“Predicted vs. real stock prices: can the difference be explained by key macroeconomic factors?”

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Predicted vs. real stock prices: can the difference be explained by key macroeconomic factors?

Abstract

Penman and Sougiannis (1998) consider that price deviations from fundamental value are model estimation errors, while Barberis et al. (1998) suggest that these deviations are due to psychological factors that affect investor reaction to information. In this paper, the authors use the valuation models proposed by Barberis (1998) and Ohlson (1995) and data from the London Stock Exchange in order to calculate the fundamental value of a stock and then examine whether the differences between predicted and real stock prices are due to macroeconomic fundamentals or psychological factors. On the whole the results show that, for both valuation models, differences between predicted and real stock prices are explained by important macroeconomic variables.

Keywords: valuation models, investor sentiment.
JEL Classification: G1.

Introduction

As Lee (1999) points out, research on equity valuation with the use of accounting information for the estimation of shareholder value "has emerged as a central theme in the accounting research of the 1990s". More specifically Peasnell (1982), Ohlson (1995) and Feltham and Ohlson (1995) suggest that security prices should be determined by book value and discounted future abnormal earnings. Indeed, there are a lot of empirical studies based on accounting methods of valuation that support that price deviations from fundamental values are due to a model prediction error (Penman and Sougiannis, 1998; Francis et al., 1999).

At about the same period with the above studies Barberis et al. (1998) present a parsimonious model of investor sentiment consistent with the empirical findings in the literature of investor underreaction and overreaction to information (see Bernard and Thomas, 1989; Chan et al., 1997; Chopra et al., 1992; De Bondt and Thaler, 1985; Ikenberry et al., 1995; La Porta, 1996). Their model involves a representative agent and a random walk as the true process for earnings. In this case the price of a security should be the discounted value of earnings, i.e. N_t/d, where N_t is earnings at time t and d is the discount rate. In Barberis et al., price deviations from fundamental values are due to the fact that investors do not use the true (random walk) model to forecast earnings, but rather some combination of two alternative models that are described in the paper. In their first Proposition, they present a formula for the price of a security that has two terms and a very simple interpretation: the first term (N_t/d) is the price that would obtain if the investor used the true random walk process to forecast earnings. The second term provides the deviation of the price from this fundamental value. They also explore the range of values for which their price function exhibits both underreaction and overreaction to earnings news. The implication in the Barberis et al. (1998) model is that price deviations from fundamental value are not model estimation errors but deviations that are due to psychological factors that affect investor reaction to information.

Irrespective of which approach is employed, an important question is what drives deviations from theoretical prices. For example, in Barberis et al. deviations of the actual prices from the predicted prices are due to investor sentiment and not a model prediction error. One can argue, however, that standard valuation models are incomplete and capture only a fraction of the full fundamental information set. Thus, what appears as deviations from fundamental values is simply a fundamental price component not captured by the valuation model.

This paper aims to investigate this issue further: we employ standard security valuation techniques in order to estimate the deviation of actual prices from fundamental values, and then examine whether these deviations are related to fundamental macroeconomic variables. These price deviations from fundamental values is a very important issue in the theory of valuation. In this paper, we use average deviations of all firms at time t for every year for the period of 1987-2007. The objective is to estimate the difference between predicted and real stock prices and then examine whether this difference is due to model estimation errors, to investor sentiment, or fundamental informations not captured by the valuation model. This is done by the use of standard valuation models (Barberis, 1998; Ohlson, 1995) in order to calculate the theoretical fundamental value of a stock and then compare it to the observed market stock price. The difference between predicted and real stock prices are then regressed to a set of key macroeconomic variables (as a proxy for fundamental informations), and factors that proxy for investor sentiment. The rest of

the paper is organized as follows: section 1 reviews the literature, section 2 presents the data and methodology, section 3 presents the empirical findings and the final section concludes the paper.

1. Literature review

Recent empirical research in finance has focused on the theory of underreaction and overreaction. The underreaction evidence shows that over horizons of 3-12 months, security prices underreact to news and, as a consequence, news is incorporated only slowly into prices. In other words, investors underreact to good news (e.g. when earnings are higher than expected) resulting to momentum profits. The overreaction evidence shows that over longer horizons (3-5 years) security prices overreact to information leading to contrarian profits. This is a challenge to the efficient markets theory since it suggests that in a variety of markets sophisticated investors can earn superior returns by taking advantage of underreaction and overreaction without bearing extra risk. This evidence also presents a challenge to behavioral finance theory because early models do not successfully explain the facts. The challenge is to explain how investors might form beliefs that lead to both underreaction and overreaction (Barberis et al., 1998).

