Investor Sentiment Effects on Share Price Deviations from their Intrinsic Values Based on Accounting Fundamentals

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Abstract

We investigate the existence of evidence of investor sentiment on share price deviations from their intrinsic values across two sentiment regimes of shares market: the low-to-normal and the excess one. We use the residual income valuation model to calculate the intrinsic values of shares based on accounting fundamentals and we suggest a panel data threshold model to capture the sentiment regimes of the market, using as threshold variable alternative investor sentiment indices. The suggested model enables us, first, to endogenously identify from the data the threshold value of a sentiment index triggering market sentiment regime shifts and, based on it, to examine if the effects of investor sentiment on share prices across the above two sentiment regimes are in accordance to the theory. Application of the model to UK data shows that investor sentiment influences positively share prices in the low-to-normal and negatively in the excess one. We also show that investor sentiment dominates risk premium effects on shares characterized by low book-to-market, and dividend- and earnings-to-price ratios. The above results are consistent with the predictions of the sentiment hypothesis.

JEL classification: G12, G14, G15

Keywords: asset pricing, investor sentiment, risk premium, firm-specific variables, panel data, cointegration, threshold model.

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1 Introduction

There is a long debate in the finance literature over whether investor sentiment, such as excessive optimism, fears and moods, affect significantly share returns and/or prices (see, Statman (2011), for a survey).[1] According to the sentiment hypothesis, deviations of share prices from their fundamental values should reflect behavioral investor attitudes (i.e., psychological factors) which influence investors' reaction to market and/or company information. These attitudes tend to lead to overpriced, or underpriced, shares, depending on the sentiment level (or regime) of shares market. In particular, the sentiment hypothesis predicts that abrupt adjustments of share prices to their intrinsic values and bubbles burst should occur in periods of excess investor sentiment (see, e.g., Thorp (2004), Brown and Cliff (2004, 2005)). On the other hand, the generic effects of investor sentiment on share prices tend to build up in periods of lower and normal levels of investor sentiment. These predictions are at odd to those of the risk premium hypothesis (see, e.g., Shefrin (2001, 2015)). Thus, conditioning on the above different sentiment regimes of shares market enables us to distinguish the effects on investor sentiment on share prices from those of the risk premium, which otherwise are difficult to be distinguished to each other (see, e.g., Fama and French (2004)).

To empirically examine the validity of the above predictions of the sentiment hypothesis, in this paper we suggest a panel data threshold model of current market share price deviations from their intrinsic values using as threshold variable alternative choices of investor sentiment indices, suggested in the literature. These include the consumer confidence indicator (see Schmeling (2009)), the economic sentiment index suggested by Baker and Wurgler (2006) and the weighted average of different sectors confidence indices. The periods of the sample in which abrupt share price adjustments occur can be identified by the excess-sentiment regime of the model, while those associated with generic sentiment effects by the low-to-normal-sentiment regime. The suggested model enables us to estimate from the data, at hand, the threshold value of a sentiment index above (or below) which investor and share market sentiment is more likely to switch and, based on this estimate, examine if the sentiment effects

[1] Proponents of this behavioral approach to asset pricing include De Bondt and Thaler (1985), Bernard and Thomas (1989), Lee et al (1991), Barberis et al. (1998), Daniel et al (2001), Brooks and Katsaris (2005), and Li et al (2008), inter alia.

are asymmetric across the two sentiment regimes. The fact that the model can estimate the threshold parameter endogenously from the data based on an investor sentiment index provides useful information about the level of shares market sentiment that can trigger price corrections, or bubbles burst. It also distinguishes our model from others in the literature assigning ad-hoc dummy variables to capture the effects of investor sentiment on share prices or returns relying on out-of-sample (exogenous) information (see, e.g., Stambaugh et al (2012), Lutz (2015), Massa and Yadav (2015), and Zhu and Niu (2016)).[2] In addition to this, the panel data nature of the model also allows us to investigate the effects of investor sentiment on the cross-section distribution of firm-specific characteristics of share prices, like the size and book-to-market ratio, at each regime of the model. As aptly noted, first, by Baker and Wurgler (2006), shares with small size and low book-to-market ratio should be affected by investor sentiment effects due to limits to arbitrage. Our model enables us to investigate if these effects occur in the low-to-normal or excess investor sentiment regimes.

To our knowledge, this is the first paper that address the above questions based on current market share price deviations from their fundamental values. The prices of currently traded shares constitute present values of future cash flows discounted by expected (required) share returns embodying ex ante risk premium effects. This enables us to appraise at which extent the deviations of the market share prices from their intrinsic values are due to investor sentiment and/or risk premium effects. Another reason of using share prices, instead of returns often used in the literature (see, e.g., Shefrin (2015), for a survey), is that returns are measured by their realized values, ex-post, and thus may not efficiently approximate their expected values embodied in current share prices when quite persistent and/or big in magnitude future cash flow shocks occur in future periods (see Ogneva (2012)). Such shocks may obscure behavioral attitudes of investors in market share prices, when using ex-post realized returns.

We estimate the suggested model based on price deviations of UK shares listed in the

[2]For example, optimistic, or pessimistic, periods of share markets often associated with the peak, or trough, phases of business cycles are captured by dummy variables based on out-of-sample information (e.g., official government announcements about business cycle phases). This approach may be proved quite restrictive since not all the peaks (or troughs) of business cycles are associated with optimistic (or pessimistic) periods of share markets. Note that, since the eminent paper of Fama (1981), share market movements are understood as being pro-cyclical to business cycle phases.

UK stock market from their intrinsic values, over the period 1987-2012. To calculate the intrinsic value of shares, we employ the residual income model (see, e.g., Ohlson (1995)). This model relies on accounting fundamentals, like the book value and earnings, which are publicly available by the yearly financial statements of companies. These fundamentals are positively correlated with future cash flows, thus providing important company information about share prices (see Patatoukas (2014)). The residual income model facilitates calculation of the intrinsic values of shares, over a finite horizon, as it is based on the present value of abnormal earnings. As competition forces abnormal earnings to zero, one needs estimates of abnormal earnings only for a few years ahead to explain deviations of share prices from their book values. Another interesting feature of the residual income model is that it can exploit analyst earnings forecasts to estimate expected future residual income and, hence, the intrinsic values of shares. However, note that, since these forecasts may be affected by investor sentiment (see, e.g., Chen (2011)) and thus may subject to serious forecast errors (see Hribar and Mclnnis (2012)), in our analysis we employ an exponential smoothing model to calculate expected company earnings. This model relies on past information of the actual earnings per company share and their corrections from their analyst forecasts. It is a model of actual earnings of companies which does not suffer from the problem of optimistic sentiment on analyst earnings forecasts, while it can exploit useful information from analysts in forecasting future actual earnings throughout its error correction term.

The estimation of the model leads to a number of interesting conclusions, concerning both qualitative and quantitative effects of investor sentiment on share prices. First, it provides strong evidence of asymmetric investor sentiment effects on share prices between the two sentiment regimes considered by the model. It is shown that the generic effects of investor sentiment on share prices are positive in the low-to-normal-sentiment regime. In the excess-sentiment regime, they become negative and much larger in magnitude than the low-to-normal regime due to the abrupt adjustments of share prices to their fundamental values. The excess-sentiment regime is characterized by excessive optimism and it includes periods of bubbles bursts and cumulative share price adjustments to their fundamental values. These results are in accordance to the predictions of the sentiment hypothesis, mentioned before. Second, it is shown that the estimate of the threshold parameter value, distinguishing the two sentiment regimes lies in the top (i.e., 20%) percentile of the empirical distribution of all the alternative sentiment indices used in our empirical analysis. A final conclusion that can be drawn from the estimation of the model concerns the cross-section distribution of the investor sentiment effects on share prices, with respect to the firm-specific characteristics mentioned before. This pattern is found to be significant and in accordance to the predictions of the sentiment hypothesis for both sentiment regimes.

The paper is organized as follows. Section 2 presents the share valuation model employed to calculate the intrinsic values of shares. Section 3 discuss possible asymmetric effects of investor sentiment on share prices, in more details, and it introduces the threshold panel data model. This section also carries out the empirical analysis of the paper and discuss the estimation results. Section 4 concludes the paper.

2 The share valuation model

2.1 The residual income model

The residual income model (RIM) (see, e.g., Ohlson (1995), Feltham and Ohlson (1995), and Penman and Sougiannis (1998)) is based on the dividend discount model (DDM), given as

$$P_{it}^{*} = \sum\nolimits_{\tau=1}^{\infty} \frac{\mathcal{E}_t(d_{it+\tau})}{(1+r_f)^{\tau}}, \text{ for all } i, \tag{1}$$

where $\mathcal{E}_t(\cdot)$ denotes the conditional on information set I_t expectations operator, P_{it}^{*} is the intrinsic (fundamental) value of a company i share, at time t, $d_{it+\tau}$ denotes the net dividends of the company, at time $t+\tau$, and r_f is the risk-free discount rate. Note at this point that expected dividends in formula (1) are discounted by the risk-free rate r_f, as initially assumed by Ohlson (1995). This is done in order to obtain intrinsic values of shares which are net of risk premium or investor sentiment effects.[3] Thus, the deviations of P_{it}^{*}, calculated based on (1) or Ohlson's formula (see (3), below), from their actual, market share prices (denoted as P_{it}), given as $P_{it} - P_{it}^{*}$, can be also used to test for the existence of time-varying risk premium effects on share prices P_{it}, apart from investor sentiment. In order to control for

[3]Note that another reason for using r_f as a discount factor is that it makes the RIM model internally consistent with the discounted earnings formula $P_{it}^{*} = E_{it}/r_f$, used in the literature to evaluate the effects of investor sentiment on share prices (see, e.g., Barberis et al (1998) and Dechow et al (1999)).

the risk premium effects on P_{it}, in our analysis we will rely on Fama-French's factors model (see Fama and French (1993, 1996) and the intertemporal asset pricing framework (see, e.g., Cochrane (2005)).[4]

The RIM share valuation formula can be derived from (1) by the so called clean-surplus equation, given as

$$B_{it} = B_{it-1} + E_{it} - d_{it}, \text{ for all } t, \tag{2}$$

where B_{it} is the book value of equity of company i, E_{it} denotes the earnings of the company from $t-1$ to t and $E_{it} - d_{it}$ constitutes the added value of the company net of dividends. Solving out (2) for d_{it} and substituting into (1) yields the following well known valuation formula of the RIM:

$$P^*_{it} = B_{it} + \sum\nolimits_{\tau=1}^{T} \frac{\mathcal{E}_t(E_{it+\tau} - r_f B_{it+\tau-1})}{(1+r_f)^\tau} + P^*_{iT}, \text{ for all } i, \tag{3}$$

where P^*_{iT} is the terminal value of share i.[5]

The share valuation formula given by (3) assumes that the intrinsic value of a share i, P^*_{it}, depends on the current, t-time book value of its company, B_{it}, which is a measure of company's historical capital invested, and the discounted future abnormal earnings (referred to as residual income) given as $E_{it+\tau} - r_f B_{it+\tau-1}$. The residual income constitutes the difference between the company's earnings $E_{it+\tau}$ and the opportunity cost of capital. This income reflects the effects of future earnings from wealth creating activities of the company on the intrinsic value of its share, at time t. There are two main reasons that one may employ the RIM valuation formula (3), instead of the DDM one (see equations (1)), to calculate the intrinsic value of a share (see Lee (1999) and Lee et al (1999), or more recently Penman (2015)). First, formula (3) relies on values of firm-specific variables, like $B_{it+\tau}$ which are publicly available by the financial statements and accounting data of the firms. Second, it facilitates calculation of share price P^*_{it} over a finite horizon T, based on forecasts of $B_{it+\tau}$

[4] Both of these approaches provide a more general framework of pricing risk in shares than the CAPM (see, e.g., Fama and French (1993)).

