t_{a,b} = \sqrt{\eta}\left[\frac{\overline{R}_b - \overline{R}}{\hat{\sigma}_b} + \frac{1}{3}\hat{\gamma}_b\left(\frac{\overline{R}_b - \overline{R}}{\hat{\sigma}_b}\right)^2 + \frac{1}{6\eta}\hat{\gamma}_b\right]; \quad b = 1, 2, ..., B \tag{11}$$

where $\overline{R}_b$, $\hat{\sigma}_b$ and $\hat{\gamma}_b$ are the mean, standard deviation and asymmetry coefficient estimation of the *bootstrap* sub-sample b. Finally, if we assume that the empirical distribution represents the true return distribution and that the returns are serially uncorrelated, we can obtain the p-value from the original t_a statistic from the *bootstrap*

[16] For GMM we have taken the explicative variables as instruments and we have used the heteroscedasticity and autocorrelation consistent weighting matrix with Bartlett Kernel option and the fixed bandwidth selection of Newey-West.

[17] The relatively elevated asymmetry coefficients for some of the return series analyzed (for example, 3.34 for the accumulated returns in the first month of the holding period for the *UE* measure) make this bootstrap procedure advisable.

statistic sample, $\{t_{a,b} : b = 1, 2, ...B\}$. This methodology has been applied using $B = 10.000$ repetitions and *bootstrap* sub-samples with size $\eta = \Gamma$.

This *bootstrap* procedure is only valid for independent data. However, the cumulative return series, equation [7], are overlapped and therefore present an autocorrelation problem. In order to solve this disadvantage, instead of applying the usual *bootstrap*, we have applied a moving block *bootstrap* (Efron and Tibshirani, 1993). Since the autocorrelation in the cumulative return series until month T after the formation date is of $(T-1)$ order, the blocks are formed with T observations.

The p-values obtained with the GMM and *bootstrap* procedures are in the third and fourth rows of each panel of Table 2, and in the third and fourth columns of each panel of Table 3. We find that the results are broadly robust to these new tests.

In the following sections we analyze the PAD strategy profits in depth. To do this, we use the monthly calendar-time return series obtained with the second approach considered, equation [8]. In addition, with the aim of simplifying the results presentation we only analyze the 6 months holding period. Since, in general terms the normality assumption is not fulfilled, all tests are made using GMM procedure.

4 RELATIONSHIP BETWEEN SURPRISE MEASURES: *UE* VERSUS *REV*

Before analysing the sources of PAD in the following section, in this section we examine whether both *UE* and *REV* measures have explanatory marginal power or, on the contrary, one of them subsumes the other

To do this, following Liu *et al.* (2003), we use a double-rank portfolio construction procedure. Firstly, we identify nine portfolios, in each formation date, resulting from the intersection between the three portfolios constructed with the *UE* measure - $C1^{UE}$, $C2^{UE}$ and $C3^{UE}$ - and the three portfolios constructed according to the *REV* - $C1^{REV}$, $C2^{REV}$ and $C3^{REV}$. For example, the [$C1^{UE}$; $C1^{REV}$] portfolio will contain stocks which have simultaneously experienced an unfavourable surprise using both the *UE* and *REV* measures. Finally, we construct two PAD strategies, one using *UE* and the other using *REV*, controlling for the influence of the other surprise measure in the following way:

$$PAD_{UE}^{ctr.REV} = \frac{[C3^{UE};C1^{REV}]+[C3^{UE};C2^{REV}]+[C3^{UE};C3^{REV}]}{3} - \frac{[C1^{UE};C1^{REV}]+[C1^{UE};C2^{REV}]+[C1^{UE};C3^{REV}]}{3} \quad (12)$$

$$PAD_{REV}^{ctr.UE} = \frac{[C3^{REV};C1^{UE}]+[C3^{REV};C2^{UE}]+[C3^{REV};C3^{UE}]}{3} - \frac{[C1^{REV};C1^{UE}]+[C1^{REV};C2^{UE}]+[C1^{REV};C3^{UE}]}{3} \quad (13)$$

In this way, we can check the influence degree between both measures. Concretely, if the strategy $PAD_{UE}^{ctr.REV}$ ($PAD_{REV}^{ctr.UE}$) does not yield significant returns we can conclude that the *UE* (*REV*) measure has no explanatory power once we have controlled for *REV (UE)*. Additionally, we also construct a mixed investment strategy that simultaneously bets for both measures:

$$PAD_{[UE\&REV]} = [C3^{EU};C3^{REV}] - [C1^{UE};C1^{REV}] \quad (14)$$

Table 4 shows the average return for each of the strategies. We observe that, although the amount and p-values of the $PAD_{UE}^{ctr.REV}$ and $PAD_{REV}^{ctr.UE}$ strategy returns decrease, they continue being significantly positive. In addition, the $PAD_{[UE\&REV]}$ return strategy is higher than those provided by both strategies separately. These results would suggest that both earnings surprise measures, although related, have additional explanatory power once we have controlled for the influence of the other.

[Insert Table 4]

5 ANALYSIS OF THE POSSIBLE EXPLANATIONS FOR THE PAD STRATEGY PROFITS

The aim of this section is to test the possible explanations for the post-earnings announcement drift phenomenon. We have applied different adjustments to test if this phenomenon is a compensation of market risk, or the reflection of the well-know size, BTM ratio or momentum effects. Finally, we consider adjustments which condition at the economic moment.

5.1 PAD PROFITS AND THE CAPM MODEL

Firstly, we consider the CAPM model to examine whether the return-risk relationship explains the pattern detected in the post-earnings announcement returns. More precisely, we adjust the ex-post CAPM version to the calendar-time monthly returns of each portfolio,

$$\left\{(R_{c,t}-r_t)=\alpha_c+\beta_c(R_{M,t}-r_t)+\varepsilon_t,\ \mathrm{t}=01/94, 02/94,...,12/03\right\} \qquad \begin{matrix} c=1(L),2,3(H) \\ PAD=(H-L) \end{matrix} \qquad (15)$$

where r_t is risk-free asset return on calendar month *t*, $R_{M,t}$ is the value-weighted market portfolio return on month *t*, β_c is market risk of the portfolio *c*, and α_c is Jensen's alpha which gauges the abnormal return.