De Bondt and Thaler (1985) use monthly return data for New York Stock Exchange for the period between January 1926 and December 1982 and test whether the overreaction hypothesis is predictive. Their empirical results are consistent with the overreaction hypothesis. More specifically, they discover that portfolios of stocks with extremely poor returns over the previous five years significantly outperform portfolios of stocks with extremely high returns, even after making the risk adjustments. This large difference in returns between winners and losers is interpreted as evidence that there are systematic valuations errors in the stock markets caused by investor overreaction. Zarowin (1990) reexamines De Bondt and Thaler's evidence on stock market overreaction controlling for size differences between winners and losers. He finds that the tendency of losers to outperform is not due to investor overreaction, but to the tendency of losers to be smaller sized firms than winners. He also reports that when losers are compared to winners of equal size there is little evidence of any return discrepancy and that in periods when winners are smaller than losers, winners outperform losers. Chopra et al. (1992) use monthly data of the NYSE from 1926 to 1986 and find an economically important overreaction effect present in the stock market even after adjusting for size and beta. In portfolios formed on the basis of prior five years returns, extreme prior losers outperform extreme prior winners by 5%-10% per year during the subsequent five years. They also find that the overreaction effect is substantially stronger for smaller firms than for larger firms.

Bernard and Thomas (1989) attempt to discriminate between two alternative explanations for post earnings announcements drift: a failure to adjust abnormal returns fully for risk and a delay in the response to earnings reports. Over the period of 1974-1986, using a sample of 84,792 firm quarters of data for NYSE/AMEX, they conclude that much of their evidence cannot plausibly reconciled with arguments built on risk miss-measurement but is consistent with a delay price response. In addition, Inkebery et al. (1995) examine a long-run firm performance following open market repurchase announcements for a sample of 1,239 repurchases between 1980 to 1990, by firms whose shares traded on the NYSE, ASE or NASDAQ. According to the literature, undervaluation is an important reason motivating share repurchases, but other reasons also exist. For example, managers in low book to market firms may consider repurchasing shares as a way to artificially support prices that have typically risen dramatically in the recent past. In this paper, sorting firms on the basis of book to market ratios, they found that for undervalued stocks (high book to market ratios), the effect of repurchasing own shares by the companies is important (45.3%). They also find that for repurchases announced by glamour stocks (low book to market ratios), where undervaluation is less likely to be an important motive, no positive drift in abnormal returns is observed.

Beaver and Landsman (1981) study portfolios that are formed directly upon residual return behavior in the months prior to portfolio formation and examine the empirical behavior of residual return in the post formation period. They based on US data for the period of 1932-1977 and find that the average residual return is essentially zero in the months subsequent to portfolios formation. However non-zero residual behavior is observed in particular years. Moreover, the results suggest the possibility that abnormal returns observed after certain events (e.g. earnings announcements) may at least in part reflect more general phenomena associated with being winners and losers in terms of residual returns in the months previous to the event. Rendleman et al. (1982) based on a US sample of stocks and daily returns for the period of 1971-1980 and find that roughly 50% of the adjustment of stock returns to unexpected quarterly earnings occurs over a 90-day period after the earnings are announced. Reinganum (1982) studies the effect that small firms experience large returns in January and exceptionally large returns during the first few trading days of January.

His empirical tests indicate that the abnormally high returns witnessed at the very beginning of January appear to be consistent with tax-loss selling. However, tax-loss selling cannot explain the entire January seasonal effect. The small firms least likely to be sold for tax reasons (prior year 'winners') also exhibit large average January returns, although not unusually large returns during the first few days of January. Blume and Stambaugh (1983) support that previous estimates of a size effect based on daily returns data are biased. They consider that the use of quoted closing prices in computed returns on individual stocks imparts an upwards bias. They also realize that returns computed for buy-and-hold portfolios largely avoid the bias induced by closing prices. Based on such buy-and-hold US returns for the period of 1963-1980, they realize that the average size effect over the entire year is half as large previously reported and support that all of the full year average size effect is due to the month of January.

