Estimation Error of Earnings Information: A Test of Representativeness and Anchoring-adjustment Heuristic

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ABSTRACT

The main objective of this research is to examine representativeness and anchoring-adjustment on investors' over/under reaction to earnings information, and the consequence this has on earnings estimation and stock valuation. In particular, the over/under reaction creates an over response to the earnings information that is persistent in the long-term and an under reaction to the earnings information that changes extremely in the short-term. This research was designed with a $2 \times 2 \times 4$, full factorial. Data was analyzed by repeated measures ANOVA within-subject. 20 post-graduate master students were participants in the experimental. The experimental revealed that investors relied heavily on previous earnings (PEs) and made the level and pattern of the PEs their initial belief (anchor). They overreact on the current earnings (CEs) information when confirming the fundamental beliefs, and they also overreacted toward persistent earnings. The results of the study confirmed that the overreaction behavior was due to of representativeness heuristic bias. On the contrary, the participant of the experiment underreacted towards the CEs information when disconfirming the fundamental beliefs, and also underreacted towards the pattern of earnings that show extreme change. The under reaction happens because of anchoring-adjustment heuristic bias. Consequently, when the previous and CEs have low (high) persistence earnings trend, they underestimated (overestimated) to the future earnings or made error in earnings estimation and underpriced (overpriced) to the securities accordingly or mispriced. It can also be concluded that the error of earnings estimation and stock mispricing is a consequence of the usage of representativeness or anchoring-adjustment heuristic, and indicates that psychological perspective can explain post earnings announcement drift in the capital market.

Keywords: Representativeness and Anchoring-adjustment Heuristic, Overreaction and Under Reaction, Error of Earnings Estimation and Share Mispriced, Post Earnings Announcement Drift
JEL Classification: M41, G02

1. INTRODUCTION

The phenomenon of over/under reaction of investors to earnings information is an interesting issue in capital markets. The issue becomes even more interesting because it is assumed to be a factor of appearing of earnings error estimation by investors and analyst that followed by mispricing of securities. The anomaly of post earnings announcement drift (PEAD), which is when a price is still moving following published unexpected earnings, is evidence of the earnings error estimation and mispricing (De Bondt and Thaler, 1985; 1987; Bernard and Thomas, 1989 and 1990).

Further, De Bondt and Thaler (1985; 1987) argued that PEAD emerge because investors overreact to earnings performance level, which is persistent in the long-term. The consequence of this behavior is mistakes within the of prediction of future earnings

and shares which can be mispriced accordingly. So, the PEAD is a corrective action to the mispricing of a share. Meanwhile, Bernard and Thomas (1990) and Abarbanell, and Bernard (1992) explained that analysts and investors underreact to earnings that show extreme changes in short-term when they predict future earnings. This action causes mistakes in the prediction and shares are mispriced accordingly. So, the PEAD is a form of corrective action to the mispricing of that share.

The question that then appears in the area of behavioral finance is why investors overreact to earnings information that persists in the long-term and why do they underreact to earnings information that shows extreme changes in short-term? Replying to these questions, Bloomfield et al. (2000) describe, through a laboratory experiment study, that investors underreact to reliable information (current earnings [CEs]) and overreact to unreliable information (previous

earnings [PEs]) when they conduct predictions moderated by investor overconfidence. Bloomfield et al. (2003) give additional empirical evidence that the investors over/under reaction caused by an interaction between previous periods of earnings structures and a heavy tendency of an investor to rely on this information. The finding of Bloomfield et al. (2000; 2003) has not yet tested from a psychology perspective.

In psychology and behavioral finance literature, we have told cognitive heuristic can be used to explain why human behavior over/under-reacts to information which they accept, or explain why they make mistakes in their predictions when appraising a probability or value. There are two heuristic components related to the phenomenon mentioned above, and these are representativeness and anchoring-adjustment (Tversky and Kahneman, 1974). These heuristics are also referred to by Barberis et al. (1998), Fuller (2000), Shefrin (2000), and Shleifer (2000). The first heuristic to be considered is that of a cause of overreaction and the second is a cause of under reaction to the information.