[5] See, e.g., Penman and Sougiannis (1998). The terminal value P^*_{iT} is given as

$$P^*_{iT} = \frac{1}{(1+r_{ie})^T} \left[\frac{\mathcal{E}_t(E_{it+T+1} - r_{ie} B_{it+T})}{(r_{ie} - g_i)} \right],$$

where g_i is the growth rate of the company's earnings.

and $E_{it+\tau}$. This can be done under different assumptions about the terminal value of the share P^*_{iT}. One such assumption is that P^*_{iT} is given by the value of a perpetuity of residual income $E_{it+\tau} - r_f B_{it+\tau-1}$, with growing earnings, or not. Another sensible assumption about P^*_{iT} would be that, after horizon T, the company earns income which is equal to its cost of capital (i.e., $E_{it+T+1} = r_f B_{it+T}$), which means that $P^*_{iT} = 0$.

2.2 Intrinsic values of share prices based on formula (3)

To calculate the intrinsic values P^*_{it}, based on formula (3), and their deviations from their market values $P_{it} - P^*_{it}$, we rely on data from the London Stock Exchange. Our sample covers the period from year 1987 to 2012, implying $T = 26$ yearly observations, and it includes $N = 37$ companies from the FTSE 100 index, which have been traded continuously in the UK stock market during the sample period. Thus, the total number of panel data observations analyzed is $NT = 962$ observations. The actual market prices P_{it} are expressed in nominal values and have annual frequency. In particular, they are obtained 15 days after the releases dates of the yearly financial statements of the companies of our sample in order to allow for P_{it} to absorb any news that are incorporated in the financial statements and accounting data of the companies reported. Thus, our study can be also thought of as an event study of the financial statement announcements on share prices, across different investor sentiment regimes.

The intrinsic values P^*_{it} are based on data for earnings and book values on the dates that the yearly financial statement releases are made by companies.[6] More specifically, B_{it} are calculated based on data of a company's balance sheets and E_{it} are obtained from the profits

[6] These data are available on annual basis. The analyst earnings forecasts, extracted from DataStream, are obtained from the Institutional Brokers' Estimate System (IBES). They are based on combined estimates of the analysts about a company's earnings per share that concerns the next fiscal year. This is done based on models-projections and research on the future plans of companies, and they are given on a summary (consensus) level (i.e., taken as the average of detailed (analyst-by-analyst) forecasts, see also Hughes et al (2008)). In each year and for every company of our sample, the number of analysts of the IBES basis is sufficient to calculate accurate estimates of earnings forecasts. This number varies mostly from 8 to 30, at an average of 16 forecasts, and it is available upon request.

Descriptive statistics of these forecasts, over the cross-section and time-dimension of our data, are given in Table 1. These statistics show that the analyst earnings forecasts also include smaller in terms of size companies. The correlation coefficient of the analyst earnings forecasts with the actual per share earnings one period ahead is about 68%, at aggregate level, which means that they contain important information about future company earnings.

and loss accounts. Based on the values of E_{it}, we can calculate expected future abnormal earnings (denoted as AE), defined as $AE = \sum_{\tau=1}^{T} \frac{\mathcal{E}_t(E_{it+\tau} - r_{ie} B_{it+\tau-1})}{(1+r_f)^\tau}$, where the expected values of $E_{it+\tau}$ are calculated for $T = 5$ periods (years) ahead and the forecasts of $B_{it+\tau}$ are obtained as $B_{it+\tau} = B_{it+\tau-1} + E_{it+\tau} - D_{it+\tau}$, where $D_{it+\tau}$ denotes the dividend of share i in period $t + \tau$ (see, e.g., Lee et al (1999)).[7] As r_f, we employ the three month interest rate in an annual basis, while $D_{it+\tau}$ is estimated using the current dividend payout ratio k, as $D_{it+\tau} = E_{it+\tau} \times k$.

To calculate the expected earnings $\mathcal{E}_t(E_{it+\tau})$, we rely on estimates of the following model:

$$E_{it+\tau} = a_\tau E_{it} + (1 - a_\tau)(E_{it} - E_{it}^a) + \eta_{it}, \text{ for } \tau = 1, 2, ..., 5 \tag{4}$$

where E_{it}^a are the analyst earnings forecasts and η_{it} is the error term. This is a type of exponential smoothing model which provides forecasts of actual earnings $E_{it+\tau}$, τ-periods ahead, by combining information of the current, actual values of E_{it} and the analyst earning forecasts E_{it}^a, made one-period back. The right hand side (RHS) regressor term $E_{it} - E_{it}^a$ of model (4) can be thought of as an error correction term taking into account errors (revisions) made in the analyst earnings forecasts one period back about actual earnings E_{it}. These errors can be attributed to excess optimism, as noted in the literature (see the introduction). Evidence that these errors are significant means that the use of earnings forecasts E_{it}^a in calculating abnormal earnings AE will lead to biased estimates of the intrinsic share prices P_{it}^*, meaning that these prices must not be employed to test the investor sentiment hypothesis predictions based on share deviations $P_{it} - P_{it}^*$, which is the focus of this paper. We have found that the inclusion of $E_{it} - E_{it}^a$ into model (4) considerably improves the performance of the model to predict future $E_{it+\tau}$, compared to the autoregressive model. As all exponential smoothing models, (4) constitutes a particularly useful framework to forecast future levels of $E_{it+\tau}$ based on short time-dimension panel data samples, as in our case.

Model (4) was estimated by the least squares dummy variables (LSDV) panel data method, allowing for fixed effects. Its coefficient estimates and the observed values of E_{it} and E_{it}^a were used to provide forecasts of $E_{it+\tau}$ and calculate AE over the different forecast

[7] In our analysis, we have set $P_{iT}^* = 0$, as we have found that the cross-section average of the residual income $E_{it+\tau} - r_f B_{it+\tau-1}$ after $T = 5$ periods ahead is not significantly different than zero, for all t, and thus its effect on terminal value P_{iT}^* and current share price P_{it}^* can be treated as negligible.

horizons $\tau = 1, 2, ..., T$, as required by formula (3). The estimation results of the model support its use in forecasting $E_{it+\tau}$ and calculating the intrinsic values P^*_{it}. The estimates of the slope coefficient a_τ were found to vary between 0.85 and 0.60 (as τ increases), implying a high degree of earnings persistency, for all i, also noted in the literature (see Chen (2011)). The less than unity estimates of a_τ mean that analyst earnings forecasts E^a_{it} constitute biased upwards estimates of actual earnings E_{it}. Thus, they should not be used to provide forecasts of the actual future earnings $E_{it+\tau}$, as argued before. Instead, E^a_{it} was found to contain useful information about $E_{it+\tau}$ throughout the error correction term $E_{it} - E^a_{it}$. This was justified by the estimates of the variance of the error of model (4), for all τ, which were found to substantially decrease when $E_{it} - E^a_{it}$ is included in the RHS of the model, as an additional regressor.

To have a pictorial view of how well the valuation formula (3) captures movements in market share prices, in Figure 1 we graphically present aggregate values of market prices P_{it}, denoted as P_bar, against their intrinsic values, denoted as P*_bar; P_bar is calculated as the cross-section average of market share prices P_{it}, at any t, while P*_bar as the cross-section average of P^*_{it}, at any t, where P^*_{it} are calculated based on (3) and the procedure described above to obtain forecasts of $E_{it+\tau}$. Inspection of Figure 1 indicates that formula (3) provides intrinsic values of shares which follow very closely the movements of their traded (market) prices, over medium or long horizons. The graphs of both aggregate series P_bar and P*_bar seem to follow the pattern of a pair of cointegrated time series, driven by a common stochastic trend. The two series graphically seem to correspond one-to-one to each other and have a cointegrating vector (1,-1).[8] This can explain the stationary pattern of the deviations between P_bar and P*_bar (i.e., P_bar − P*_bar), which are graphically presented in Figure 2.

Evidence of cointegration between the above aggregate series of share prices can be obviously attributed to the fact that share prices P_{it} and P^*_{it} are cointegrated at individual level, for all i. This result is formally established in the appendix based on the recent developments of panel data integration-cointegration analysis. In particular, in the appendix we show that

[8] Note that evidence that, at aggregate level, share prices and accounting fundamentals are cointegrated are provided by Curtis (2011), for the US stock market.

P_{it} and P_{it}^{*} are integrated and cointegrated series, for all i, with cointegrating vector (1,-1). Note that inference procedures based on panel data integration-cointegration analysis are more powerful than the single time series ones, since they exploit information across both the time and cross-section dimensions of the data (see, e.g., Karavias and Tzavalis (2016, 2017)).

Establishing that the individual series P_{it} and P_{it}^{*} are cointegrated, with cointegrating vector (1,-1), is a crucial step in our analysis. It means that the RIM constitutes a valid long-run structural relationship to obtain intrinsic (or fundamental) values of shares and the price deviations $P_{it} - P_{it}^{*}$ are stationary (see, e.g., Cuthbertson and Nitzsche (2004)). Stationarity of $P_{it} - P_{it}^{*}$ is also claimed by both the sentiment and time-varying risk premium hypotheses. More specifically, the sentiment hypothesis asserts that positive price deviations $P_{it} - P_{it}^{*}$ should be temporary and converge to zero when share prices adjust to their fundamentals. On the other hand, the risk premium hypothesis predicts that prices P_{it} embody mean reverting risk premium effects.

[INSERT FIGURES 1 AND 2]

3 A panel data threshold model of investor sentiment effects on share prices

The threshold panel data model that we suggest to investigate the effects of the investor sentiment on share price deviations $P_{it} - P_{it}^{*}$ is given as follows:

$$P_{it} - P_{it}^{*} = c_i + \sum_{j=1}^{J} c_j^{(d_L)} dum_{jt}^{(d_L)} + \sum_{k=1}^{K} \beta_k x_{kt}$$

$$+ \left(\sum_{j=1}^{J} \gamma_j z_{jit} + \sum_{j=1}^{J} \gamma_j^{(d_L)} (dum_{jt}^{(d_L)} \times z_{jit}) + \delta SENT_t \right) \times \mathcal{I}\{SI_t < q\}$$

$$+ \left(\sum_{j=1}^{J} \gamma_j^{*} z_{jit} + \sum_{j=1}^{J} \gamma_j^{*(d_L)} (dum_{jt}^{(d_L)} \times z_{jit}) + \delta^{*} SENT_t \right) \times \mathcal{I}\{SI_t \geq q\} + u_{it}, \quad (5)$$

for $i = 1, 2, ..., N$ shares and $t = 1, 2, , ..., T$ time series observations, where $\mathcal{I}\{.\}$ is an index function which takes value 1 (or zero) if the event $\{SI_t \geq q\}$ (or $\{SI_t < q\}$) occurs, where

SI_t denotes an investor sentiment index which constitutes the threshold variable of the model, and q is the threshold parameter above (or below) which regime switching occurs. In particular, $\mathcal{I}\{SI_t < q\}$ corresponds to the low-to-normal-sentiment regime of the share market, while $\mathcal{I}\{SI_t \geq q\}$ to the excess one. The explanatory variables of the model are defined below, where we discuss the effects of them on share prices, in more details, according to the sentiment hypothesis.[9]

The panel data nature of model (5) enables us to examine the validity of both the generic and cross-section predictions of the sentiment hypothesis across the two sentiment regimes, within the same econometric framework. The generic effects of investor sentiments on $P_{it} - P^*_{it}$ are common across all shares i, at any time t. These can be captured by the explanatory variable of the model $SENT_t$. This variable is common across all i and it is defined as the percentage change of sentiment index SI_t so as to be able to capture the generic effects of positive, or negative, changes of SI_t on $P_{it} - P^*_{it}$, over time. More specifically, the inclusion of $SENT_t$ in the RHS of the model enables us to formally test if the generic effects of variable $SENT_t$ on $P_{it} - P^*_{it}$ in the low-to-normal-sentiment regime are positive (i.e., $\delta > 0$), as predicted by the sentiment hypothesis. As argued by Brown and Cliff (2005), and Shefrin (2008), in the low-to-normal-sentiment regime optimistic expectations (i.e., positive sentiments) about share prices are build up by investors. These sentiments drive market prices of shares up, constantly. On the other hand, the effects of $SENT_t$ on $P_{it} - P^*_{it}$ are expected to be negative (i.e., $\delta^* < 0$) in the excess-sentiment regime due to sudden share price corrections to their fundamental values, often occurring in this regime. As aptly argued by Thorp (2004), the excess-sentiment regime, reflecting extreme bullish sentiment levels of investor sentiment, comes after strong and persistent market run-ups when investors are fully invested in shares. In this regime, a market downturn is expected to happen. This will signal an abrupt transition to the low-to-normal-sentiment regime. Estimation of the threshold parameter q from the data, endogenously, throughout model (5) will indicate the value of SI_t above which share price corrections (i.e., market bubbles burst) are more likely to occur.