De Bondt and Thaler (1987), based on US data for the period of 1926-1982, report additional evidence that supports the overreaction hypothesis and that is inconsistent with two alternative hypotheses based on firm size and differences in risk, as measured by CAPM-betas. The seasonal pattern of returns is also examined. Excess returns in January are related to both short-term and long-term past performance, as well as to the previous year market return. Lakonishok and Vermaelen (1990) report anomalous price behavior around repurchase tender offers using US data for the period of 1962-1986. Buying shares before the expiration date of a repurchase tender offer and tendering to the firm produces, on average, abnormal returns of more than 9 percent over a period shorter than one week. In addition, they find that repurchasing companies experience economically and statistically significant abnormal returns in the two years after the repurchase. Jegadeesh (1990) presents new empirical evidence of predictability of individual stock returns. Using the observed systematic behavior of stock returns, one-step-ahead return forecasts are made and ten portfolios are formed from the forecasts. The difference between the abnormal returns on the extreme decile portfolios over the period of 1934-1987 is 2.49 percent per month. Seyhan (1990) uses US data for the period of 1975-1988 and examines insider trading activity around the Crash. The results show that 1) the Crash was a surprise to corporate insiders; 2) insiders became buyers of stock in record numbers immediately following the Crash; 3) stocks that declined more during the Crash were also purchased more by insiders; and 4) stocks that were purchased more extensively by insiders during October 1987 showed larger positive returns in 1988. The overall evidence suggests that overreaction was an important part of the Crash. Zarowin (1989) tests whether the stock market overreacts to extreme earnings, by examining firm's stock returns over 36 months (based on US firms for the period of 1971-1981) subsequent to extreme earnings years. While the poorest earners do outperform the best earners, the poorest earners are also significantly smaller than the best earners. When poor earners are matched with good earners of equal size, there is little evidence of differential performance. This suggests that size, and not investor overreaction to earnings, is responsible for the overreaction phenomenon, the tendency for prior period losers to outperform prior period winners in the subsequent period. Conrad and Kaul (1993) show (based on NYSE data for the period of 1929-1988) that the returns to the typical long-term contrarian strategy implemented in previous studies are upwardly biased because they are calculated by cumulating single-period (monthly) returns over long intervals. The cumulation process not only cumulates "true" returns but also the upward bias in single-period returns induced by measurement errors. They also show that the remaining "true" returns to loser or winner firms have no relation to overreaction.

In addition, there is another recent literature that examines the overreaction hypothesis. Barberis and Huang (2001) study equilibrium firm-level stock returns in two-economies based on US data for the period of 1889-1985: one in which investors are loss-averse over the fluctuations of their stock portfolios and another in which they are loss-averse over the fluctuations of individual stocks that they own. Both approaches can shed light on empirical phenomena but they find the second approach to be more successful: in that economy, the typical individual stock return has a high mean and excess volatility, and there is a large value premium in the cross-section which can, to some extent, be captured by a commonly used multifactor model. Padmaja and Rau (2002) consider that two conflicting behavioral models, underreaction and overreaction, have been proposed as explanations for the long-run abnormal return patterns following a variety of corporate events. They test hypotheses that distinguish between these two behavioral models for four corporate events, seasoned equity offerings, share repurchases, stock-financed acquisitions and cash-financed acquisitions. The evidence is consistent with the hypothesis that long-run abnormal returns are attributable to the investor underreaction model. Investors underreact to short-term information available prior to the event and subsequently under-react to information conveyed by the corporate event. Long-run abnormal returns