The objective of this research is to give empirical evidence for the existence of investors' over/under reaction to earnings information. It will, furthermore, explain why and when investors overreact to the levels and patterns of earnings which persist on a long-term basis whereas they under-react to the level and earnings patterns that change in the short-term. The examination conducted by using the component of heuristics as explained above. This research will show how the component of heuristics can create patterns mistake of prediction as which hypothesized in the literature of psychology of finance.

2. LITERATURES REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Literature Review
2.1.1. Representativeness and anchoring-adjustment heuristic
Put simply; an anchoring-adjustment heuristic can be interpreted as a straight forward and practical "rule of thumb" which done when someone wishes to take a decision in a high condition uncertainty. This heuristic is a shortcut; people will not think complicated by using mathematical laws, disregarding the law of normative and tend to think pragmatically.

A heuristic is often used to assess probability and predict a value (Tversky and Kahneman, 1974). However, frequently decision making by using a heuristic generates diffraction. Diffraction often happens in a financial market by mistake in expectation of firm value. The error of this expectation then drawn in securities mispricing which interpreted as a phenomenon of overreaction or under reaction to information. This phenomenon is a bias of heuristic. There are two factors of heuristic that are of relevance; representativeness, and anchoring-adjustment (Tversky and Kahneman, 1974; Tvede, 1999; Fuller, 2000; Shefrin, 2000).

Representativeness heuristic is one of the heuristic principles that is important in influencing a recognized financial decision. This heuristic relates to a decision under stereotypes, which refers to

a tendency to make a judgment based on the similarity of a type or correspondence (Hogarth, 1987). Representativeness proposed by the psychology experts, Kahneman and Tversky (1972), and Tversky and Kahneman (1974). This heuristic says that frequently humans use a typical approach in appraising value or predicting probability.

Tversky and Kahneman (1974) show that when people try to determine the likelihood that a data set "A" obtained from model "B," or that object "A" property of the group of B, often use the representativeness heuristic. It means that they evaluate probability based on a level by which A reflects the character of essential of B.

In a capital market, for example, investors can classify some shares as growth securities under a history of the increase in consistent earnings. Investors often misunderstand that performance in the past are representative of performance in the future and often disregard information which is foreign to this matter. This fact makes investors overreact to performance that persists for the long term. This issue causes investors to misprice a share. This representativeness can explain why finding of De Bondt and Thaler (1987) interpreted as an overreaction.

Representativeness bias can also be seen within the application of sample size neglect or law of small number (Tversky and Kahneman, 1971). When a firm has a consistent story of earnings growth for several years, investors might conclude that their history is representative in underlying earnings growth potential for the future, though a consistent pattern of high growth may be nothing more than a random draw for few successful firms. Compatible with the depiction of Barberis et al. (1998) that the movement of earnings from year to year form a pattern, in fact, is not its earnings repeated process. Earnings are independent or random. Earnings behavior follows a random pattern or at least follow an autoregressive 1 pattern (Bloomfield et al., 2000; Bernard and Thomas, 1989 and 1990; Machfoedz, 1994; Habbe, 2002). When found in a movement pattern of high earnings or positive long-term growth of a company, it does not mean that the majority of business patterns are like that. At the same time, many companies have a negative pattern of earnings or have an inconsistent pattern. Even an organization that has positively patterned at one time can have a negative pattern or do not pattern at all before or after this time.

As a consequence, an investor using the representativeness heuristic might disregard the reality that a history of high earnings is unlikely to repeat itself (Shleifer, 2000. p. 129). This phenomenon often referred to as the traditional functional fixation hypothesis; that is where an individual investor interprets accounting information regardless of what accounting method is used (Hand, 1990).

Empirically, Bloomfield et al. (2003) documented that investors rely too much on PE information when predicting future earnings. It means that investors affected by earnings level, earnings patterns, and the signs of earnings. Investors assume that persistence of earnings pattern as representative of future earnings. The levels tend to make investors overreact to the

earnings pattern. When an earning pattern is positive, future earnings also will be positive, and vice-versa. Also, when an earnings pattern is of high persistence, future earnings also will be high (and vice-versa). The consequence of using this heuristic, which causes an overreaction, enables one to make a prediction error that also induces a mistake in the price of stocks. The finding showed that past earnings can be said to be an initial value (anchor) of investor for predicting the future value.