Table 5 shows the results of this analysis. This table presents the mean return, the Jensen's alpha, the beta, the adjusted-R^2 and the p-values for each of the analyzed strategies. Panel A (B) shows the results associated with the *SUE* (*REV*) measure.

[Insert Table 5]

Firstly, we find that the returns, both raw and risk-adjusted, increase with the surprise level for both earnings surprise measures. In addition, we reject the equality hypothesis between the returns achieved with each the portfolios. In this sense, the results support that earnings surprise affects the stock's average return in the holding period. We also find that the PAD strategy yields significantly positive raw and risk-adjusted returns for both surprise measures.

With regard to the pattern followed by betas, it has a U-shape for the *UE* measure, so that the portfolios with extreme surprises are riskier than the intermediate ones[18], although there are no significant differences in the risk levels between the best and worst earnings surprises portfolios. However, when the *REV* measure is used, we observe that the stocks of the best surprises portfolio, with higher returns, are less risky than the stocks of the worst. So, we find a negative relationship, opposite to the positive one predicted by the CAPM model.

[18] This behaviour of betas is coherent with the greater probability that the stocks with extreme earnings surprises are more volatile stocks.

Consequently, the results obtained in this section show the inability of the CAPM to explain the high returns provided by both PAD strategies.

5.2 POST-EARNINGS ANNOUNCEMENT DRIFT AND SIZE AND BOOK-TO-MARKET CHARACTERISTICS

We have just verified that the returns differences do not seem to have their origins in market risk differences as proposed by the CAPM. Nevertheless, financial literature has shown that the size characteristic (market capitalization) and BTM ratio, along with the market beta, play an important role in explaining the cross-section dispersion of expected returns. A stock's mean returns tend to decrease (increase) as the size (ratio BTM) goes up. Therefore, it is possible that the pattern observed in the returns is no more than a consequence of the stocks with favourable (unfavourable) surprises being on average small (big) stocks and with higher (lower) BTM ratios.

In order to analyse the size and BTM ratio characteristics, we require this kind of data to be available at least in the first month of the holding period. This requirement could introduce a survival bias. This is the reason why we repeat the analysis made in section 5.1. using the new restricted database. We find that the returns, both raw and risk-adjusted, do not differ from those obtained with the full sample.[19] In this sense, it is possible to affirm that the results are robust to the size and BTM restrictions imposed on the sample.

[Insert Table 6]

Once a possible survival bias is discarded, we examine the size and BTM ratio characteristics for the different portfolios. Panel A of Table 6 shows these results. We observe that favourable *UE* surprises portfolios, C3, exhibit a lower BTM ratio than the unfavourable ones, C1, although their size is similar. Whereas favourable *REV* surprises portfolios have higher levels of size than the unfavourable ones, with a similar BTM ratio.

Summarising, the size and BTM ratio characteristics of the extreme surprises portfolios are either not relevant or have a sign opposed to what is expected if this PAD phenomenon was simply a support of the well-known size and book-to-market effects. As in Liu et al. (2003), our evidence makes the understanding of this phenomenon more difficult still.

[19] Details of these results are available on request.

5.3 FAMA-FRENCH THREE-FACTOR MODEL

So far, we have checked that neither the CAPM market beta nor the size and BTM ratio characteristics are able to separately explain the PAD strategy profits. In this section we study what happens when these three variables are considered jointly through the Fama-French three-factor model (1993). This model adds two additional factors to the CAPM model,

$$E(R_i) = r + \beta_i [E(R_M) - r] + s_i E(SMB) + h_i E(HML) \qquad (16)$$

where SMB is the small stock's return minus the big stock's return. HML is the difference between the higher BTM portfolios' returns and those of the lower BTM portfolios.

We have followed the usual procedure to calculate the SMB and HML factors. At the end of December for each year, we rank the stocks by size and, subsequently, we form two portfolios with similar number of stocks: small (S) and big (B). At the same time and independently, we rank the available stocks based on their BTM ratio and we place them into three portfolios with similar number of stocks: high (H), medium (M) and low (L) BTM ratio. Next, we identify those stocks that belong simultaneously to a specific category of size and BTM ratio. We obtain six portfolios: SH, SM, SL, BH, BM and BL. Thus, for example, the SH portfolio is composed of stocks of small size (S) and high BTM ratio (H) simultaneously. Once the composition of the six portfolios is identified, we calculate the return in each of the twelve months of the following year as the average equally-weighted return of the stocks included in the portfolios. We repeat this procedure annually. The SMB factor is the difference between the average return of small size portfolios (SH, SM, SL) and that of the big size portfolios (BH, BM, BL). The HML factor is the difference between the average return of high BTM ratio portfolios (SH, BH) and that of the low BTM ratio portfolios (SL, BL). This procedure guarantees that the defined factors are orthogonal to each other.

Panel B of Table 6 reports the results obtained when we apply the Fama-French three factor model (1993) to the monthly calendar returns:

$$\begin{gathered}\left\{(R_{c,t} - r_t) = \alpha_c + \beta_c (R_{M,t} - r_t) + s_c SMB_t + h_c HML_t + \varepsilon_t, \quad \mathrm{t} = 01/94, 02/94, ..., 12/03\right\} \\ c = 1(L), 2, 3(H) \;\; y \;\; PAD = (H - L)\end{gathered} \qquad (17)$$

We find that the coefficients associated with the new factors are not significant. Moreover, there is no significant change between these alphas and those of the CAPM model. Therefore, the Fama-French model would not be able to explain the PAD strategy abnormal returns.[20]

5.4 CONTROLLING PORTFOLIOS BY SIZE AND BTM RATIO

We have just found that PAD strategy profits do not disappear when we use the Fama-French three-factor model (1993). However, Lyon, Barber and Tsai (1999) report that an alternative procedure consisting of monthly calendar returns adjusted by size and BTM ratio control-portfolios provides more conservative tests. This procedure presents some advantages regarding the Fama-French three-factor model. The first is that it does not require linearity in the three factors and it allows interaction between them. Furthermore, Mitchell and Stafford (2000) suggest that the Fama-French model regression assumes that factor sensibilities are constant throughout time, 120 months in our case. This situation seems quite improbable since the portfolio composition changes every month. Additionally, Daniel and Titman (1997) note that the average returns cross-section variation are better explained by characteristics than by factor sensibility.