reflect the net effect of investor underreaction to these two pieces of information. They find no evidence to support the overreaction model. They also find no evidence to support a more complicated behavioral model that postulates investor underreaction to short-term information and overreaction to long-term trends. Coval and Shumway (2005) document strong evidence for behavioral biases among Chicago Board of Trade proprietary traders (for the period of 1989-1998) and investigates the effect these biases have on prices. Their traders appear highly loss-averse, regularly assuming above-average afternoon risk to recover from morning losses. This behavior has important short-term consequences for afternoon prices, as losing traders actively purchase contracts at higher prices and sell contracts at lower prices than those that prevailed previously. However, the market appears to distinguish these risk-seeking trades from informed trading. Prices set by loss-averse traders are reversed significantly more quickly than those set by unbiased traders. Mishra (2005) studied the stock price reaction to bonus issues in India using the event study methodology. The samples of 46 bonus issues from June 1998 to August 2004 were used to study the announcement effect. The results indicated that there were significant positive abnormal returns for a five-day period prior to bonus announcement in line with evidence from the developed markets. The results provided stronger evidence of semi-strong market efficiency of the Indian stock market. Kothari et al. (2009) examine (based on US data for the period of 1962-2004) whether managers delay disclosure of bad news relative to good news. If managers accumulate and withhold bad news up to a certain threshold, but leak and immediately reveal good news to investors, then they expect the magnitude of the negative stock price reaction to bad news disclosures to be greater than the magnitude of the positive stock price reaction to good news disclosures. They present evidence consistent with this prediction. Their analysis suggests that management, on average, delays the release of bad news to investors. Tetlock (2011) examines whether the cross-sectional of variations of stock returns (for the period of 1996-2008) is sensitive to investor's response to the staleness of news and finds that firms' stock returns respond less to stale news. He defines the staleness of a news story as its textual similarity to the previous ten stories about the same firm. Even so, a firm's return on the day of stale news negatively predicts its return in the following week. Individual investors trade more aggressively on news when news is stale. The subsequent return reversal is significantly larger in stocks with above-average individual investor trading activity. These results are consistent with the idea that individual investors overreact to stale information, leading to temporary movements in firms' stock prices. Ray (2011) tests the semi-strong form of efficiency in the Indian equity market, following an event study approach. The events considered in his paper are bonus issues and stock splits that have been taken place in the market for the period of 1996-2008. These events are tested for abnormal returns and liquidity. The results suggest that the Indian market reacts to the stock split announcements but not to bonus issues, and the change in liquidity is significant for stock splits at 1% significance level. Mynhardt and Plastun (2013) examine the short-term price reactions after one-day abnormal price changes on the Ukrainian stock market. The original method of abnormal returns calculation is examined. They find significant evidence of overreactions using the daily data over the period of 2008-2012. Their analysis confirms the hypothesis that after an abnormal price movement the size of contrarian price movement is usually higher then after normal (typical) daily fluctuation. Comparing Ukrainian data with the figures from US stock market it is concluded that the Ukrainian stock market is less efficient which gives rise to opportunities for extra profits obtained from trading based on contrarian strategies. Jean-Sebastien Michel (2014) hypothesizes that the stock market overreacts to management earnings forecasts because of the uncertainty surrounding them. He finds, based on US data for the period of 1994-2011, that negative management forecast surprises lead to a -5.9% abnormal return around the forecast and a 1.9% correction in the 2-month period after earnings are announced. Positive surprises work in the opposite direction, with 1.9% abnormal return and a 1.7% correction. The level of the stock market overreaction varies with the forecast and the firm characteristics, but the marginal impact remains the same: a 1% change in the stock market reaction around the forecast is associated with a 0.4% correction.

On the other hand, another set of literature supports that price deviations from fundamental values could be considered as valuations errors. For example, Penman and Sougiannis (1998) examine valuation methods based on dividend, cash flow, and abnormal earnings estimates, for US equities for the period of 1973-1990, using a panel data analysis. They find that abnormal earnings estimates have the smallest prediction errors than the other methods. The largest prediction errors are observed for the free cash flow estimates. Lee and Swaminathan (1998) examined whether traditional indices (based on dividends, book to market, earnings) and an index based on Ohlson's model can predict US equity returns for the period of 1963-1996. They find that although the traditional indices have low

return predictability, the index based on Ohlson's model is more successful. Francis et al. (2000) compare the reliability of value estimates from the dividend, earnings, and abnormal earnings models using US pooled data for the period of 1989-1993. They find that the abnormal earnings estimates are more accurate and explain more of the variability in equity prices that the other variables. Bernard et al. (1996) examine six accounting-based stock price anomalies using two sets of tests to determine the extent to which the anomalies (a) represent market mispricing, or (b) reflect premia for unidentified risks. Market mispricing is indicated if the anomalous returns are concentrated around subsequent earnings announcements, in patterns suggesting that the earnings information causes traders to reexamine their prior (incorrect) beliefs. Mispricing is also indicated if anomalous returns on zero investment portfolios are positive, period after period. Their results (based on US data for the period of 1973-1992) indicate that an anomaly based on earnings momentum probably reflects market mispricing, but that two value/glamour anomalies (based on the book/market ratio and the earnings/price ratio), and two anomalies based on computerized fundamental analyses (from Ou and Penman 1989 and Holthausen and Larcker 1992) are more likely to reflect risk premia than indicated by prior research. Evidence on a sixth anomaly, based on a price momentum, is mixed.