[9] Note that the model does not allow for regime shifts in all of its slope coefficients. A more general specification of the model allowing for this can be also considered, but this is an empirical matter.

The group of explanatory variables z_{jit} ($j = 1, 2, ..., J$), included in the RHS of model (5), defined over the cross-section and time-series observations of the data, consists of firm-specific variables which include the following: the size (capitalization) of a firm (denoted as $SIZE_{it}$), the book-to-market value (denoted as $(B/M)_{it}$), the earnings-to-price ratio (denoted as $(E/P)_{it}$) and the dividend-to-price ratio (denoted as $(D/P)_{it}$). These variables can control for the effects of the Fama-French (FF-model) risk premium factors on share price deviations $P_{it} - P^*_{it}$ (see Fama and French (1993, 1996), and Brennan and Xia (2001)). According to the FF-model, the risk premium effects of $SIZE_{it}$ on P_{it} (and, hence, $P_{it} - P^*_{it}$) should be positive (which means negative for expected returns), while those of $(B/M)_{it}$ should be negative.[10] The risk premium effects of firm-specific variables $(E/P)_{it}$ and $(D/P)_{it}$ on $P_{it} - P^*_{it}$ are expected to be similar to those of $(B/M)_{it}$. They will tend to reduce market prices of shares in order to compensate investors for risk premium effects due to possible earnings or dividends loses. According to the risk premium hypothesis, the risk premium effects on P_{it}, or $P_{it} - P^*_{it}$, should be independent of the sentiment regime of the market. This means that the estimates of slope coefficients γ_j and γ^*_j should not differ across the two sentiment regimes of the model. This hypothesis can be formally tested based on model (5).

Apart from the FF-model risk premium factors, in the RHS of model (5) we also include a group of macroeconomic variables (denoted as x_{kt} $(k = 1, 2, .., K)$) to control for time-varying risk premium effects on $P_{it} - P^*_{it}$ due to changes in the business cycle conditions of the economy (see, e.g., Cochrane (2005)). The variables capturing these effects constitute common factors, for all shares i. They often include the GDP growth rate (denoted as $GROWTH_t$), the difference between the yields of the long and short term bonds (denoted as $TERM_t$), the inflation rate (denoted as INF_t), the first-difference in the short-term risk-free rate used as a discount factor in formula (3) (denoted as DF_t), the percentage change in real exchange rate (denoted as $EXCH_t$) and the aggregate stock market return (denoted as $MARKET_t$). See the studies of Chen (1991), and Ferson and Korajczyk (1995), or more recently in Flannery and Protopadakis (2002).[11]

[10] The positive sign effect of the size risk premium factor on share prices implies that small cap shares generate greater returns than the large cap ones (see also Banz (1981)). This overperformance of the small cap shares is attributed to an additional risk factor, according to the FF-model.

[11] Note that the variable $MARKET_t$ can be also considered as a FF-model risk premium factor. However, since it captures aggregate movements of share prices, we include it in the group of macroeconomic variable.

Finally, the group of truncated variables $dum_{jt}^{(d_L)} \times z_{jit}$, for all j, where $dum_{jt}^{(d_L)}$ denotes a qualitative dummy which equals unity if z_{jit} takes a value in its lowest distribution percentile d_L (e.g., d_L =10%), for all j and t, and zero otherwise, reflects the sentiment effects of the group of the firm-specific variables z_{jit} on share price deviations $P_{it} - P_{it}^*$.[12] These truncated variables can capture small size, no earnings and non-dividend paying, as well as extreme growth effects on P_{it}, or $P_{it} - P_{it}^*$, which are often attributed to investor sentiment (see, e.g., Wurgler and Zhuravskaya (2002), Abreu and Brunnermeier (2003), and Baker and Wurgler (2006), inter alia). As argued in these studies, shares with the above features are very costly to arbitrage, and thus their market prices do not discount investment risk premium effects in equilibrium. This does not happen with shares characterized by substantial earnings, low growth, large size and dividend paying, which are often traded in the market and their prices are also adjusted for risk premium effects. Thus, the sign of the effects of $dum_{jt}^{(d_L)} \times z_{jit}$ on $P_{it} - P_{it}^*$ should be opposite to those of firm-specific variables z_{jit}, defined over the whole support interval (or in their upper 90th percentile) of their empirical distribution, which capture the FF-model risk premium effects.

The statistical significance of the truncated variables and their interactions depends partly on the availability of enough observations in the first decile of the sample, that will minimize standard errors. Given that the panel data model (5) is homogeneous in time, it is not necessary to have many observations in the lower decile at each year, rather its the total number of observations in the lower decile over all years that matters. In our data, we have 96 observations in the lower deciles for each of $(E/P)_{it}$, $(B/P)_{it}$ and $(D/P)_{it}$ and 93 observations in the lower decile of $SIZE_{it}$, therefore, we have sufficient data to identify cross-sectional effects. Firms can move in and out of the decile every year, as it happens with the periodic (monthly in Fama and French 1993) portfolio rebalancing in the portfolio-sorts approach.

[12] Note that the choice of the decile that we can truncate the empirical distributions of random variables z_{jit} in order to isolate possible investor sentiment effects on share prices is an empirical matter. In our empirical analysis, we have found that our results remain robust to a choice of $d_L = 5\%$.

3.1 Estimation results

3.1.1 Macroeconomic and investor sentiment data

To estimate model (5), we employ the UK data set of shares prices used in the previous section to calculate the intrinsic values of shares P_{it}^*. The macroeconomic variables employed in the estimation of the model are defined and measured as follows: The growth rate variable ($GROWTH_t$) is based on the UK GDP at constant prices. Inflation rate (INF_t) is based on the UK consumer price index. $TERM_t$ is the difference between the yield of the 10-year bond and the three-month interest rate. DF_t is the first difference of the three-month interest rate. $EXCH_t$ is the percentage change of the real effective exchange rate and the aggregate UK share market return ($MARKET_t$) is based on the $FTSE$ 100 price index. The definitions of the firm-specific variables employed in the estimation of the model are given before (see, Sections 2 and 3). Regarding the variable measuring $SIZE_t$, this is defined as the market share price P_{it} times the number of shares in circulation (see Fama and French (1993)). Note that all macroeconomic variables and the sentiment variable $SENT_t$ are measured before the release dates of the yearly financial statements of the companies used of our sample.

To see if our estimation results are sensitive to different measures of investor sentiment, we have estimated model (5) based on three different sentiment indices SI_t and, hence, measures of $SENT_t$. The first is based on the sentiment index SI_t provided by the DataStream for the UK stock market. This index is a weighted average (WA) of the following five individual confidence indicators: an industrial, service, financial service, consumer confidence, retail trade confidence and construction confidence, and is denoted as $WACI$. Compared to consumer confidence indicator (CCI), often used in empirical studies to reflect sentiment effects (see, e.g., Schmeling (2009)), $WACI$ gives a more objective and representative measure of investor sentiment conditions held in the economy and stock market, at any point of time t, as it is the average of different confidence indicators. We will henceforth denote this measure of variable $SENT_t$, as $SENT_t(WACI)$.

The second measure of $SENT_t$ is based on CCI, defined before, and is denoted as $SENT_t(CCI)$. Finally, following recent literature (see Baker and Wurgler (2006)), the third measure of $SENT_t$ is based on an investor sentiment index constructed as a principal component factor (PCF) of the following economic variables: the market share turnover, the numbers of IPOs within each month, the consumer confidence, the closed-end fund discount, the put-call trading volume ratio, the put-call interest ratio and market volatility index. The definition of these variables are given in the Appendix. The sentiment variable based on PCF is denoted as $SENT_t(PCF)$. Note that, due to the non availability of data for some of the above economic series, the values of variable $SENT_t(PCI)$ are available only from year 2000 to 2012.

A graphical presentation of the above three sentiment indices is given in Figure 3. Inspection of this figure indicates that, for most periods of our sample, all the above three indices move very closely to each other, especially $WACI$ and PCF. The correlation coefficients among them are found to be very high; they vary between 0.70 and 0.80. Another interesting feature that can be noted by the inspection of Figure 3 is that the three sentiment indices seem to capture the well known turning points of the UK share market sentiment (i.e., stock market peaks and troughs) associated with bubbles burst, or speculative episodes, like those in years 1987, 1997, 2001-2002 and 2007-2008.

[INSERT FIGURE 3]

Before turning into the discussion of the estimation results of threshold model (5), next we present some descriptive statistics of all variables of the model, including the dependent variable $P_{it} - P^*_{it}$. These are reported in Tables 1A,1B and 1C and can reveal whether basic features of our data are consistent with the predictions of the sentiment hypothesis, discussed before. In particular, Table 1A presents key descriptive statistics, like the mean, standard deviation, and max and min values, while Table 1B presents the correlation coefficients among all the variables. Finally, Table 1C presents correlation coefficients of the firm-specific variables $(E/P)_{it}$, $(B/M)_{it}$, $(D/P)_{it}$ and $SIZE_{it}$ with $P_{it} - P^*_{it}$, variables $SENT(WACI)_t$ and $SENT(CCI)_t$, and indices $WACI$ and CCI; for which there is data availability for the whole sample period. These coefficients concern the bottom 10th and upper 90th percentiles of the empirical distributions of the firm-specific variables z_{jit}. The results for the 90th percentile may better distinguish the effects of risk premium on $P_{it} - P^*_{it}$, compared to investor sentiment which dominate shares with very small, or zero, values of z_{jit}.

The above tables provide a number of results which are worthy of comments. First, the average value of $P_{it} - P^*_{it}$ is positive which means that the market prices P_{it} tend to be above their intrinsic values P^*_{it}, over the whole sample, which is in accordance to the sentiment hypothesis. However, the substantial volatility of $P_{it} - P^*_{it}$, and its negative large minimum values, observed during our sample, mean that there is also high probability that the sign of $P_{it} - P^*_{it}$ can become negative, reflecting downward adjustments in market prices P_{it} due to risk premium effects. Second, the sign of the average values of $SENT_t(CCI)$, and $SENT_t(WACI)$ is negative. This can be attributed to the dominance of substantial negative investor sentiment adjustments occurred during the sample, associated with the financial crises and bubbles burst mentioned before. Third, the degree of correlation of $P_{it} - P^*_{it}$ with the explanatory variables of the model is low, which is consistent with evidence supporting very small predictability of share returns and/or price changes (see, e.g., Avramova and Chordiab (2006)). Note that this is also true for the three different measures of $SENT_t$ considered. Although the sign of the correlation between $SENT_t$ and $P_{it} - P^*_{it}$ is positive, which is in accordance with the sentiment hypothesis, its magnitude is quite low.