Considering this evidence, in this section we analyze the PAD strategy profits using the control portfolios procedure. At the start of each month *t*, we construct a total of nine portfolios according to a double criterion ranking: three size portfolios and three BTM ratio portfolios. We take the size and BTM ratio of the previous month (*t*-1) and we use the 1/3 and 2/3 percentiles as breaking points. Next, we calculate the returns of these portfolios for month *t*. Finally, we subtract from each stock return the control-portfolio return to which the stock belongs.[21] The PAD returns are calculated with the new adjusted returns.

Panel C of Table 6 shows the mean control-portfolios adjusted returns. We observe that the PAD strategy profits decrease with regard to those obtained with the Fama-French model (panel B) although they are still highly significant. Therefore, these results confirm

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[20] These results are consistent with those obtained by Chan *et al.* (1996) and Liu *et al.* (2003) for the USA and the UK markets respectively.

[21] The composition of the control portfolios is updated at the beginning of every month and it can change throughout the holding period. This procedure is similar to that used by Nagel (2001), Lee and Swaminathan (2000) and Moskowitz and Grinblatt (1999) in analyses of the momentum effect.

that possible risk factors related to the size and BTM ratio characteristics do not seem to be able to explain the high PAD strategy returns.

5.5 PAD VERSUS MOMENTUM

Along with the PAD, another important phenomenon detected in the return behaviour is the momentum effect of Jegadeesh and Titman (1993): the winner stocks (those with higher returns in the 3-12 previous months) continue beating the loser stocks (those with lower returns) in the following 3-12 months. As the winner (loser) stocks are probably stocks with favourable (unfavourable) past news, and since the earnings announcements are the most important corporative regularly disclosed information, we can suppose that there is a relationship between momentum and PAD.[22]

Regarding the Spanish momentum evidence, Forner and Marhuenda (2006) find that, although its presence is very robust before 1990, this phenomenon seems to weaken considerably in the nineties. Consistent with this previous evidence, we do not observe momentum in our analysis period (1994-2003). Specifically, we obtain that the momentum strategy that buys (sells) at the beginning of every month the first 30% of stocks with higher (lower) returns in the months -7..., -2 and keeps them during the following six months (1..., 6)[23], provides an average return of 0.3397 with a p-value of 0.285 and a Jensen's alpha of 0.4415 with a p-value of 0.169.

However, in spite of the weakness of the momentum effect in our study period, it can be interesting to analyze the relationship between this and the PAD effect. To do this, we first adjust the PAD returns by adding to the Fama and French (1993) model a fourth factor of momentum equal to the return of the momentum strategy previously described:[24]

$$(R_{c,t} - r_t) = \alpha_c + \beta_c (R_{M,t} - r_t) + s_c SMB_t + h_c HML_t + m_c MOM + \varepsilon_t, \quad c = 1(L), 2, 3(H) \;\; y \;\; PAD = (H - L) \tag{18}$$

[22] The relationship between momentum and PAD has been studied by Chan et al. (1996) and Liu, Strong and Xu (2004) for the USA and UK markets respectively.

[23] It is usual to jump a month between the ranking period (-7...,-2) and the holding period (1..., 6) in order to avoid possible effects related to the market microstructure.

[24] This is the most commonly studied momentum strategy (Esta afirmacion es general o solo para el mercado espanol). However, the first work to include this factor - Carhart (1997) - classifies the winner and loser stocks according to the return yield in months -12..., -2 and keeps them for only a month. The results obtained when the factor is constructed in this way are very similar and are available for interested readers.

The results of this regression are shown in Table 7. For both the *UE* and *REV* surprise measures, the PAD strategy returns are positive and significantly affected by the momentum factor. Nevertheless, only when the earnings surprise is measured by means of *UE*, this model can explain the PAD returns. For the *REV* surprise, the PAD strategy keeps providing significantly positive abnormal returns after fitting this four-factor model.

[Insert Table 7]

In order to look deeper into the relationship between these two phenomena, we use a double-criterion portfolio construction procedure, similar to that of section 4 but this time classifying by past earnings surprises and past returns. Specifically, at the beginning of each month (formation date) we form three portfolios with the same number of stocks based on the earnings surprise (C1, C2 and C3) and simultaneously and independently we form three portfolios using the return in the months -7, …, -2 (PR1, PR2 and PR3), this time using the 30 and 70% percentiles. The intersection of these portfolios results in 9 portfolios that are held during the next 6 months. For example, the portfolio [C1;PR1] is formed by the stocks that are simultaneously losers and have an unfavourable earnings surprise. Finally, a PAD strategy orthogonal to the momentum effect is constructed in the following way:

$$PAD^{ctr.Mom} = \frac{[C3;PR1]+[C3;PR2]+[C3;PR3]}{3} - \frac{[C1;PR1]+[C1;PR2]+[C1;PR3]}{3} \quad (19)$$

If this strategy does not provide significant returns it would mean that the PAD phenomenon is explained by the momentum effect. Additionally, a mixed investment strategy that bets simultaneously for both phenomena is constructed:

$$PAD\&MOM = [C3;PR3]-[C1;PR1] \quad (20)$$

Table 8 shows, for both earnings surprise measures *UE* and *REV*, the mean return and the Jensen’s alpha of the two previously proposed strategies. Although, the magnitude and p-values of the $PAD^{ctr.Mom}$ strategy returns decrease, these continue being significantly positive. Unlike the results obtained with the previous analysis for the *UE* surprise measure, these new results indicate that the PAD phenomenon, although related, has additional explanatory power beyond the momentum effect. Additionally, the $PAD\&MOM$ strategy return is greater than that provided by both strategies separately, which again suggests that both phenomena have additional explanatory power. However, although the $PAD\&MOM$ strategy return is significant, it is less than the PAD strategy return. However, this is probably the logical consequence of a worse diversification of the $PAD\&MOM$ strategy.