Relying too much on this pattern and the level of PEs makes it an initial value or initial belief (anchor). When the pattern of past earnings extremely change (be it either negative or positive) in the short run, the term of PEs differ from CEs. Hence investors will tend more to rely on earlier forms to respond to CEs conservatively. They tend to resist change or underreact to information that differs from their anchor. In the end, they try to adjust the value with that new information, but it tends to be insufficient. The small adjustment expressed within share prices that are still moving after an earnings announcement (PEAD). This phenomenon is called anchoring-adjustment (Tversky and Kahneman, 1974). In such condition, when investor predicts the future earnings, tend to underestimate and followed share underpriced.

2.1.2. Overreaction/under reaction, estimation error, and securities mispriced

Bernard and Thomas (1989; 1990), and Abarbanell and Bernard (1992) documented that analyst and investor underreact to earnings change when they predict future earnings. Meanwhile, De Bondt and Thaler (1987) confirmed that investors overreact to persistence level of earnings performance. Discussion of this problem is progressively expanded (Maines and Hand, 1996; Calegari and Fargher, 1997; Barberis et al., 1998; Daniel et al., 1998; Rahmawati and Suryani, 2005).

However, the question that often emerges amongst observers of behavioral finance is why do investors underreact to extreme earnings change in the short-range whereas they overreact cumulatively in the long term. Bloomfield et al. (2000) describe, through laboratory experiment study, that investors underreact to reliable information (CEs) and overreact to unreliable information (PEs) when investor conduct prediction moderated by investor' overconfidence. Bloomfield et al. (2003) give additional empirical evidence that the behavior of investors' over/under reaction caused by an interaction between past periods of time and a heavy tendency of an investor to use this information.

Aside from Bloomfield et al. (2000; 2003), Barberis et al. (1998) proposed a model concerning the behavior of an investor, which was motivated by two decision biases. They assume that individuals are conservative - that is they tend to adjust their fundamental beliefs considerably in the face of new evidence. They also easy use the representativeness heuristic that gives too much weight to last patterns of data which avoided the probability of another tendency in population. The model of Barberis et al. (1998) also describes that the conservative attitude of individuals means that the appraisal of future earnings tends to be mean-reverting when facing an earnings pattern which is sequentially changing.

The conceptual model proposed by Barberis et al. (1998) is similar to the model of heuristic developed by Tversky and Kahneman (1974). Barberis et al. (1998) raise two heuristics which can cause a mistake; these are conservatism and representativeness which can explain under-reaction and overreaction. Whereas Tversky and Kahneman (1974) explain and have tested in a few studies of the heuristic component which can make people deflect in assessing and predicting probability, that is representativeness and anchoring-adjustment. The heuristics by experts of the psychology of finance, therefore, can explain the phenomenon of under-reaction and overreaction.

The consequences of investor over/under reaction on the level and pattern of earnings caused by heuristic bias are occurrences of estimation error followed by share mispricing. Some evidence of error prediction in earnings and share mispricing in capital markets have proven empirically. The one piece of proof of a mistake of earnings prediction and share mispriced is PEAD in capital markets (Bernard and Thomas, 1989; 1990; Calegari and Fargher, 1997; Mendenhall, 1991; Abarbanell and Bernard, 1992; Ali et al., 1992; Alford and Berger, 1997). This mistake is not only conducted by investors but also by analysts and even happened in modern capital markets like Wall Street (Chopra, 1998). Asri (2003) argues that the mistake of estimation not be only influenced by the accuracy of a model, but emotional and cognitive (heuristic) factors have also partially contributed to the error (Asri, 2003).

2.2. Hypothesis Development

Based on the theoretical review and some empirical evidence described above, the empirical model between the variable in this research shown in matrices in Figure 1. The model based on representativeness and anchoring-adjustment heuristic (Tversky and Kahneman, 1974).

Figure 1 shows the relationship between previous and CEs, investor reaction and valuation, and heuristic. Overreliance on level and earnings patterns makes investors overreact to the persistence performance level (representativeness) (Quadrant I and IV). This matter causes earnings of prediction to be overestimated. For this reason, the price is too high (low) after the performance is persistently strengthened (weak). This matter is equal to the overreaction anomaly. Too much relies on PEs level, which causes investors to use the earnings level as an anchor which has the consequence of appearing to be an under reaction to change in a profit of that level (Quadrant II and III). With the existence of that anchoring, ultimately earnings estimation is imprecise. Prices finally become too low (high) after rising (fallings) in earnings performance.