The explanatory variables which are found to be at most correlated with $P_{it} - P^*_{it}$ are the firm-specific variables $(B/M)_{it}$, $(D/P)_{it}$, and $SIZE_{it}$. The sign of the correlation coefficients of $(B/M)_{it}$ and $(D/P)_{it}$ with $P_{it} - P^*_{it}$ is negative, while the correlation of $SIZE_{it}$ with $P_{it} - P^*_{it}$ is positive, as predicted by the FF-model of risk premium. This is true for all sentiment indices considered and it also holds for the 90th percentile results of the above firm-specific variables (see Table 1C). However, these results do not hold for the bottom 10th percentile of the distributions of the above variables. As can be seen from Table 1C, the sign of the correlation coefficients of $(B/M)_{it}$ and $(D/P)_{it}$ with $P_{it} - P^*_{it}$ becomes positive in that percentile, for both sentiment indices CCI and $WACI$ considered. The same happens with $(E/P)_{it}$, while the correlation between $SIZE_{it}$ and $P_{it} - P^*_{it}$ tends to zero. These results are consistent with the predictions of the investor sentiment hypothesis, stating that shares with low values of $(E/P)_{it}$, $(B/M)_{it}$ and $(D/P)_{it}$ are positively affected by investor sentiment effects.[13]

[13] Note that the much closer to zero value of the correlation coefficient of $SIZE_{it}$ in its bottom 10th percentile with $P_{it} - P^*_{it}$, compared to its upper 90th percentile, may be attributed to fact that the sentiment effects captured by this firm-specific variable may not so strong compared to the risk premium ones also

Finally, the results of Table 1C indicate that the three alternative measures of investor sentiment employed in our analysis are correlated with the macroeconomic variables (especially $GROWTH_t$, $MARKET_t$, $EXCH_t$ and $INFL_t$), but not at a level which can cause multicollinearity problems in the estimation of the model. As we have also found in our empirical analysis, orthogonalizing $SENT_t$ to macroeconomic variables does not change our results.

[INSERT TABLES 1A, 1B and 1C]

3.1.2 Estimates

In this section, we present estimates of threshold model (5). We compare the estimation results of the model to those of the following linear model:

$$P_{it}-P_{it}^{*} = c_i+\sum_{j=1}^{J} c_j^{(d_L)} dum_{jt}^{(d_L)}+\sum_{k=1}^{K}\beta_k x_{kt}+\sum_{j=1}^{J}\gamma_j z_{jit}+\sum_{j=1}^{J}\gamma_j^{(d_L)}(dum_{jt}^{(d_L)}\times z_{jit})+\delta SENT_t+e_{it}, \tag{6}$$

ignoring threshold effects. The estimates of the linear model (6) are presented in Table 2, while those of the threshold model (5) in Tables 3A-3B; Table 3A presents the estimates of the threshold model with regime shifts only in the slope coefficient of variable $SENT_t$, while Table 3B with regime shifts in the slope coefficients of both $SENT_t$ and the firm-specific variables of the model. For all the above tables, in columns (I), (II) and (III) we respectively report estimates of the models based on the three alternative measures of variable $SENT_t$ considered (i.e., $SENT_t(WACI)$, $SENT_t(CCI)$ and $SENT_t(PCF)$).[14]

The comparison of the estimation results of models (6) and (5) can show if ignoring threshold-type asymmetries in the investor sentiment effects on share price deviations $P_{it}-P_{it}^{*}$ undermines these effects. On the other hand, the comparison of the estimation results of threshold model (5) with regime shifts in the firm-specific variables to those without (see

captured by this variable.

[14]Note that, in Table 3B, we do not present estimates of the threshold model (5) based on the measure of investor sentiment given the principal component factor (PCF), due to the no availability of data of this factor for the whole sample. This does not leave enough sample information, over the time dimension of the data, to identify the slope coefficients of firm specific variables z_{jit} and $dum_{jt}\times z_{jit}$, under the two sentiment regimes.

Tables 3B and 3A, respectively) can shed light on the following questions: First, if the version of model which also considers regime shifts in the slope coefficients of the firm-specific variables constitutes the best specification of the data and, second, if the investor sentiment effects on $P_{it} - P^*_{it}$ with respect to the cross-section distribution of the firm-specific features of shares predicted by the sentiment hypothesis characterizes only the low-to-normal-sentiment regime, as it is argued before.

To estimate the linear model (6), we rely on the least squares dummy variables (LSDV) estimation method. This method can control for individual effects of the cross-section units of our panel data set on $P_{it} - P^*_{it}$, by employing appropriately specified dummy variables in the intercept term of the model, for all i. The threshold model (5) is also estimated based on the LSDV method. This method is appropriately modified to estimate the value of the threshold parameter q endogenously from the data based on a search procedure (see Hansen (1999)). In particular, the optimum estimate of q is taken as that corresponding to the minimum value of the minimum residual sum of squares of the model, over different values of q, taken from the empirical distribution of threshold variable SI_t searched for a threshold, after trimming out to top and bottom 10% percentile values of this distribution. As shown by Hansen (1999), this searching procedure provides super consistent estimates of q. Given these estimates, we can carry out inference on the slope coefficients of model (5) based on the standard asymptotic theory.

[INSERT TABLES 2, 3A AND 3B]

A number of interesting conclusions can be drawn from the results of Tables 2 and 3A-3B. First, they clearly indicate that the panel data threshold model (5) captures important regime-shift type of asymmetries both in the sign and magnitude of the generic effects of sentiment variable $SENT_t$ and the truncated firm-specific variables $dum^{(d_L)}_{jt} \times z_{jit}$ on price deviations $P_{it} - P^*_{it}$. The significance of these asymmetries can be formally justified by the LR test statistic reported in Tables 3A and 3B, which tests the null hypothesis H_0: $\gamma_j = \gamma^*_j$, $\gamma^{(d_L)}_j = \gamma^{*(d_L)}_j$ and $\delta = \delta^*$, for all j, against its alternative H_a: $\gamma_j \neq \gamma^*_j$ or $\gamma^{(d_L)}_j \neq \gamma^{*(d_L)}_j$ or $\delta \neq \delta^*$. The values of this test statistic, reported in the tables, clearly reject the above null hypothesis (implying no investor sentiment regime shifts), at the 5% level, against its alternative hypothesis supporting model (5), with regime shifts. Note that, for variable $SENT_t$, the regime-shift asymmetries are more profound for the full specification of the model, allowing also for shifts in the effects of firm-specific variables on $P_{it} - P_{it}^*$ (see the differences in the estimates of δ and δ^* between Tables 3A and 3B). This specification is found to better fit into the data, in terms of the variance of the error term of the model u_{it}.

Second, the coefficients estimates of the model reported in Tables 3A-3B are consistent with the predictions of the sentiment hypothesis, across the two regimes. They show that the effects of $SENT_t$ on $P_{it} - P_{it}^*$ are significant, at the 5% level, and are positive in the low-to-normal-sentiment regime, where optimistic investor sentiments are developed, and negative in the excess. In the excess sentiment regime, a negative change in $SENT_t$ means that will reduce the value of $P_{it} - P_{it}^*$ reflecting corrections of P_{it} towards their fundamental values. The differences in the magnitude of the above sentiment effects between the two regimes are substantial. For instance, based on the slope coefficient estimates of variable $SENT_t$ for $WACI$, reported in Table 3B, we can see that a positive change of $SENT_t$ by 1% leads to an increase of $P_{it} - P_{it}^*$ by £0.02 in the low-to-normal-sentiment regime, while, in the excess, implies a decrease by £0.12, which is much bigger than £0.02. These results hold for the other two sentiment indices considered. The much bigger in magnitude effects of $SENT_t$ on $P_{it} - P_{it}^*$ in the excess-sentiment regime can be attributed to the substantial cumulative corrections of share prices to their fundamental values, occurring within this regime. The comparison of the above results to those of Table 2 indicates that ignoring the existence of the above sentiment regime shifts undermine, critically, the effects of $SENT_t$ on $P_{it} - P_{it}^*$. It leads to estimates of the effects of $SENT_t$ on $P_{it} - P_{it}^*$ which are quite small in magnitude and, more importantly, it misses the negative effects of $SENT_t$ on $P_{it} - P_{it}^*$ in the excess-sentiment regime.

Apart from the generic effects of $SENT_t$, evidence supports the influence of share prices P_{it} by investor sentiment can be also obtained by the estimates of the slope coefficients of the truncated firm-specific variables $dum_{jt}^{(d_L)} \times z_{jit}$, for $d_L = 0.10$, on $P_{it} - P_{it}^*$. The results of Table 3A clearly indicate that, for $WACI$ and CCI, the estimates of the above coefficients are significant for most of the firm-specific variables considered, at the 5% level, while their signs are positive for $(E/P)_{it}$, $(B/M)_{it}$, and $(D/P)_{it}$, and negative for $SIZE_{it}$. These results are consistent with those of Baker and Wugler (2006) and in accordance to the sentiment hypothesis.[15] Also note that the signs of the slope coefficients of $dum_{jt}^{(d_L)} \times z_{jit}$ are consistent across the two sentiment regimes of the model (see estimates of $\gamma_j^{(d_L)}$ and $\gamma_j^{*(d_L)}$, reported in Table 3B), as one would expect. The positive sign of the slope coefficients of $(E/P)_{it}$, $(B/M)_{it}$, and $(D/P)_{it}$ in the excess-sentiment regime means that, the lower the value of these variables, the stronger the effects of share prices corrections will be. Regarding the significance of $\gamma_j^{(d_L)}$ and $\gamma_j^{*(d_L)}$, across the two regimes, the results of the table indicate that these coefficients (namely $\gamma_j^{(d_L)}$) are significant in the low-to-normal sentiment regime, at the 5% or 10% levels, for all the firm-specific variables with the exception of $SIZE_{it}$. In the excess sentiment regime, $\gamma_j^{*(d_L)}$ is significant for $(D/P)_{it}$ for $WACI$, and $(E/P)_{it}$ and $(B/M)_{it}$ for CCI.

Third, the estimates of the threshold parameter q, reported in Tables 3A-3B, indicate that the long-term corrections of share prices to their intrinsic values, occurred in the excess-sentiment regime, are more likely to happen for values of the empirical distribution of the sentiment indices in their top percentile (e.g., 15% and 20%, for $WACI$ and PCF). As can be pictorially confirmed by referring to Figure 3, which presents the three sentiment indices considered in our analysis against the sample estimates of their threshold parameter r reported in Table 3A, the corrections of share prices occurring in the excess-sentiment regime are associated with the end of periods of excessive optimism of the UK share market. In particular, they cover periods of bubble bursts and/or financial crises of this market of years 1987-1988, 2000, 2004 and 2007-2008, as predicted by the sentiment hypothesis. These results are consistent with those of Anderson and Brooks (2014), measuring the effects of growing (or collapsing) bubbles on share returns at individual level.