[Insert Table 8]

5.6 CONDITIONAL MODELS

The evidence obtained in the previous sections has shown the difficulty in explaining stock price trends over the 6 months after an earnings announcement. However, it is important to consider that, until now, we have based our study on an unconditional risk adjustment.

Thus, following the recent line in assets price literature, in this section we apply a conditional version of the previously used asset price models (the CAPM and the three-factor Fama-French models) that include information on the economic moment. With these models we will allow risks and, therefore, the expected returns, to be time-varying depending on the available information at every moment. Following Ferson and Harvey (1999), we incorporate this dynamism by using the Cochrane (1996)[25] methodology of scaled models. For the three-factor Fama-French (1993) model we have the following expression:[26]

$$R_{D,t} - r_t = \left(\alpha_{0,D} + \alpha'_{1,D} Z_{t-1}\right) + \left(\beta'_{0,D} + Z'_{t-1}\beta_{1,D}\right)\begin{pmatrix}(R_{M,t} - r_t) \\ SMB_t \\ HML_t\end{pmatrix} + \varepsilon_{D,t} \qquad (21)$$

where Z is a vector of $L \times 1$ state variables that contain information about the state of the economy, reflecting the investors' returns expectations, and $\alpha_{0,D}$, $\alpha_{1,D}$, $\beta_{0,D}$ y $\beta_{1,D}$ are the model parameters. $\alpha_{0,D}$ is a scalar, $\alpha_{1,D}$ is $L \times 1$, $\beta_{0,D}$ is 3×1 and $\beta_{1,D}$ is $L \times 3$.

As a state variable we have used the aggregate BTM ratio, calculated as the cross section average of the individual ratios. In this sense, Nieto and Rodriguez (2002) show the relative capacity of this variable to predict future returns in the Spanish market in the

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[25] The empirical literature has demonstrated the goodness of this kind of conditional model when state variables that predict economic cycles are used [Lettau and Ludvigson (2001) and Hodrick and Zhang (2001), for the USA market, and Nieto and Rodriguez (2005), for the Spanish market].

[26] A similar approach is used in Wu (2002) for the analysis of the momentum effect.

period 1982-1999. This evidence is confirmed in our sample, where the OLS regression of the quarterly equally-weighted market returns against the lag of the aggregate BTM has a coefficient of 0.10168 with a t-statistic of 4.0044 (this results hold for a value-weighted index, as well as for a Newey-West adjustment). In addition, Nieto (2004) shows that the conditional models using aggregate BTM ratio as a state variable work better than the static models.

The results obtained with this conditional approach are shown in Table 9. [27] We have used the demeaned aggregate BTM ratio so the abnormal returns are reflected directly by the α_0. For the two earnings surprise measures UE and REV, the abnormal returns increase sharply with the earning surprise levels, and the null hypothesis that all the abnormal returns are equal to zero is rejected (last column of each panel). Also, and most importantly, the PAD strategy still provides highly significant abnormal returns. This result is especially prominent, since it indicates that even when the asset pricing model is conditioned by the economic moment, this market anomaly seems to persist, at least in the Spanish market.

[Insert Table 9]

As an alternative to the scaled models approach of Cochrane (1996), the study is also repeated using the conditional models approach of Jagannathan and Wang (1996). For this, in the equation [21] we have omitted the interactions between the factors and the state variables, that is, we force that $\beta_{1,D} = 0$. Finally, we also add as state variables the aggregate dividend yield (cross section average of the individual ratios), and a variable that reflects the term structure of interest rates, calculated as the difference between the ten-year government bonds yield (long term interest) and the risk free assets yield (short term interest). The results obtained in both cases are similar and are available for all interested readers.

6 SUB-PERIOD ANALYSIS

[27] The condition index of Belsley et al. (1980) [Greene (1999)] is 10,296 for the conditional CAPM and 13,297 for the conditional three factors model of Fama and French. According to Besley at al. (1980), only values superior to 20 are indication of possible multicolineality problems.

In this section we examine the robustness of the PAD phenomenon throughout different sub-periods. Figure 2 shows the monthly average return of the PAD strategy for each year of the sample period. When we consider the *UE* measure, the PAD seems to be especially concentrated in the second half of the period. Conversely, when we choose the *REV* surprise measure, the PAD exhibits high stability throughout the whole period. We only observe a monthly average negative return in the last year analyzed, 2003, but the magnitude is much reduced (- 0.01%).

In addition, the PAD strategy return has been analyzed for two sub-periods: 1994-1998 and 1999-2003. We find that the PAD strategy only provides significantly positive returns (both raw and risk-adjusted) in the second sub-period when we use the *UE* measure. However, when we use the *REV* measure the PAD strategy is profitable for both sub-periods (even after adjusting for risk). Nevertheless, for the *UE* measure, we also find that the PAD phenomenon is stronger for the second sub-period. These results, available upon request, support those shown in Figure 2.

7 CONCLUSIONS

This paper provides the first comprehensive study of post-earnings announcement drift for the Spanish market. In this sense, we have tested the existence of this phenomenon on a sample of companies quoted in the Spanish stock market for the period between January 1994 - December 2003, using two earnings surprise measures based on earnings announcements, *UE*, and mean analyst forecasts, *REV*. Another contribution of this paper is that, to our knowledge, we are the first in testing whether this phenomenon can be explained by the more sophisticated conditional asset pricing models.