2. Data and methodology

We use the valuation model proposed by Barberis (1998) and Ohlson (1995) as discussed above in order to calculate the fundamental value of a stock and then examine whether the differences between predicted and real stock prices are explained by key macroeconomic factors and psychological factors, using data from the London Stock Exchange, covering the period between 1987 and 2007. Our sample includes companies from the FTSE 100 index that have been traded continuously in the stock market during the examined period. The data is expressed in nominal values and annual frequency (available from Datastream).

In order to calculate the fundamental value (of each company of FTSE 100) at time t proposed by the Barberis (1998) valuation model, we discount the earnings at time t (based on the risk-free rate as a discount factor) using yearly data for the period of 1987-2007. More specifically, we use the following formula:

$$P_t = \frac{N_t}{d},$$

where P_t is the price per share at time t, N_t is the earnings at time t, d is the discount rate.

On the other hand, in order to calculate the fundamental value at time t proposed by the Ohlson[1] valuation model, we use the book value at time t and afterwards we add the discounting of forecasted abnormal earnings for the next five years. We make these calculations for each company of FTSE 100 index using yearly data for the period of 1987-2007. More specifically we based on the following formula:

$$P_t = B_t + \frac{(FEPS_{t+1} - r_f B_{t+1-1})}{(1+r_f)^1} + \frac{(FEPS_{t+2} - r_f B_{t+2-1})}{(1+r_f)^2} + \frac{(FEPS_{t+3} - r_f B_{t+3-1})}{(1+r_f)^3} +$$
$$+ \frac{(FEPS_{t+4} - r_f B_{t+4-1})}{(1+r_f)^4} + \frac{(FEPS_{t+5} - r_f B_{t+5-1})}{(1+r_f)^5} + TV,$$

where, P_t denotes the price per share at time t; B_t denotes the book value at time t from the most recent financial statement divided by the number of shares outstanding; $FEPS_{t+i}$ represents the forecasted earnings per share in period $t + i$ where $i = 1$; r_f denotes the risk free discount rate.

$$B_{t+i} = B_{t+i-1} + FEPS_{t+i} - FDPS_{t+i},$$

where $FDPS_{t+i}$ is the forecasted dividend per share for year $t + i$ estimated using the current dividend payout ratio (k). Specifically, we assume $FDPS_{t+i} \times k$; TV is the terminal value, estimated using the following ratio:

$$TV = \frac{(FEPS_{t+6} - r_f B_{t+6-1})}{[(r_f - g)(r_f + 1)^{t+6}]},$$

where g is the growth rate at time t.

Once the differences between actual and predicted prices are estimated, they are used as the dependent variable in a time-series regression on a set of macroeconomic variables in order to evaluate whether these differences are explained by these fundamental variables. If that is the case, then it can be argued that the differences are due to fundamental factors that are not captured by the valuation models.

First, we regress the differences that result from the Barberis et al.'s model as follows:

[1] We calculate the fundamental value that based at the Ohlson valuation model following the methodology of Lee et al. (1999).

$$DIFB_t = \alpha + \beta_1 INDPROD_t + \beta_2 GDPCUR_t + \\ + \beta_3 UKTOUS_t + \beta_4 UKTOEURO_t + \\ + \beta_5 THREEMONTH_t + \beta_6 DEF_t + \\ + \beta_7 DEBT_t + \beta_8 SUPPLY + \varepsilon_t. \quad (1)$$

In (1) $DIFB_t$ is the differences at time t, $INDPROD_t$ is the industrial production at time t, $GDPCUR_t$ is the gross domestic product in current prices, $UKTOUS_t$ is the exchange rate between UK pound and US dollar at time t, $UKTOEURO_t$ is the exchange rate between UK pound and EURO at time t, $THREEMONTH_t$ is the three month treasury bill at time t, DEF_t is the public deficit at time t, $DEBT_t$ is the gross debt at time t, $SUPPLY_t$ is the money supply at time t and ε_t is the unobserved remainder.