Within the representativeness heuristic, whenever earnings performance are persistently low (high), investors tend to overreact and this causes a representation of earning in the future to be underestimated (overestimated) and securities underpriced (overpriced) accordingly (Quadrant I and IV). With explanation above mentioned, the hypotheses formulated are as follows.

H_1: Investors will overreact to earnings pattern that is persistently low in the long-term, and the consequence will be that they

Figure 1: The relationship among level/pattern of earnings, reaction, estimation earnings and price, and heuristic

Frame/Level of Earnings		Current Earnings (CE)	
		Low	High
Previous Earnings (PE)	Low	**I** Indicates persistent low performance, Earnings Targets Underestimated, Share Underpriced (Overreaction to the persistent earnings level, Representativeness)	**II** Indicates improved in performance, Earnings Target Underestimated, Share Underpriced (Underreaction against extreme changes in the level of earnings, Anchoring-Adjustment)
	High	**III** Indicates decreased in performance, Earnings Target Overestimated, Share Overpriced (Underreaction against extreme changes in the level of earnings, Anchoring-Adjustment)	**IV** Indicating persistent high performance, Earnings Targets Overestimated, Share Overpriced (Overreaction to the persistent earnings level, Representativeness)

predict lower earnings (underestimate) and assess securities at a lower level (underpriced).

H$_2$: Investors will overreact to earnings patterns that are presently high in the long-term, and the consequence will be that they predict higher earnings (overestimate) and assess securities at a higher level (overpriced).

Anchoring-adjustment emphasizes that individuals slowly adjust their initial belief when accepting extremely different information or that which is contrary to the direction of the initial value (Kahneman and Tversky, 1974). Individuals tend to be conservative to something that is different or at a variance with an initial value that they hold (Barberis et al., 1998). The gradual adjustment of fundamental beliefs indicates why there is an under reaction to new information.

The existence of this depends on the level and past earnings patterns (Bloomfield et al., 2003), meaning that investors will use the degree and PEs pattern as an anchor. The implication of this anchor will be to induce an under reaction to the level of CEs and earnings patterns that change on that level (Quadrant II and III). The existence of such behavior causes diffraction, which designates that adjustments in an investors' belief are insufficiently in following the level of CEs. Finally, when a change of earnings is extremely positive (negative) in the short-range, future earnings become underestimated (overestimated) and securities underpriced (overpriced). Based on explanation mentioned above, the following hypothesis formulated.

H$_3$: Investors will underreact to earnings pattern that shows extreme positive changes in the short-range, and the consequence will be to predict lower earnings (underestimate) and assess securities at a lower level (underprice).

H$_4$: Investors will underreact to earnings pattern that shows extreme negative changes in the short-range, and the consequence will be to predict higher earnings (overestimate) and assess securities at a higher level (overprice).

3. RESEARCH METHOD

3.1. Experimental Design

This research based on a laboratory experiment designed with full factorial 2×2 within-subject, with PEs (two level: Low-high), and CEs (two level: Low-high) as factors. To test whether the interaction between past earnings and CEs vary according to the mean amount of company performance, four of a set of securities which each contain four securities that different of their mean return on equity (ROE) level used. Forming the four set securities refers to Bloomfield et al. (2003), and the set securities have four levels (Set 1 is the lowest level, and Set 4 is the highest). The fourth set securities then form a pattern of $2 \times 2 \times 4$. The statistical examination used is a repeat of measures ANOVA through the consideration of the same subject measured of different duty, and t-test.

3.2. Research Treatment

There are two research instruments used, software and print out instruments. The software is a trading simulation program which is designed to obtain data on earnings prediction, stocks market price (MP), trading volume, assets of each investor, gains or losses of each investor, investor error (IE), price error, demography of subject, and manipulation check. Research treatment is shown in the form of earnings information series (4 years) presented in a table and graph form, that show PEs levels (ROE$_{t-3}$, ROE$_{t-2}$, and ROE$_{t-1}$) and CEs (ROE$_{t0}$). Level and patterns of treatment refer to low/high persistence patterns in the long term and the pattern of positive/negative changes in the short-range as the main issue of this research. It designed according to representativeness and anchoring-adjustment heuristic.