The results show that the PAD strategy, consisting of buying the stocks with more favourable earnings surprises and short-selling those with more unfavourable surprises, yields significant positive returns in the months after the earnings announcement when the *UE* and *REV* measures are used. In addition, we observe that both earnings surprise measures show marginal explanatory power, that is, *UE* does not subsume *REV*, and *REV* does not subsume *UE*. This evidence, which is similar to that observed in other stock markets like those of the USA and the UK, reduces the suspicion that this phenomenon was a *data snooping* result.

The PAD returns are robust to a large number of controls that include the traditional CAPM, the three-factor model of Fama and French (1993) and control portfolios by size and BTM ratio. In addition, PAD also seems to be robust to an adjustment by the momentum effect of Jegadeesh and Titman (1993), suggesting the PAD has marginal explanatory power beyond the momentum. We also observe that in the sub-period 1994-1998 the REV measure has higher predictive power than UE, whereas the sub-period 1999-2003 shows just the opposite.

Furthermore, when we adjust the PAD returns with a conditional version of the asset pricing models (CAPM and the three-factor model of Fama and French), allowing investors' risk valuation and expected returns to depend on the economic cycle, the profits of this strategy remain. The fact that the PAD anomaly survives to this more sophisticated conditional adjustment strengthen the great robustness of this phenomenon.

These results make things more difficult for the market efficiency hypothesis. Given this evidence, we think that it would be especially interesting in future research to test those explanations that consider that the PAD phenomenon has its origin in an infra-reaction and/or over-reaction of the investors to the information included in the earnings announcement, consequence of different psychological bias that the agents commit in their investment decision making.

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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 -UE and REV -, as well as the number of months with a low number of surprises (between 1-10) or without surprises (0). UE 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 in the mean analysts forecast, divided by the book value of firm's equity at the beginning of the current year. PANEL B: Average number of stocks with earnings surprises for each of the 12 months of the year.

PANEL A

		1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
UE	**Mean**	14.6	17.1	29.1	39.8	40.3	40.0	38.8	39.2	40.0	37.7	35.6
	Min.	0	0	1	1	4	2	2	1	1	1	0
	Max.	68	65	99	99	98	91	84	97	96	89	86
	0	3	2	0	0	0	0	0	0	0	0	1
	1-10	6	6	5	3	2	2	2	2	2	3	1
REV	**Mean**	109.8	104.3	103.3	92.8	98.3	107.6	106.8	89.9	90.2	89.5	86.2
	Min.	94	101	101	90	93	105	103	88	86	86	83
	Max.	118	112	104	101	106	109	110	91	93	93	89
	0	0	0	0	0	0	0	0	0	0	0	0
	1-10	0	0	0	0	0	0	0	0	0	0	0

PANEL B

	Mes del año												
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	χ^2
UE	8.2	**49.8**	**45.8**	15.3	**62.1**	2.3	30.1	**47.7**	28.1	19.7	**66.3**	1.8	886.4*
REV	95.9	96.5	95.3	96.8	96.8	96.8	94.6	96.6	97.1	97.3	97.5	96.8	2.8

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 favourable earnings surprise portfolio (C3) and sells the unfavorable surprises portfolio (C1) throughout the 12 months after the formation date [$\overline{CR}$], as well as the Newey-West, GMM and *bootstrap* p-values.

		Month alter formation date											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
PANEL A: *UE*													
$\overline{CR}_{PAD}$ %		1.501	2.204	3.042	3.673	4.185	4.753	5.297	5.631	6.039	6.159	6.611	7.347
P-val.	***N-W***	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.002]	[0.003]	[0.007]	[0.008]	[0.007]
	GMM	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.002]	[0.003]	[0.002]
	Boot	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.003]	[0.004]	[0.011]	[0.006]	[0.002]
PANEL B: *REV*													
$\overline{CR}_{PAD}$ %		0.492	0.978	1.509	1.601	2.087	2.734	2.836	3.189	3.367	3.397	3.543	3.432
P-val.	***N-W***	[0.046]	[0.001]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.004]
	GMM	[0.024]	[0.001]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.002]
	Boot	[0.019]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.014]

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 favourable earnings surprise portfolio (C3) and sells the unfavorable surprises portfolio (C1), and keep these positions during the next *h* months, as well as the MCO, GMM and bootstrap p-values.

h	**PANEL A:** *UE*				**PANEL B:** *REV*			
	$\overline{R}$%	***P-value***			$\overline{R}$%	***P-value***		
		MCO	***GMM***	***Boot.***		***MCO***	***GMM***	***Boot.***
3	0.7336	[0.002]	[0.001]	[0.001]	0.4797	[0.003]	[0.000]	[0.004]
6	0.6482	[0.005]	[0.006]	[0.003]	0.4065	[0.008]	[0.000]	[0.007]
9	0.4987	[0.032]	[0.040]	[0.025]	0.3152	[0.027]	[0.005]	[0.034]
12	0.4053	[0.057]	[0.072]	[0.042]	0.2093	[0.111]	[0.065]	[0.127]

TABLE 4

Relation between the two surprise measures: UE versus REV

Average return [$\overline{R}$] of the *UE*-PAD strategy controlled by *REV*, $PAD_{UE}^{ctr.REV}$, and the *REV*-PAD strategy controlled by *UE*, $PAD_{REV}^{ctr.UE}$, as well as to the mixed strategy, $PAD\left[UE \ \& \ REV\right]$. Six months holding periods. In brackets are the p-values (GMM).

	$PAD_{UE}^{ctr.REV}$	$PAD_{REV}^{ctr.UE}$	$PAD\left[UE \ \& \ REV\right]$
$\overline{R}\%$	0.56 [0.044]	0.35 [0.025]	0.8720 [0.004]

TABLE 5

CAPM results.