Then we regress the differences that result from Ohlson (1995) model as follows:

$$DIFO_t = \alpha + \beta_1 INDPROD_t + \beta_2 GDPCUR_t + \\ + \beta_3 CPI_t + \beta_4 UKTOUS_t + \beta_5 UKTOEURO_t + \\ + \beta_6 TENYEAR_t + \beta_7 INF_t + \beta_8 DEF_t + \quad (2) \\ + \beta_9 DEBT_t + \beta_{10} BALOFPAY_t + \\ + \beta_{11} SUPPLY_t + \varepsilon_t.$$

In (2) $DIFO_t$ is the differences at time t, $INDPROD_t$ is the industrial production at time t, $GDPCUR_t$ is the gross domestic product in current prices at time t, CPI_t is the consumer price index at time t, $UKTOUS_t$ is the exchange rate between UK pound and US dollar at time t, $UKTOEURO_t$ is the exchange rate between UK pound and Euro at time t, $TENYEAR_t$ is the ten year bond at time t, INF_t is the inflation rate at time t, DEF_t is the public deficit at time t, $DEBT_t$ is the gross debt at time t, $BALOFRAY_t$ is the balance of payments at time t, $SUPPLY_t$ is the money supply at time t, and ε_t is the unobserved remainder.

More specifically, the differences (DIFB and DIFO) are the differences between the fundamental values that predicted by Barberis (1998) and Ohlson valuation models respectively and the real stock prices at the stock market. We calculate these differences for each separate company at time t and then, in order to calculate the dependent variable, we take the average value of all differences for all firms for every year for the period of 1987-2007.

As regards to the rest of the variables:

The balance of payments (BALOFPAY). BALOFPAY is the balance of payments of the British economy for every year of the examined period.

The consumer confidence (CONF). CONF is the consumer confidence of the British economy for every year of the examined period.

The consumer price index (CPI). CPI is the consumer price index of the British economy for every year of the examined period.

The deficit (DEF). DEF the public deficit of the British economy for every year of the examined period.

The economic sentiment (SENT). SENT is the economic sentiment of investors of the British economy for every year of the examined period.

The external debt (EXDEBT). EXDEBT is the external debt of the British economy for every year of the examined period.

The exchange rate (UKTOEURO). UKTOEURO is the exchange rate between UK pound and EURO for every year of the examined period

The exchange rate (UKTOUS). UKTOUS is the exchange rate between UK pound and US dollar for every year of the examined period.

The gross domestic product (GDPCON). GDPCON is the gross domestic product in constant prices of the British economy for every year of the examined period.

The gross domestic product (GDPCUR). GDPCUR is the gross domestic product in current prices of the British economy for every year of the examined period.

The gross debt (GRDEBT). GRDEBT is the gross debt of the British economy for every year of the examined period.

The industrial production (INDPROD). INDPROD is the industrial production of the British Economy for every year of the examined period.

The real effective exchange rate (EFFECTIVE). EFFECTIVE is the real effective exchange rate for every year of the examined period.

The inflation (INF). INF is the inflation rate of the British economy for every year of the examined period.

The money supply (SUPPLY). SUPPLY is the money supply of the British economy for every year of the examined period.

The ten year bond (TENYEAR) TENYEAR is the ten year bond of the British economy for every year of the examined period.

The three month treasury bill (THREE-MONTH). THREEMONTH is the three month treasury bill of the British economy for every year of the examined period.

3. Empirical findings

Table 1 presents the descriptive statistics of the variables involved in our study. As we can see from this table, the average DIFB is 0.22 and the average DIFO is 0.15 with a standard deviation of 0.54 and 0.15 respectively. The average UKTOEURO is 0.72, a value that is similar to the average of UKTOUS (0.59). In addition, the average GROSSDEBT is 12,740.86 a value that is much higher than the average of GDPCUR (862.81), the average of INDPROD (96.42) and the average of THREEMONTH (7.17). The average CPI is 81.32 while the average INF is 3.64. As well, the average price of SUPPLY, and TENYEAR is 550,526.0 and 7.06 respectively. On the other hand, the average BALOFPAY (-18,174.48) is a negative value much lower than the average DEF (-9,375.71).