Fourth, regarding the risk premium effects captured by model (5), our results clearly support the view that these effects also influence share prices P_{it}. More specifically, the results of Tables 3A and 3B indicate that the estimates of the slope coefficients of the firm-specific variables z_{jit}, i.e., γ_j and γ_j^*, capturing the FF-model risk premium factors, have

[15] Note that, for PCF, they have the correct sign and are signifcant, at 5% level, only for $(B/M)_{it}$. This result may be attributed to the lack of data for PCF, over the whole sample.

the correct sign predicted by the risk premium hypothesis, and they are significant for most of these variables, at the 5% level. This is a more clear cut result for the case that investor sentiment is measured by $WACI$ and CCI. Comparing the results across the two sentiment regimes (see Table 3B) shows that the slope coefficients of z_{jit} tend to be significant mainly in the low-to-normal sentiment regime. In the excess one, they are not so important, with the exception of $(B/M)_{it}$. This result can be attributed to the cumulative share price corrections occurring in the excess sentiment regime. These may dominate the risk premium effects on share prices. For both regimes, the opposite sign of the estimates of γ_j and γ_j^* to those of slope coefficients $\gamma_j^{(d_L)}$ and $\gamma_j^{*(d_L)}$, capturing investor sentiment effects, means that investor sentiment tend to reverse the relationship between risk premium and share prices.

Finally, regarding the risk premium effects captured by the group of macroeconomic variables, the results of the table imply that these effects are also priced in the share market. The estimates of their slope coefficients β_k indicate that, with the exception of inflation rate, the remaining variables of the above group have significant explanatory power on $P_{it} - P_{it}^*$. The signs of these estimates correspond to those reported in the literature (see, e.g., Flannery and Protopadakis (2002)). The negative sign effects of variables $GROWTH_t$, $TERM_t$ and DF_t on $P_{it} - P_{it}^*$ can be interpreted as capturing state (or cyclical) movements of risk premium on share prices. On the other hand, the positive in sign effects of $EXCH_t$ on $P_{it} - P_{it}^*$ can be attributed to the fact that an increase in effective real exchange rate means an improvement of the international competitiveness of the domestic economy which will reduce the currency risk embodied in share prices, for foreign investors holding domestic (UK) shares. Note that the above results hold independently of the presence, or not, of threshold effects in the model, adding support to the view that risk premium effects are unaffected by shifts in investor sentiment.

3.1.3 Robustness of our results

In this section we carry out two exercises to check the robustness of our estimation results. First, to see if they characterize our data, descriptively, in Table 4 we present values of the correlation coefficients of price deviations $P_{it} - P_{it}^*$ with explanatory variable $SENT_t$, and the firm-specific variables $(E/P)_{it}$, $(B/M)_{it}$, $(D/P)_{it}$ and $SIZE_{it}$ in their bottom 10th and upper 90th percentiles of their distributions. This is done across the two investor sentiment regimes of model (5), identified by the data, based on sentiment indices $WACI$ and CCI, which cover the whole period of the sample. The results of this table are consistent with those obtained by the estimates of the model (see Table 3B). They indicate that there exist a clear cut change in the sign of the correlation coefficients of $SENT_t$ with $P_{it} - P_{it}^*$ across the two regimes of the model, while those of the firm specific variables $(E/P)_{it}$, $(B/M)_{it}$ and $(D/P)_{it}$ in their bottom 10th percentile have the sign predicted by the sentiment hypothesis.

[INSERT TABLE 4]

The second robustness exercise concerns with the frequency of the data. To see if our results remain robust to a higher frequency of the data, we have re-estimated model (5) based on quarterly data which increase the time-dimension of the panel data to $T = 104$. Since the financial statement announcements are made only annually, we have maintained their year values as quarterly observations after each year's announcement, until the next year's one (see also Baker and Wurgler (2006)). Based on these observations we have calculated intrinsic prices P_{it}^*. The actual prices P_{it} are selected after the financial statement announcements, as is done for the year frequency of the data, thus preserving the event study nature of our analysis conditional on the different regimes of the share market. Selecting actual prices at quarters before the announcements will produce data which lack the announcement information, or may otherwise include information on events irrelevant to the financial statement. Balance sheet items have also been interpolated in order to get quarterly observations, as in Baker and Wurgler (2006). Thus, we have used quarterly values for: SENT(CCI), SENT(WACI), GDP, inflation, exchange rate, risk-free rate and market return.

[INSERT TABLES 5A AND 5B]

The results of the above exercise are reported in Tables 5A-5B; Table 5A presents results for the case that no regime switching is allowed for firm-specific variables, while 5B for the full specification of the model. That is, the results of Tables 5A and 5B correspond to those of Tables 3A and 3B, respectively. Note that the tables present results for the sentiment indices CCI and $WACI$, since the data for PCF are not available for the whole sample period. The comparison of the estimation results of Tables 5A and 5B to those of 3A and 3B, respectively, indicate that there are no important differences in the estimates of the slope coefficients and the threshold parameter of the model between these two sets of results. This is true for both the sign and magnitude of the coefficient estimates. An interesting result of Table 5B is that the slope coefficient of the truncated firm-specific variable $dum_{jt}^{(d_L)} \times z_{jit}$, for $z_{jit} = SIZE_{it}$, now clearly becomes significant, at the 5% level, for both sentiment indices considered. This variable and $dum_{jt}^{(d_L)} \times z_{jit}$, for $z_{jit} =(B/M)_{it}$, seem to capture the investor sentiment regimes, in the excess sentiment regime.

4 Conclusions

Investor sentiment offers an alternative explanation of the deviation of share prices and/or expected returns from their fundamental values. In this paper, we examine if the effects of investor sentiment on share price deviations from their intrinsic values are asymmetric and dependent on the level of shares market sentiment, as is predicted by the sentiment hypothesis. To address these questions, we suggest a panel data threshold model of the above share price deviations using as threshold variable an investor sentiment index. The suggested model enables us to formally test both the cross-section and generic predictions of the sentiment hypothesis on share prices within the same framework. It also allows us to endogenously estimate from the data the threshold value of publicly available sentiment indices above (or below) which market sentiment regime shifts are more likely to occur. To calculate the intrinsic values of share prices, we rely on the residual income share valuation model, which relies on publicly available values of accounting fundamentals. The validity of this model as a structural relationship is tested based on panel data cointegration analysis.

The paper applies the model to a panel data set of shares listed in the UK stock market over the period 1987-2012 and provides a number of results which demonstrate significant investor sentiment effects on share prices. First, we show that ignoring the existence of different market sentiment regimes in the UK share market undermines the effects of investor sentiment on share prices. Second, we provide clear-cut evidence that generic effects of investor sentiment on share prices tend to occur in the low-to-normal-sentiment regime, where investor and market sentiments are build up and tend to be optimistic. In periods of excess optimism, we find that the effects of investor sentiment on share prices become negative, since abrupt corrections of share prices to their fundamental values tend to occur. Third, we show that bubble bursts and/or financial crises, like those in years 1987-88, 2000, 2004 and 2007-2008, tend to occur in the excess sentiment regime. Finally, another interesting conclusion that can be drawn from the results of the paper is that shares with small values of firm-specific characteristics, like the book-to-market value, and the dividend- and earnings-to-price ratios are strongly affected by investor sentiment. This is true for both sentiment regimes considered by our model.

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5 Appendix

In this appendix, we firstly present the results of our panel data integration-cointegration analysis for share prices P_{it} and their intrinsic values P^*_{it}. Secondly, we give the definitions of the economic variables used to construct the economic sentiment index (SI_t) based on principal component analysis.

5.1 Panel data integration-cointegration analysis

5.1.1 Unit root tests

Before testing if P_{it} and P^*_{it} are cointegrated series, we first need to establish that both of these series are integrated series of order one, denoted as I(1). To this end, we conduct a number of alternative panel data unit root testing procedures, suggested in the literature. These include the following test statistics: Im's et al (2003) (denoted as IPS), Levin's et al (2002) (denoted as LLC), Breitung's and Das (2005) (denoted as B-t) and Harris's and

Tzavalis (1999) (denoted as HT).[16] The last test has higher power than the three tests for panels whose time dimension is short (finite). The test of Breitung and Das (2005) is appropriate for large T panels and it is robust to cross-sectional correlation of the panel autoregression model error terms. All the above test statistics allow for linear trends in the auxiliary regression testing for unit roots, so as to treat symmetrically deterministic trends in series P_{it} and P_{it}^* under the null and alternative hypotheses.

The results of our panel data unit root analysis are reported in Table A1. The table presents values of the above statistics. Their p-values (error type I of rejecting the null hypothesis of a unit root) are reported in brackets. The results of the table clearly indicate that P_{it} and P_{it}^* constitute I(1) series, for all i. The values of all the test statistics reported in the table can not reject the null hypothesis of a unit root at 5%, or at lower levels. The p-values rejecting the above null hypothesis are all equal to one for all the test statistics, which mean that the probability of rejecting the null hypothesis of unit root falsely equals one.

Table A1: Panel unit root tests

	HT	LLC	IPS	B-t
P_{it}	2.40 [1.00]	1.28 [1.00]	0.99 [1.00]	4.37 [1.00]
P_{it}^*	4.10 [1.00]	1.44 [1.00]	2.76 [1.00]	9.71 [1.00]
E_{it}/r_f	7.21 [1.00]	42.45 [1.00]	12.99 [1.00]	20.63 [1.00]

Notes: The table presents panel unit root tests for share prices P_{it} and P_{it}^*. HT stands for Harris and Tzavalis' (1999) panel unit root test, IPS for Im's, Pesaran and Shin (2003), LLC for Levin's, Lin and Chu (2002) and, finally, B-t stands for Breitung's and Das (2005). All the above test statistics allow for deterministic trends in their auxiliary unit root regression. P-values of rejecting the null hypothesis of unit root are in brackets.

5.1.2 Cointegration analysis

Our cointegration analysis relies on recent developments of panel data econometrics. Compared to single time series cointegration analysis, panel data cointegration methods can provide more robust and powerful inference about cointegration between series P_{it} and P_{it}^*, for all i, since they are based on disaggregated data. Using panel data sets, we can avoid

[16] Recent, more generalized versions of the HT tests allowing for serial correlation (see Tzavalis and Karavias 2014, 2019)) were also applied, but the results are not presented as the conclusions remain the same.

smoothing out possible differences in the stochastic trends of individual series P^*_{it}, or P_{it}, which may be proved very important for erroneously accepting the null hypothesis of cointegration between these series. The results of this analysis are reported in Table A2. In particular, the table presents values of cointegration test statistics and estimates of the slope coefficient of the following panel data cointegrating regression:

$$P_{it} = a_i + bP^*_{it} + \zeta_{it}, \text{ for } i = 1, 2, 3, ..., N \text{ and } t = 1, 2, ..., T, \tag{7}$$

where ζ_{it} denotes the error term. The slope coefficient estimates reported in the table are based on the fully modified least squares (FMLS) and dynamic least squares (DLS) panel data cointegration methods suggested by Pedroni (2001), allowing for heterogenous error terms η_{it}. The cointegration test statistics reported in the table are those of Pedroni (1999). They are defined as *panel-ρ* and *panel-t*, and they are based on the residuals of regression (7).