Mean return ($\overline{R}$), Jensen's alpha (α), market beta (β) and adjusted R-squared coefficient ($R^2_{aj.}$) of the different earning surprise portfolios, C1, C2 and C3, as well as for the PAD strategy that buys the favourable earning surprise portfolio (C3) and sells the unfavorable one (C1). Six month holding period. The last column shows the Chi-square statistics of the null hypotheses:

$$H_0 : \alpha_{C1} = \alpha_{C2} = \alpha_{C3} = 0; \quad H_0 : \beta_{C1} = \beta_{C2} = \beta_{C3}.$$

	PANEL A: *UE*					**PANEL B:** *REV*				
	C1	**C2**	**C3**	**C3-C1**	χ^2	**C1**	**C2**	**C3**	**C3-C1**	χ^2
$\overline{R}\%$	1.0442	1.4354	1.6924	0.6482	8.3614	1.0189	1.2972	1.4254	0.4065	13.8164
	[0.069]	[0.006]	[0.007]	[0.006]	[0.015]	[0.071]	[0.028]	[0.010]	[0.000]	[0.001]
$\alpha\%$	0.0296	0.4823	0.6740	0.6444	9.9628	-0.0155	0.2664	0.4329	0.4485	17.9571
	[0.908]	[0.024]	[0.055]	[0.007]	[0.019]	[0.950]	[0.309]	[0.060]	[0.000]	[0.000]
β	0.8558	0.7680	0.8612	0.0054	3.985	0.8841	0.8790	0.8243	-0.0598	4.2543
	[0.000]	[0.000]	[0.000]	[0.888]	[0.136]	[0.000]	[0.000]	[0.000]	[0.063]	[0.119]
$R^2_{aj.}$	0.7036	0.7709	0.6611			0.7659	0.7456	0.7873		

TABLE 6

Size and BTM characteristics, results of the three-factor model of Fama&French (1993) and size-BTM control portfolios adjusted returns. Accounting data restricted sample.

Results for the sample restricted to the size and BTM ratio data availability. Panel A shows the size and BTM characteristics of the earning surprise portfolios, C1, C2 and C3, as well as of the PAD strategy. Panel B shows the results of the three factors model of Fama and French. Panel C shows the average monthly returns adjusted by size and BTM control portfolios. Six month holding periods. In the last column are the Chi-square statistics of the null hypotheses:

$$H_0 : \alpha_{C1} = \alpha_{C2} = \alpha_{C3} = 0; \quad H_0 : \beta_{C1} = \beta_{C2} = \beta_{C3}.$$

	UE					*REV*				
	C1	**C2**	**C3**	**C3-C1**	χ^2	**C1**	**C2**	**C3**	**C3-C1**	χ^2
PANEL A: ***Size and BTM characteristics***										
Size	2068.86	3301.73	2215.02	146.16	21.259	1423.31	4273.96	2316.24	892.93	119.410
				[0.663]	[0.000]				[0.000]	[0.000]
BTM	0.6848	0.7136	0.4594	-0.2255	9.9164	0.6414	0.6220	0.6024	-0.0390	3.6445
				[0.004]	[0.007]				[0.110]	[0.162]
PANEL B: ***Three-factor model of Fama and French***										
$\alpha\%$	-0.0466	0.3904	0.5463	0.5930	6.8393	-0.1489	0.1240	0.3893	0.5382	17.9405
	[0.818]	[0.041]	[0.058]	[0.026]	[0.077]	[0.536]	[0.539]	[0.054]	[0.000]	[0.001]
β	0.8649	0.7969	0.8998	0.0349	4.1191	0.8985	0.8820	0.8612	-0.0374	1.5542
	[0.000]	[0.000]	[0.000]	[0.368]	[0.127]	[0.000]	[0.000]	[0.000]	[0.245]	[0.460]
s	0.6101	0.2243	0.6517	0.0416	17.495	0.4772	0.4978	0.3730	-0.1041	2.8805
	[0.000]	[0.001]	[0.000]	[0.714]	[0.000]	[0.000]	[0.000]	[0.000]	[0.128]	[0.237]
h	0.2752	0.0351	0.2112	-0.0640	10.687	0.2092	0.2171	0.1206	-0.0886	2.0859
	[0.001]	[0.530]	[0.029]	[0.453]	[0.005]	[0.009]	[0.001]	[0.179]	[0.246]	[0.352]
$R^2_{aj.}$	0.8176	0.8141	0.7629			0.8163	0.8525	0.8241		
PANEL C: ***Size-BTM control portfolios adjusted returns***										
	-0.2086	0.1482	0.3333	0.5418	8.5457	-0.2228	-0.0033	0.1935	0.4163	15.65346
	[0.066]	[0.099]	[0.007]	[0.008]	[0.014]	[0.027]	[0.971]	[0.006]	[0.000]	0.0004

TABLE 7

Three factors model of Fama and French (1993) with a fourth factor of momentum.

Results for the sample restricted to the size and BTM ratio data availability. Jensen's alpha (α), market beta (β), the SMB and HML coefficients (s and h), the momentum coefficient (m) and the adjusted R-squared ($R^2_{aj.}$) of the calendar-time monthly returns. Six month holding period. In the last column are the Chi-square statistics of the null hypotheses:

$$H_0 : \alpha_{C1} = \alpha_{C2} = \alpha_{C3} = 0; \quad H_0 : \beta_{C1} = \beta_{C2} = \beta_{C3}$$