The price deviations from fundamental values is a very important issue in the theory of valuation. In this paper we use average deviations of all firms at time *t* for every year for the period of 1987-2007. We observe that these deviations are very volatile especially during the sub period of 1994-2001. Of course the volatility of these deviations in this specific period can be easily explained by the following reasons: the overvalue appreciation of the stock market, the dot com babble and the telecommunications crash.

In order to estimate each of the above model (in equations 1 and 2) we follow the methodology from general to specific. More specifically we regress the dependent variable with several independent variables that represent key macroeconomic factors of the English economy. At every estimation step we exclude the nonsignificant explanatory variable. We continue our estimations until we reach a specification in which all explanatory variables are statistically significant. Tables 2 and 3 report the results.

Firstly, the results of the estimation of equation (1) above are presented in Table 2. The explanatory ability of the model is significant, bearing in mind that the key macroeconomic factors explain a large portion of the variability of the dependent variable (R^2 = 95%). The results show that key independent variables such as the industrial production, the gross domestic product, the exchange rate between the UK pound and US dollar, the exchange rate between the UK pound and the Euro, the three month treasury bill rate, the public deficit, the gross debt and the money supply represent important determinants of the differences between predicted and real stock prices. In addition, variables such as, the consumer confidence and the economic sentiment of investor do not explain the variability of these differences.

The main question of our analysis, i.e., whether price deviations from fundamental values are affected by economic conditions, is upheld by the data. One possible explanation for this conclusion is that the discounted earnings valuation model that proposed by Barberis (1998) is misspecified and does not incorporate the impact of important macroeconomic factors. The alternative question of our analysis, i.e., whether price deviations from fundamental values are affected by the sentiment of investors is not upheld by the data. These results do not confirm the theory proposed by the Barberis valuation model that price deviations from fundamental value are due to psychological factors that affect investor reaction to information. The question following this conclussion is to determine the cause of the failure of the psychological factors to explain the differences between predicted and real stock prices. An explanation for this conclusion is that the dermination of the correct psychological factors that affect investor reaction to information is a very comlicated process that cannot be captured by variables such as the consumer confidence and the sentiment of investor. The F-statistic of the model has a price of 48.00 with a probability value of 0.00. The Durbin-Watson statistic and the Residual Sum of Squares have a price of 2.57 and 0.18 respectively. The results also show that all explanatory variables are statistically significant and have the expected sign.

Secondly, the results of the estimation of equation (2) above are presented in Table 3. As we can see from the results, the independent variables explain a large portion of the variability of the dependent one (R^2 = 75%). The results show that key independent variables such as the industrial production, the gross domestic product, the consumer price index, the exchange rate between UK pound and US dollar and between UK pound and EURO, the ten year bond, the inflation rate, the deficit, the gross debt, the balance of payments and the money supply are statistically significant and represent important determinants of the differences between predicted and real stock prices. Our original question of whether the differences between predicted and real stock prices are explained by several macroeconomic factors is upheld by the data. These results are not supportive to the theory (Penman and Sougiannis, 1998) that price deviations from fundamental value are treated as model estimation errors. One possible explanation for this conclusion is that the Ohlson (1995) valuation model is misspecified and does not incorporate the impact of important macroeconomic factors. The F-statistic of the model has a price of 6.33 with a probability value of 0.00. The Durbin-Watson statistic has a price of 2.94 while the Residual Sum of Squares has a price of 0.05.

Conclusion

We use the valuation model proposed by Barberis (1998) as well as the Ohlson valuation model in order to calculate the fundamental value of a stock and then examine whether the differences between predicted and real stock prices are explained by key macroeconomic factors and psychological factors that affect investor reaction to information, using data from the London Stock Exchange, for the period between 1987 and 2007.

More specifically, when the valuation model of Barberis et al. (1998) is employed the results show that key macroeconomic variables are important determinants of the differences between predicted and real stock prices (R^2 = 95%). One possible explanation is that the deviations from fundamental values are not due to investor sentiment as Barberis et al. suggest, but due to important macroeconomic information not captured by the valuation model. For example, variables such as consumer confidence and economic sentiment do not explain a significant portion of the variability of the dependent variable. Of course, one must also consider the possibility that the chosen investor sentiment variables (consumer confidence and economic sentiment) do not capture adequately the true investor sentiment, although these variables are commonly employed in empirical studies to proxy for investor sentiment.