Table A2: Cointegration results

	$P_{it} = a_i + bP^*_{it} + \eta_{it}$, $i = 1, 2, ..., N$ and $t = 1, 2, ..., T$	
Estimates	FMLS	DLS
b	1.07 (0.12)	1.09 (0.04)
Wald(1)	0.56 [0.57]	1.51 [0.11]
panel-t	6.92 [0.00]	
panel-ρ	-4.88 [0.00]	

Notes: The table presents the results of our cointegration analysis. P^*_{it} are calculated based on Ohlson's formula (3) and analyst earnings forecasts. Standard errors are in parentheses and p-values in the brackets. Wald(1) is the Wald test statistic of null hypothesis b=1. This statistic is distributed as a chi-squared random variable with one degree of freedom. FMLS stands for the fully modified least squares (FMLS) estimator, while DLS for the dynamic least squares (DLS) estimator (see Perroni (2001)). The order of the dynamic terms assumed in these estimators is set to one. *Panel-ρ* and *panel-t* are Pedroni's (1999) cointegration test statistics based on the residuals of the cointegrating regression. These statistics can test the null hypothesis of no cointegration against its alternative of cointegration. NA means not applicable.

The results of the table clearly indicate that share prices P_{it} and their intrinsic values P^*_{it} obtained through formula (3) constitute a pair of cointegrated series with a long-run coefficient $b = 1$, implying a cointegrating vector between P_{it} and P^*_{it} given by (1,-1). None of the cointegration tests reported in the table can accept the null hypothesis of no cointegration between P_{it} and P^*_{it}, while the null hypothesis $b = 1$ can not be rejected by the Wald test statistic reported in the table, denoted as Wald(1). These results mean that price deviations $P_{it} - P_{it}^*$ constitute stationary series, for all i. We have found that the success of the RIM to provide share prices P_{it}^* which closely follow the long-run movements of their market counterparts can be attributed to the fact that this model relies on book values B_{it}. In particular, we have found that movements in B_{it} determine to a large extent those in market prices P_{it} and their intrinsic values P_{it}^*. Share prices P_{it} are found to be also cointegrated with their book values B_{it}, for all i. These results are not reported for reasons of space.

5.2 Economic sentiment variables

The definitions of the economic variables used to construct the economic sentiment index, SI_t, based on principal component analysis are as follows:

Market share turnover is expressed in terms of trading volume and trading values. Market share turnover, or more generally liquidity, can be viewed as an investor sentiment index. Higher turnover predict lower subsequent returns in both firm-level and aggregate data (see, e.g., Baker and Stein (2004), Scheinkman and Xiong (2003)). Market turnover by value is the total value of trades over the month divided by the total capitalization of the London Stock Exchange (LSE). Market turnover by volume is the total volume of shares traded on LSE over the month divided by the number of shares listed on the stock exchange.

Numbers of IPOs within each month: First-day return of IPOs is expressed as the difference between initial trading price and offer price divided by offer price of the IPO stock. The IPO market is often viewed to be sensitive to sentiment. More specifically, high first day return on IPOs is considered as a measure of investor enthusiasm while the low return of IPOs is often interpreted as a symptom of market timing (see Baker and Wurgler (2007)).

Consumer confidence is a business survey data reported by the European Commission and the European Financial Affairs. UK respondents express their economic or financial expectations over the next 12 months in the following areas: the general economic situation, unemployment rate, personal household financial position and personal savings.

Closed-end fund discount is the difference between the net asset value of a fund's security holdings and the fund's market price. Many authors based on the closed-end fund discounts in order to measure individual investor sentiment considering that when the discount increases the retail investors are bearish (see Lee et al (1991), and Neal and Wheatley (1998)).

Put-call trading volume ratio is a measure of market participants' sentiment derived from options. It equals to the ratio of trading volume of put options by the trading volume of call options considering a bearish indicator in the stock market. More specifically, when the trading volume of put options becomes large relative to the trading volume of call options, the sentiment goes up, and vice versa.

Put-call interest ratio is the open interest of put options divided by the open interest of call options. This ratio could be considered as a preferred measure of sentiment offering a better predictive power for volatility in subsequent periods, as it may be argued that the open interest of options is the final picture of sentiment at the end of the day or the week.

The market volatility index measures the implied volatility of options and defines the investor's certainty or uncertainty regarding the volatility. More specifically, the higher the market volatility index is the greater the fear of investors becomes.

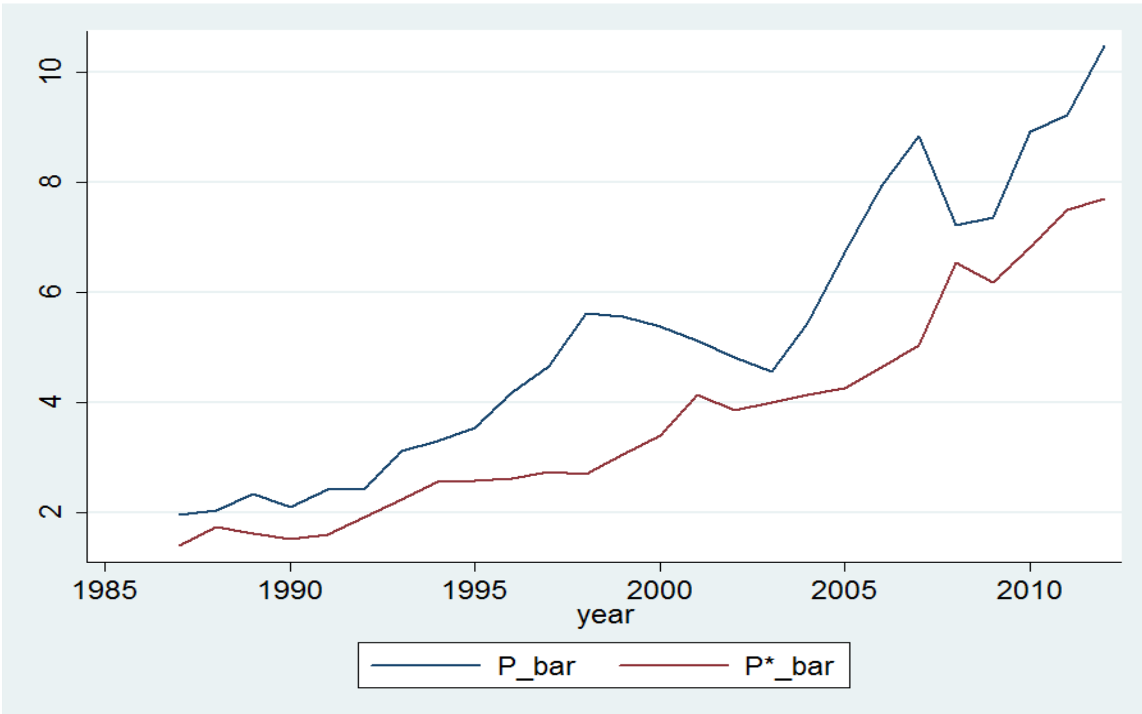

Figure 1: Average values of market prices P_{it} (denoted as $\bar{P}_t$ - P_bar) against their counterpart intrinsic values based on the RIM (denoted as $\bar{P}_t^*$ - P̄_bar).

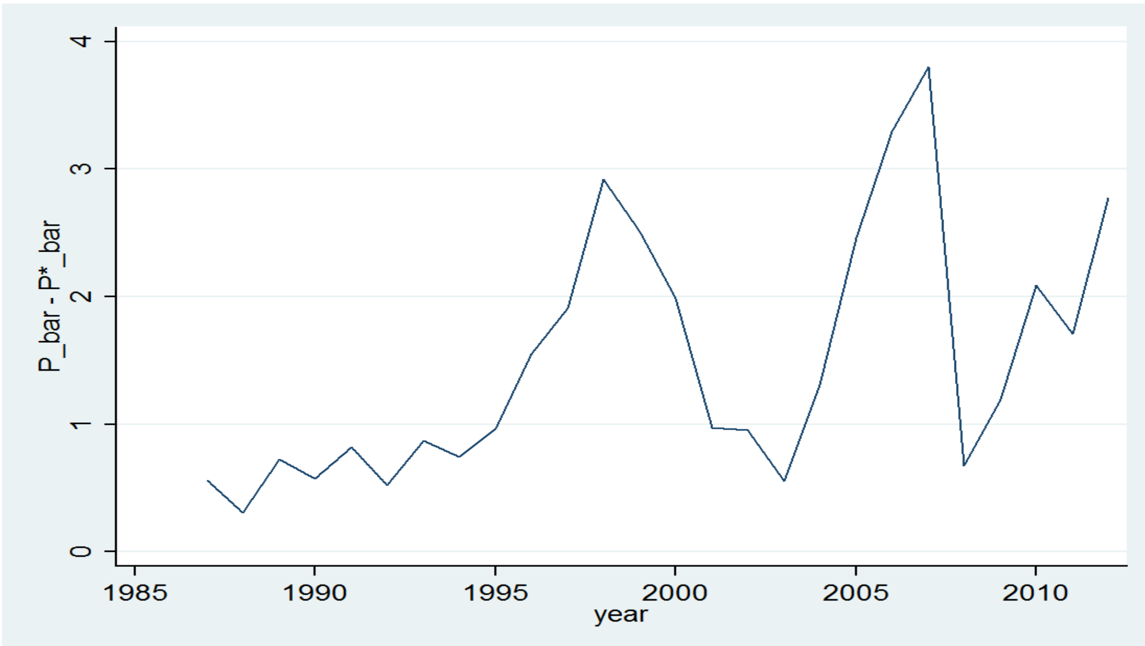

Figure 2: Deviations between $\bar{P}_t$ and $\bar{P}_t^*$.

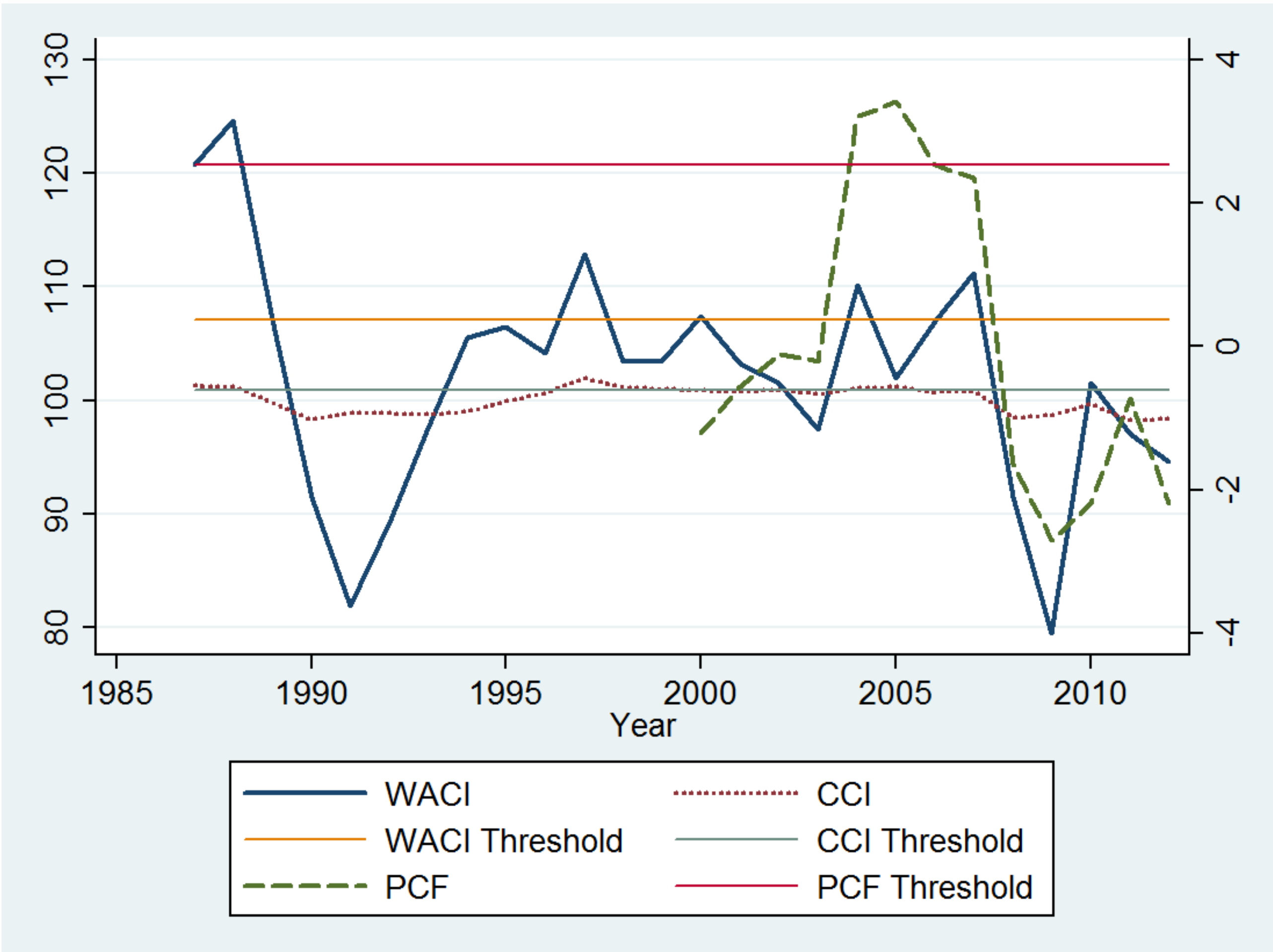

Figure 3: Alternative sentiment indices against their threshold parameter values estimated.