	UE					*REV*				
	C1	**C2**	**C3**	**C3-C1**	χ^2	**C1**	**C2**	**C3**	**C3-C1**	χ^2
$\alpha\%$	0.0284	0.2821	0.4782	0.4498	3.2125	-0.0401	0.0832	0.3156	0.3558	10.8004
	[0.889]	[0.170]	[0.117]	[0.114]	[0.360]	[0.863]	[0.704]	[0.134]	[0.004]	[0.013]
β	0.8510	0.8170	0.9125	0.0615	4.0119	0.8783	0.8895	0.8748	-0.0035	0.2277
	[0.000]	[0.000]	[0.000]	[0.125]	[0.135]	[0.000]	[0.000]	[0.000]	[0.878]	[0.892]
s	0.5596	0.2971	0.6975	0.1379	9.8993	0.4040	0.5253	0.4225	0.0185	4.0099
	[0.000]	[0.000]	[0.000]	[0.147]	[0.007]	[0.000]	[0.000]	[0.000]	[0.724]	[0.135]
h	0.2387	0.0878	0.2444	0.0057	3.7387	0.1562	0.2369	0.1565	0.0002	3.7255
	[0.006]	[0.175]	[0.018]	[0.944]	[0.154]	[0.053]	[0.001]	[0.076]	[0.997]	[0.155]
m	-0.1112	0.1604	0.1010	0.2122	17.3597	-0.1612	0.0604	0.1091	0.2704	45.0068
	[0.069]	[0.027]	[0.234]	[0.011]	[0.000]	[0.017]	[0.360]	[0.049]	[0.000]	[0.000]
R^2	0.8206	0.8254	0.7642			0.8243	0.8526	0.8276		

TABLE 8

PAD versus Momentum

Mean return ($\overline{R}$) and CAPM Jensen's alpha (α) of the PAD strategy controlled by momentum [$PAD^{ctr.Mom}$], as well as of the mixed strategy $PAD \,\&\, MOM$. Six-month holding period. In brackets are the GMM p-values.

		UE	*REV*
$PAD^{ctr.Mom}$	$\overline{R}\%$	0.5264 [0.042]	0.3019 [0.024]
	$\alpha\ \%$	0.4972 [0.052]	0.3046 [0.022]
$PAD \,\&\, MOM$	$\overline{R}\%$	0.9720 [0.029]	0.7815 [0.052]
	$\alpha\ \%$	1.0297 [0.022]	0.8980 [0.034]

TABLE 9

Conditional version of the CAPM and the three-factor model of Fama and French (1993)

Results of running the conditional version of the CAPM and the three factors model of Fama and French (1993) to the calendar-time monthly returns of the earnings surprise portfolios, C1, C2 and C3, as well as of the PAD strategy that buys the favourable earnings surprise portfolio (C3) and short-sells the unfavorable one (C1). Aggregated BTM ratio has been used as state variable (this variable has been demeaned so the abnormal returns are reflected directly by the α_0). Six months holding periods. Results for the sample restricted to the size and BTM ratio data availability. In the last column are the Chi-square statistics of the null hypotheses: $H_0 : \alpha_{C1} = \alpha_{C2} = \alpha_{C3} = 0;\quad H_0 : \beta_{C1} = \beta_{C2} = \beta_{C3}$.

	UE					*REV*				
	C1	**C2**	**C3**	**C3-C1**	χ^2	**C1**	**C2**	**C3**	**C3-C1**	χ^2
PANEL A: *CAPM*										
α_0%	0.0066	0.4693	0.5410	0.5344	11.2761	-0.1423	0.1919	0.3483	0.4905	14.8391
	[0.978]	[0.019]	[0.127]	[0.023]	[0.010]	[0.571]	[0.446]	[0.146]	[0.000]	[0.002]
α_1%	-0.2709	2.1905	0.9164	1.1873	7.1489	-0.8771	0.8640	0.5456	1.4227	3.0179
	[0.881]	[0.029]	[0.700]	[0.455]	[0.067]	[0.579]	[0.544]	[0.758]	[0.129]	[0.389]
β_0	0.8755	0.7783	0.8939	0.0184	14.4626	0.9108	0.8822	0.8573	-0.0535	2.3947
	[0.000]	[0.000]	[0.000]	[0.653]	[0.001]	[0.000]	[0.000]	[0.002]	[0.125]	[0.302]
β_1	0.6181	-0.2150	0.6892	0.0710	36.5080	0.6093	0.3890	0.5637	-0.0456	2.8036
	[0.009]	[0.332]	[0.045]	[0.778]	[0.000]	[0.002]	[0.097]	[0.012]	[0.820]	[0.246]
$R^2_{aj.}$	0.7292	0.8009	0.6819			0.7681	0.7885	0.7982		
PANEL B: ***Three- factor model of Fama and French (1993)***										
α_0%	-0.0961	0.4729	0.4721	0.5682	12.4673	-0.2377	0.1069	0.3248	0.5625	18.9658
	[0.639]	[0.009]	[0.106]	[0.021]	[0.006]	[0.347]	[0.607]	[0.103]	[0.000]	[0.000]
α_1%	-0.5159	1.9979	1.2844	1.8003	8.1483	-0.5761	0.7807	0.6175	1.1935	2.9444
	[0.704]	[0.018]	[0.330]	[0.233]	[0.043]	[0.636]	[0.365]	[0.582]	[0.274]	[0.400]
β_0	0.8655	0.7750	0.8942	0.0287	10.7998	0.9066	0.8725	0.8567	-0.0499	2.4504
	[0.000]	[0.000]	[0.000]	[0.442]	[0.005]	[0.000]	[0.000]	[0.000]	[0.121]	[0.294]
s_0	0.5868	0.2358	0.6209	0.0340	20.5135	0.4540	0.4828	0.3422	-0.1118	3.8452
	[0.000]	[0.000]	[0.000]	[0.737]	[0.000]	[0.000]	[0.000]	[0.000]	[0.076]	[0.146]
h_0	0.2404	0.0192	0.1446	-0.0956	9.1554	0.1659	0.1677	0.0648	-0.1011	1.7927
	[0.003]	[0.738]	[0.123]	[0.290]	[0.010]	[0.025]	[0.004]	[0.502]	[0.262]	[0.408]
β_1	0.2511	-0.4552	0.4279	0.1768	15.9084	0.4312	0.0525	0.3727	-0.0585	5.8198
	[0.306]	[0.096]	[0.069]	[0.561]	[0.000]	[0.015]	[0.764]	[0.095]	[0.754]	[0.055]
s_1	0.0078	-0.1323	-0.5254	-0.5332	1.1561	-0.4764	-0.3607	-0.2210	0.2554	0.9744
	[0.980]	[0.675]	[0.224]	[0.296]	[0.561]	[0.143]	[0.101]	[0.465]	[0.371]	[0.614]
h_1	0.2370	0.5258	0.3615	0.1244	1.4644	0.2274	0.5673	0.3010	0.0737	2.5057
	[0.422]	[0.021]	[0.319]	[0.796]	[0.481]	[0.367]	[0.002]	[0.449]	[0.876]	[0.286]
$R^2_{aj.}$	0.8160	0.8189	0.7660			0.8181	0.8532	0.8287		

FIGURE 1

PAD average cumulative return throughout the 12 months after the formation date.