When the Ohlson (1995) valuation model is employed the results suggest that key fundamental variables represent important determinants of the differences between predicted and real stock prices (R^2 = 75%). These empirical findings are not consistent with the idea that price deviations from fundamental value are model estimation errors and suggest that the valuation models do not adequately capture the full information set (e.g. ignore macroeconomic conditions).

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Appendix

Table 1. Descriptive statistics of variables

Panel A							
	DIFB	INDPROD	GDP CUR	UKTOUS	UKTO EURO	THREE MONTH	DEF
Mean	0.22	96.42	862.81	0.59	0.72	7.17	-9375.71
Median	0.18	99.90	830.09	0.60	0.70	6.16	-11545.00
Maximum	1.22	104.20	1398.88	0.69	0.86	14.50	20380.00
Minimum	-0.72	84.60	428.66	0.50	0.61	3.86	-38399.00
Std. dev.	0.54	5.97	291.16	0.06	0.07	3.22	17670.82
Panel B							
	DEBT	SUPPLY	DIFO	CPI	TEN YEAR	INF	BALOF PAY
Mean	12740.86	550526.0	0.15	81.32	7.06	3.64	-18174.48
Median	10819.00	483334.0	0.17	82.00	7.05	3.13	-18657.00
Maximum	26461.00	1068371	0.38	107.60	11.80	9.46	-962.00
Minimum	2358.00	219807.0	-0.14	53.10	4.41	1.56	-43842.00
Std. dev.	7265.30	250033.4	0.15	15.36	2.34	2.00	11303.21

Notes: DIFB − the differences between the fundamental values that predicted by the Barberis (1998) valuation model and the real stock prices at the stock market; INDPROD − the industrial production; GDPCUR − the gross domestic product in current prices; UKTOUS − the exchange rate between UK pound and US dollar; UKTOEURO − the exchange rate between UK pound and EURO; THREEMONTH − the three month treasury bill rate; DEF − the public deficit; DEBT − the gross debt; SUPPLY − the money supply; DIFO − the differences between the fundamental values that predicted by the Ohlson (1995) valuation model and the real stock prices at the stock market; CPI − the consumer price index; TENYEAR − the ten year bond; INF − the inflation; BALOFPAY − the balance of payments.

Table 2. Differences from the Barberis valuation model

Independent variables	Model
CONSTANT	9.71 (5.29)***
INDPROD	-0.21 (-7.89)***
GDPCUR	0.02 (8.67)***
UKTOUS	2.91 (4.12)***
UKTOEURO	2.85 (2.67)**
THREEMONTH	0.10 (3.43)***
DEFICIT	1.35E-05 (3.14)***
DEBT	1.36E-05 (-2.43)**
SUPPLY	-1.93E-05 (-8.23)***
F-statistic	48.00
Prob (F-statistic)	0.00
$\overline{R}^2$	0.95
RSS	0.18
D-W	2.57

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10 per cent levels, respectively. INDPROD − industrial production; GDPCUR − gross domestic product in current prices; UKTOUS − exchange rate between the UK pound and the US dollar; UKTOEURO − exchange rate between the UK pound to EURO; THREEMONTH − three month Treasury bill rate; Deficit − public deficit; DEBT − gross debt, SUPPLY − money supply.

Table 3. Differences from the Ohlson valuation model

Independent variables	Model
CONSTANT	-0.81 (-0.81)
INDPROD	0.05 (2.71)**
GDPCUR	-0.02 (-4.68)***
CPI	0.10 (4.87)***
UKTOUS	-1.25 (-2.02)*
UKTOEURO	-2.07 (-2.67)**
TENYEAR	(-0.15) (-2.64)**
INF	0.06 (1.97)*
DEF	7.75E-06 (2.65)**
DEBT	1.97E-05 (3.34)***
BALOFPAY	2.13E-05 (4.46)***
SUPPLY	1.50E-05 (4.65)***
F-statistic	6.33
Prob (F-statistic)	0.00
$\overline{R}^2$	0.75
RSS	0.05
D-W	2.94

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10 per cent levels, respectively. INDPROD − industrial production; GDPCUR − gross domestic product; CPI − consumer price index; UKTOUS − exchange rate between UK pound and US dollar; UKTOEURO − exchange rate between UK pound and EURO; TENYEAR − ten year bond; INF – inflation; DEF − public deficit; DEBT − gross debt; BALOFPAY − balance of payments; SUPPLY − money supply.