Table 1A: Basic descriptive statistics

	mean	Std. Dev.	Min.	Max.
$P_{it}-P_{it}^{*}$	1.49	3.34	−21.23	23.49
$GROWTH$	2.46	2.48	−5.51	5.56
INF	3.57	1.97	−0.52	9.46
$TERM$	0.46	1.60	−3.04	3.22
$EXCH$	−0.34	5.59	−13.81	13.72
DF	0.41	1.74	−3.95	4.21
$MARKET$	2.10	6.87	−16.32	13.06
E/P	0.13	1.33	−2.84	26.60
E^{a}/P	0.41	0.44	−0.38	4.10
B/M	0.56	0.26	0.00	4.25
D/P	0.04	0.03	0.00	0.31
$SIZE$	9386847.51	17338415.24	62654.25	$1.82E+08$
$SI(WACI)$	102.02	10.13	79.5	124.6
$SI(CCI)$	100.05	1.14	98.24	101.96
$SI(PCF)$	0	2.07	−2.70	3.41
$SENT(WACI)$	−0.97	9.89	−19.49	$24,43$
$SENT(CCI)$	−0.11	0.84	−2.38	1.27
$SENT(PCF)$	−1.46	4.76	−16.9	2.03

Notes: The table presents the mean, standard deviation (Std. Dev.), and the minimum and maximum (min and max) values of all the variables employed in the estimation of model (5). Our data consists of $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations. For the measure of investor sentiment PCF, $T = 13$ due to unavailability of data before year 2000. The variables $GROWTH, INF, TERM, DF$ and $MARKET$ are in percentage terms, or differences of them (see $TERM$ and DF).

Table 1B: Correlation coefficients

	$P_{it}-P^*_{it}$	$GROWTH$	INF	$TERM$	$EXCH$	DF	$MARKET$
$P_{it}-P^*_{it}$	1						
$GROWTH$	0.0574	1					
INF	0.0907	0.5058	1				
$TERM$	−0.0549	−0.5283	−0.1461	1			
$EXCH$	0.1375	0.5120	0.32	0.010	1		
DF	0.0405	0.6817	−0.1456	−0.7525	0.2073	1	
$MARKET$	0.1095	−0.0376	−0.1553	0.3165	0.3051	−0.0133	1
E/P	−0.1074	−0.0578	0.0481	0.1028	0.0445	−0.1127	0.0266
B/M	−0.5140	−0.0951	−0.0144	0.0537	−0.1116	−0.1033	−0.1407
D/P	−0.2385	−0.1393	−0.1395	0.0525	−0.1510	−0.0624	−0.0866
$SIZE$	0.1478	0.1510	0.0241	0.0732	0.3139	0.1117	0.3443
$SENT(WACI)$	0.0930	0.5145	0.3754	0.1601	0.7028	0.0922	0.3337
$SENT(CCI)$	0.0719	0.1419	−0.3144	0.2592	0..5646	0.2050	0.5908
$SENT(PCF)$	0.0525	−0.2351	0.0348	0.2376	−0.2526	−0.1816	0.0050

Table 1B (continued): Correlation coefficients

	E/P	B/M	D/P	$SIZE$	$SENT(WACI)$	$SENT(CCI)$	$SENT(PCF)$
E/P	1						
B/M	0.2421	1					
D/P	−0.0152	0.5124	1				
$SIZE$	0.0787	−0.1886	−0.3244	1			
$SENT(WACI)$	0.0225	−0.1017	−0.1291	0.3132	1		
$SENT(CCI)$	0.0019	−0.1093	−0.0512	0.3543	0.6627	1	
$SENT(PCF)$	0.0359	0.0376	0.0152	−0.0542	0.2846	0.1497	1

Notes: The table presents the correlation coefficients among all the variables of model (5), including the dependant one. These are based on $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations. For the measure of investor sentiment PCF, $T = 13$ due to unavailability of data before year 2000

Table 1C: Correlation coefficients of the truncated firm-specific variables $dum_{jt}^{(d_L)} \times z_{jit}$

	E/P	B/M	D/P	$SIZE$
	Bottom 10th ($d_L = 0.10$) percentile			
$SI(WACI)$	0.1062	0.0021	0.0960	0.0738
$SENT(WACI)$	0.0625	0.0136	0.0541	0.0758
$SI(CCI)$	0.0429	0.0372	0.1050	0.0355
$SENT(CCI)$	0.0372	0.0095	0.0558	0.1056
$P_{it}-P_{it}^{*}$	0.0786	0.2937	0.1793	0.0171
	Upper 90th percentile			
$SI(WACI)$	−0.0451	−0.0579	−0.1145	0.1069
$SENT(WACI)$	0.0059	−0.0985	−0.1058	0.1989
$SI(CCI)$	−0.0802	−0.1222	−0.1063	0.1323
$SENT(CCI)$	−0.0119	−0.1109	−0.0571	0.2468
$P_{it}-P_{it}^{*}$	−0.0924	−0.4749	−0.2550	0.164

Notes: The table presents correlation coefficients estimates of the truncated firm-specific variables ($dum_{jt}^{(d_L)} \times z_{jit}$) in their bottom 10th and upper 90th percentiles of their distribution with the sentiment indices $SI(WACI)$ and $SI(CCI)$, and their associated sentiment variables $SENT(WACI)$ and $SENT(CCI)$, as well as the price deviations $P_{it} - P_{it}^{*}$. These estimates are based on $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations. For the measure of investor sentiment PCF, $T = 13$ due to unavailability of data before year 2000.

Table 2: LSDV Estimates of linear model (6)

	(I)				(II)				(III)			
$GROWTH$	−0.146	(−3.19)	−0.122	(−2.93)	−0.128	(−2.77)	−0.104	(−2.44)	−0.384	(−2.85)	−0.332	(−2.42)
INF	0.068	(0.55)	0.112	1.05	0.059	(0.42)	0.097	(0.82)	0.450	(3.00)	0.426	(2.96)
$TERM$	−0.353	(−4.39)	−0.252	(−3.55)	−0.326	(−3.73)	−0.215	(−2.57)	−0.378	(−1.80)	−0.397	(−1.90)
$EXCH$	0.052	(2.99)	0.041	2.88	0.057	(2.29)	0.048	(2.20)	0.120	(4.07)	0.115	(3.94)
DF	−0.140	(−2.14)	−0.104	(−1.53)	−0.145	(−1.96)	−0.105	(−1.38)	0.141	(0.74)	0.048	(0.25)
r_M	0.019	(1.46)	0.027	2.22	0.020	(1.60)	0.028	(2.37)	0.039	(1.73)	0.046	(2.08)
E/P	−0.001	(−3.31)	−0.001	(−3.84)	−0.001	(−3.34)	−0.001	(−3.86)	−0.001	(−2.26)	−0.001	(−2.14)
$dum^{(d_L)} \times (E/P)$			0.012	(2.28)			0.0125	(2.28)			0.006	(1.08)
B/M	−0.017	(−2.77)	−0.013	(−2.17)	−0.017	(−2.76)	−0.013	(−2.15)	−0.023	(−3.32)	−0.027	(−3.02)
$dum^{(d_L)} \times (B/M)$			0.047	(2.08)			0.047	(2.07)			0.042	(3.39)
D/P	−0.100	(−1.52)	−0.074	(−1.09)	−0.101	(−1.56)	−0.075	(−1.12)	0.027	(0.31)	0.157	(1.33)
$dum^{(d_L)} \times (D/P)$			0.341	(0.60)			0.337	(0.60)			−0.059	(−0.09)
$SIZE$	0.803	(3.44)	0.617	(2.96)	0.820	(3.42)	0.642	(3.01)	0.326	(1.09)	0.245	(0.76)
$dum^{(d_L)} \times (SIZE)$			−0.930	(−2.59)			−0.947	(−2.64)			−0.250	(−0.41)
$SENT(WACI)$	0.009	(2.18)	0.009	(1.96)								
$SENT(CCI)$					−0.001	(−0.01)	−0.036	(−0.25)				
$SENT(PCF)$									0.083	(4.92)	0.078	(4.52)
R^2	0.216		0.3174		0.181		0.3170		0.275		0.377	
Observations	962				962				481			
Sample	1987 − 2012				1987 − 2012				2000 − 2012			

Notes: This table presents LSDV estimates of the linear model (6). These estimates are based on $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations. For the measure of investor sentiment PCF, $T = 13$ due to unavailability of data before year 2000. Columns (I), (II) and (III) present estimation results for the three alternative measures of the sentiment variable $SENT_t$ considered, i.e., $SENT(WACI)$, $SENT(CCI)$ and $SENT(PCF)$, respectively. t-ratio statistics are reported in parentheses. R^2 is the coefficient of determination.

Table 3A: Estimates of model (5) without regime shift in firm-specific variables

	(I)		(II)		(III)	
$GROWTH$	−0.130	(−2.68)	−0.115	(−2.58)	−0.358	(−2.49)
INF	0.097	(1.75)	0.138	(2.15)	0.423	(2.19)
$TERM$	−0.343	(−4.24)	−0.236	(−2.67)	−0.309	(−1.87)
$EXCH$	0.061	(3.56)	0.052	(2.62)	0.093	(3.32)
DF	−0.128	(−3.36)	−0.120	(−2.92)	−0.036	(−0.16)
r_M	0.029	(2.40)	0.024	(1.86)	0.051	92.57)
E/P	−0.001	(−2.87)	−0.001	(−2.90)	−0.001	(−1.83)
$dum^{(d_L)}\times(E/P)$	0.011	(1.96)	0.011	(1.98)	0.005	(0.63)
B/M	−0.013	(−4.31)	−0.013	(−4.19)	−0.025	(−4.35)
$dum^{(d_L)}\times(B/M)$	0.047	(3.51)	0.048	(3.55)	0.042	(2.50)
D/P	−0.075	(−1.82)	−0.083	(−2.00)	0.119	(1.44)
$dum^{(d_L)}\times(D/P)$	0.316	(1.25)	0.356	(1.41)	0.031	(0.08)
$SIZE$	0.621	(2.17)	0.595	(2.07)	0.366	(1.05)
$dum^{(d_L)}\times(SIZE)$	−0.899	(−1.74)	−0.896	(−1.74)	−0.228	(−0.22)
Sentiment regime:	$SENT(WACI)$		$SENT(CCI)$		$SENT(PCF)$	
$I\{SI_t < q\}$	0.021	(1.99)	0.160	(1.47)	0.161	(1.42)
$I\{SI_t \geq q\}$	−0.087	(−2.82)	−0.675	(−2.59)	−0.207	(−1.98)
Threshold parameter q	107.40		100.67		2.53	
95% CI of q	$[107.07, 110.1]$		$[99.69, 101.08]$		$[1.85, 3.20]$	
LR test stat.	10.91		8.60		7.986	
Observations	962		962		481	
Sample	1987 − 2012		1987 − 2012		2000 − 2012	

Notes: The table presents estimates of a version of model (5) without allowing for threshold effects in the firm-specific variables. These are based on $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations. For the measure of investor sentiment PCF, $T = 13$ due to unavailability of data before year 2000. Column (I) presents results for the case where the sentiment index SI is based on $WACI$, while Columns (II) and (III) for the cases that it is based on CCI and PCF, respectively. LR is the likelihood ratio test statistic that there is no threshold effects in slope coefficients δ and δ^*, i.e., H_0: $\delta = \delta^*$, against its alternative H_a: $\delta \neq \delta^*$.