Average cumulative return throughout the 12 months after the formation date of the PAD strategies using two different earning surprise measures: *UE* and *REV*

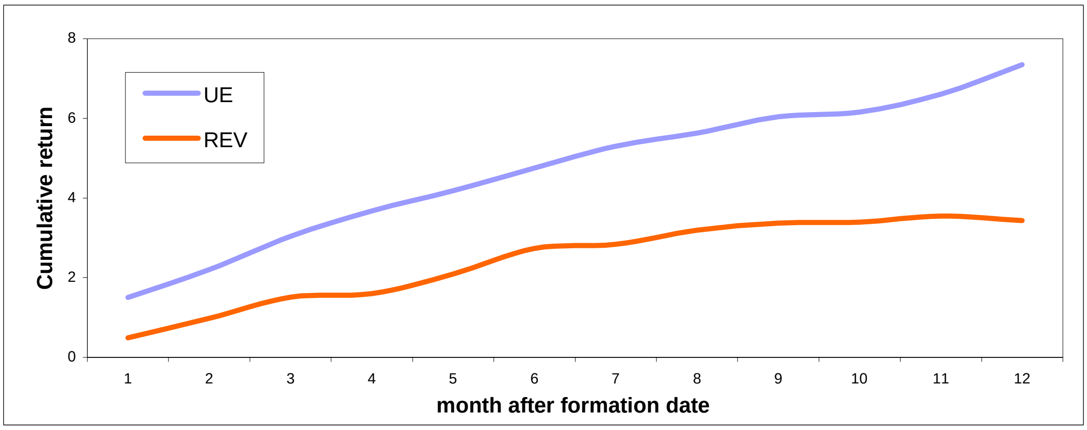
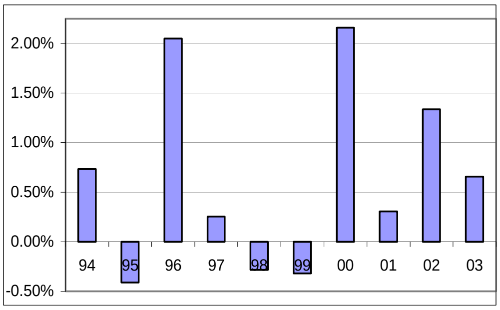
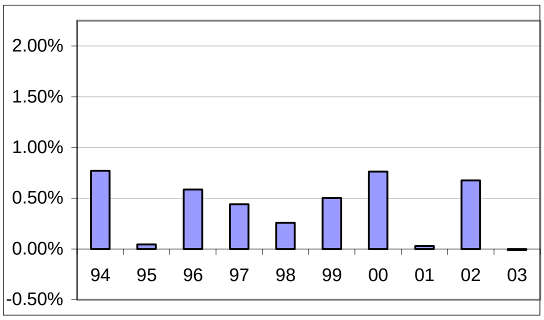


FIGURE 2

Subperiod analysis

Mean monthly return of the PAD strategy for each one of the sample years.

PANEL A: *UE*	PANEL B: *REV*
	

APENDIX

TABLE A1

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

Average cumulative return throughout the 12 months after the formation the date [$\overline{CR}$], of the cost-zero investment strategy that buys the favourable earning surprise portfolio (C3) and sells the unfavorable surprise portfolio (C1) as well as the Newey-West p-values. *UE* is the difference between the current quarter earning and the earning reported in the same quarter of the previous year (unexpected earnings), divided by the total assets at the beginning of the current year; *SUE* is the standardized unexpected earnings, calculated as the ratio between the unexpected earning and the standard deviation of the unexpected earning (computed with at least 8 observations).

	Months after formation date											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
PANEL A: *UE*												
1994-2003 period												
$\overline{CR}_{PAD}$ %	1.273	1.948	2.733	3.347	3.722	4.177	4.575	4.362	4.549	4.530	4.944	5.358
p-value	[0.005]	[0.002]	[0.000]	[0.000]	[0.000]	[0.001]	[0.002]	[0.017]	[0.034]	[0.072]	[0.074]	[0.077]
PANEL B: *SUE*												
1999-2003 period												
$\overline{CR}_{PAD}$ %	1.384	2.708	3.652	4.597	5.677	6.797	7.658	8.355	9.507	10.744	12.417	13.166
p-value	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

TABLE A2

PAD average monthly return for different holding periods.

Mean calendar-time monthly returns of the PAD strategy for holding periods of *h*=3, 6, 9, 12 months, as well as their standard p-values. *UE* is the difference between the current quarter earning and the earning for the same quarter of the previous year (unexpected earnings), divided by the total assets at the beginning of the current year; *SUE* is the standardized unexpected earnings, calculated as the ratio between the unexpected earnings and the standard deviation of the unexpected earnings (computed with at least 8 observations).

	PANEL A: *UE*		**PANEL C:** *SUE*	
h	$\overline{R}\%$	*p-value*	$\overline{R}\%$	*p-value*
	1994-1998		**1999-2003**	
3	0.7378	[0.003]	1.1941	[0.003]
6	0.6208	[0.009]	1.1488	[0.004]
9	0.4373	[0.060]	1.0116	[0.011]
12	0.3188	[0.140]	0.9294	[0.014]