Table 3B: Estimates of the full specification of model (5)

	(I)				(II)			
$GROWTH$	-0.1479	(-2.87)			-0.0897	$[-1.69]$		
INF	0.0931	(1.80)			0.0768	$[1.07]$		
$TERM$	-0.3354	(-4.15)			-0.2727	$[-2.92]$		
$EXCH$	0.0585	(3.38)			0.0704	$[3.21]$		
DF	-0.1214	(-3.13)			-0.1338	$[-3.19]$		
r_M	0.0296	(2.38)			0.0257	$[1.99]$		
	$I\{SI_t < q\}$		$I\{SI_t \geqslant q\}$		$I\{SI_t < q\}$		$I\{SI_t \geqslant q\}$	
E/P	-0.0017	(-2.76)	-0.012	(-0.33)	-0.0018	$[-2.89]$	-0.0018	$[-3.61]$
$dum^{(d_L)} \times (E/P)$	0.0159	(1.92)	0.0952	(0.95)	0.0102	$[1.66]$	0.1510	$[3.76]$
B/M	-0.0122	(-3.84)	-0.0196	(-3.26)	-0.0121	$[-3.69]$	-0.1319	$[-2.99]$
$dum^{(d_L)} \times (B/M)$	0.0584	(3.31)	0.0145	(0.48)	0.0495	$[2.43]$	0.03737	$[2.24]$
D/P	-0.1249	(-2.76)	0.1027	(1.24)	-0.1121	$[-2.44]$	-0.0207	$[-0.30]$
$dum^{(d_L)} \times (D/P)$	0.3022	(1.18)	0.7306	(2.24)	0.3803	$[1.47]$	0.4048	$[1.42]$
$SIZE$	0.5887	(1.96)	0.9550	(1.15)	0.3070	$[1.02]$	1.0288	$[2.50]$
$dum^{(d_L)} \times (SIZE)$	-0.8716	(-1.65)	1.6476	(0.87)	-0.5065	$[-0.87]$	-1.5243	$[-1.42]$
$SENT(WACI)$	0.0208	(1.95)	-0.1296	(-2.96)				
$SENT(CCI)$					0.0206	(1.94)	-0.7180	(-2.63)
Threshold parameter q	107.4				100.85			
95% CI of q	$[106.32, 108.10]$				$[100.52, 101.00]$			
LR test stat.	16.08				7.49			
$Observations$	962				962			
$Sample$	$1987 - 2012$				$1987 - 2012$			

Notes: The table presents estimates of model (5), allowing also for threshold effects in the firm-specific variables. These are based on $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations. Column (I) presents results for the case where the sentiment index SI is based on $WACI$, while Columns (II) for the cases that it is based on CCI. LR is the likelihood ratio test statistic of null hypothesis H_0: $\gamma_j = \gamma_j^*$, $\gamma_j^{(d_L)} = \gamma_j^{*(d_L)}$ and $\delta = \delta^*$, for all j, against its alternative H_a: $\gamma_j \neq \gamma_j^*$ or $\gamma_j^{(d_L)} \neq \gamma_j^{*(d_L)}$ or $\delta \neq \delta^*$.

Table 4: Correlation coefficients of the explanatory variables with $P_{it} - P_{it}^*$ across the two sentiment regimes

	$P_{it} - P_{it}^*$							
	$I\{SI(WACI) < q = 107.40\}$		$I\{SI(WACI) \geqslant q = 107.40\}$		$I\{SI(CCI) < q = 100.85\}$		$I\{SI(CCI) \geqslant q = 100.85\}$	
	bottom 10%	upper 90%	bottom 10%	upper 90%	bottom 10%	upper 90%	bottom 10%	upper 90%
E/P	0.0743	−0.0907	0.0203	−0.0162	0.0798	−0.0974	0.0244	−0.0248
B/M	0.2839	−0.4211	0.0614	−0.1859	0.2173	−0.345	0.1777	−0.2942
D/P	0.1527	−0.2226	0.0843	−0.1078	0.1062	−0.1683	0.1368	−0.1761
$SIZE$	0.0179	0.1394	0.0004	0.0783	0.0212	0.0925	0.0012	0.1299
$SENT(WACI)$	0.0550		−0.0680					
$SENT(CCI)$					0.0527		−0.0645	

Notes: The table presents values of the correlation coefficients of the firm-specific variables in their 10th and 90th percentiles of their distribution and the sentiment variable $SENT$ with price deviations $P_{it} - P_{it}^*$ across the two sentiment regimes of model (5), implied by sentiment indices $WACI$ and CCI, respectively. These values are based on $T = 26$ time series observations (from year 1987 to 2012) and $N = 37$ companies whose shares are continuously traded in the UK stock market, i.e., $NT = 962$ panel data observations.

Table 5A: Estimates of model (5) without regime shift in firm-specific variables, using quarterly data

	(I)		(II)	
$GROWTH$	-0.152	(-0.89)	0.173	(1.00)
INF	0.099	(1.53)	0.094	(1.50)
$TERM$	-0.419	(-3.67)	-0.414	(-3.43)
$EXCH$	0.007	(0.44)	-0.019	(-1.07)
DF	-0.205	(-4.08)	-0.168	(-3.44)
r_M	0.017	(1.58)	0.002	(0.17)
E/P	-0.001	(-2.75)	-0.001	(-2.80)
$dum^{(d_L)}\times(E/P)$	0.013	(2.07)	0.013	(2.07)
B/M	-0.012	(-3.47)	-0.011	(-3.38)
$dum^{(d_L)}\times(B/M)$	0.053	(3.74)	0.053	(3.76)
D/P	-0.059	(-1.34)	-0.065	(-1.50)
$dum^{(d_L)}\times(D/P)$	0.146	(0.53)	0.175	(0.63)
$SIZE$	0.620	(1.93)	0.550	(1.70)
$dum^{(d_L)}\times(SIZE)$	-1.097	(-1.98)	-1.045	(-1.88)
Sentiment regime:	$SENT(WACI)$		$SENT(CCI)$	
$I\{SI_t < q\}$	0.011	(1.02)	0.320	(1.47)
$I\{SI_t \geq q\}$	-0.071	(-2.15)	-0.207	(-0.89)
Threshold parameter q	107.3		100.45	
95% CI of q	$[107, 107.5]$		$[100.20, 100.46]$	
LR test stat.	5.43		3.90	
Observations	$3,848$		$3,848$	
Sample	$1987Q1 - 2012Q4$		$1987 - 2012$	

Notes: The table presents estimates of a version of model (5) without allowing for threshold effects in the firm-specific variables. These are based on quarterly time series observations (from 1987Q1 to 2012Q4) of the measures of sentiments $WACI$ and CCI, the macroeconomic variables of the model, and the prices P_{it}. For the intrinsic values of shares P^*_{it}, we have maintained their year values as quarterly observations after each year's financial statement announcement, until the next year's one. Column (I) presents results for the case where the sentiment index SI is based on $WACI$, while Columns (II) and (III) for the cases that it is based on CCI and PCF, respectively. LR is the likelihood ratio test statistic that there is no threshold effects in slope coefficients δ and δ^*, i.e., H_0: $\delta = \delta^*$, against its alternative H_a: $\delta \neq \delta^*$.

Table 5B: Estimates of the full specification of model (5), using quarterly data

	(I)				(II)			
$GROWTH$	0.166	(0.97)			0.167	(0.92)		
INF	0.101	(1.55)			0.096	(1.49)		
$TERM$	−0.441	(−3.77)			−0.397	(−3.23)		
$EXCH$	−0.000	(−0.02)			−0.004	(−0.20)		
DF	−0.219	(−4.28)			−0.169	(−3.35)		
r_M	0.014	(1.27)			0.002	(0.21)		
	$I\{SI_t < q\}$		$I\{SI_t \geqslant q\}$		$I\{SI_t < q\}$		$I\{SI_t \geqslant q\}$	
E/P	−0.0017	(−2.66)	−0.011	(−0.04)	−0.002	(−2.75)	−0.021	(−0.89)
$dum^{(d_L)} \times (E/P)$	0.012	(1.97)	0.008	(0.22)	0.005	(0.61)	0.046	(1.81)
B/M	−0.010	(−3.02)	−0.016	(−2.95)	−0.009	(−2.45)	−0.012	(−3.05)
$dum^{(d_L)} \times (B/M)$	0.056	(2.92)	0.049	(2.73)	0.109	(3.57)	0.039	(2.56)
D/P	−0.094	(−1.99)	0.034	(0.45)	−0.095	(−1.57)	−0.049	(−0.91)
$dum^{(d_L)} \times (D/P)$	0.020	(0.07)	0.435	(1.43)	0.124	(0.41)	0.189	(0.65)
$SIZE$	0.337	(0.93)	1.829	(2.70)	0.446	(0.97)	0.634	(1.44)
$dum^{(d_L)} \times (SIZE)$	−0.063	(−1.07)	−3.772	(−2.62)	−0.542	(−0.70)	−1.837	(−2.14)
$SENT(WACI)$	0.010	(0.86)	−0.099	(−2.61)				
$SENT(CCI)$					0.337	(1.43)	−0.050	(−0.20)
Threshold parameter q	107				99.98			
95% CI of q	$[103.05, 107.3]$				$[99.32, 100.10]$			
LR test stat.	18.73				12.66			
$Observations$	3,848				3,848			
$Sample$	$1987Q1 - 2012Q4$				$1987Q1 - 2012Q4$			

Notes: The table presents estimates of model (5), allowing also for threshold effects in the firm-specific variables. These are based on quarterly time series observations (from 1987Q1 to 2012Q4) of the measures of sentiments $WACI$ and CCI, the macroeconomic variables of the model, and the prices P_{it}. For the intrinsic values of shares P^*_{it}, we have maintained their year values as quarterly observations after each year's financial statement announcement, until the next year's one. Column (I) presents results for the case where the sentiment index SI is based on $WACI$, while Columns (II) for the cases that it is based on CCI. LR is the likelihood ratio test statistic of H_0: $\gamma_j = \gamma^*_j$, $\gamma^{(d_L)}_j = \gamma^{*(d_L)}_j$ and $\delta = \delta^*$, for all j, against its alternative H_a: $\gamma_j \neq \gamma^*_j$ or $\gamma^{(d_L)}_j \neq \gamma^{*(d_L)}_j$ or $\delta \neq \delta^*$.