The simulation software is built for up to 20 participants and commercializes 16 shares by the real-time online system. Validations of the instrument have passed pilot-testing twice (two different groups) by using MSc students of accounting of Gadjah Mada University, which have taken or are following the study of theory of portfolio and investment analysis.

3.3. Research Variables and Measurement

3.3.1. Dependent variable

The dependent variable of this research is prediction error that is IE and MP error (MPE) which are stated as follow:

$$IE = Estimation\ earnings - target\ earnings \qquad (1)$$

$$MPE = MP - target\ earnings \qquad (2)$$

Whereas,

Estimation earnings (EE) is investor estimation of ROE_{t+1} based on ROE_{t0}, ROE_{t-1}, ROE_{t-2} and ROE_{t-3}.

Target earnings (TE) is obtained from equation:

$$ROE_{t+1} = a + b_1 ROE_{t0} + b_2 ROE_{t-1} + b_3 ROE_{t-2} + b_4 ROE_{t-3} \qquad (3)$$

Estimation parameters of the Equation (3) are obtained from linier regression maximum likelihood estimation,

$$ROE_t = \alpha + \beta_1 ROE_{t-1} + \beta_2 ROE_{t-2} + \beta_3 ROE_{t-3} + b_4 ROE_{t-3} + \varepsilon \qquad (4)$$

Data used is ROE of all public firms in the Indonesian Stock Exchange (BEI) during a 10 years series.

3.3.2. Independent variable

PEs for 3 years time series of earnings (ROE_{t-3}, ROE_{t-2}, and ROE_{t-1}) and CEs (ROE_{t0}) are independent variables (factor of treatment). PEs have two levels (low, high). To test whether the interaction of PE and CE differences in some variation of earnings level, hence the intersection formed in four set securities that are Set 1 to Set 4. The first set is those with the lowest earnings performance mean, whereas the fourth set is those with the highest profit performance mean. The sets of securities then become independent variable (four levels), which form pattern $2 \times 2 \times 4$.

3.3.3. Step of experiment

There are two rounds of trading that each trade two set of securities (eight shares). Every round consists of three sessions of commerce of shares which in each session uses 15 min. Every participant had given capital Fr 2.400.000 (Fr = Forma, currency in the experiment), and 50 sheets of each share (16 shares) that have not yet valued. The value of each share based on earnings estimation. Before trading, a participant was asked to estimate next years' earnings (ROE_{t+1}) based on PEs and CEs, and then trade securities whose based on target ROE.

Participants were rewarded based on the gain. Gain or loss calculated as follows:

$$BUY = Intrinsic\ value - MP \qquad (5)$$

$$SEL = MP - Intrinsic\ value \qquad (6)$$

Gain and loss in "forma" which obtained during trading will be converted to Rupiah by formulation as follow:

Rupiah (Rp) = (Gain or loss in forma + fixed reward) × Convention rate $\qquad (7)$

3.3.4. Participant

There are 20 students participated in this experiment. These consist of 14 financial students studying a Magister in Management and 6 Magister financial accounting students, all from Gadjah Mada University. They include 8 (40%) men and 12 (60%) women. The average age is 26.65 years. Their academic bachelor background is accounting 11 (55%), management 4 (20%), economics 1 (5%) and the remaining 4 (20%). Their work experience on average is 2.1 years. The student used as a proxy of investor for two reasons, firstly, in general, almost people (in this term the student and investor) have same responses when they receive information in certain form and a high uncertainty condition. They are more likely to use heuristic in accepting and using the information in making decision. Secondly, investor experience factor in the capital market should be controlled in this experiment to find out the causality effect of the primary variable. Using the students that have no real experience in stock trading but have knowledge of financial management and capital market, by itself, the experience factor has been controlled. They are called investors that are well-educated but have a poor experience (nonprofessional investors) (Habbe and Mande, 2016).

4. RESULTS

4.1. Experimental Condition

Figure 2 shows the experimental conditions of each cell in each set of securities, which demonstrates the relationship between the earnings information, TEs, earnings estimates (EEs), investors mistakes and errors of MPs. In the securities set one, for instance, in the first quadrant, the information provided is the average of previous and CEs at a low level 2%.

Based on the Equations (3 and 4), the obtained earnings target which is as the fundamental or intrinsic value (IV) of the stock in Set 1 in the first quadrant, that is 4.9%. The average value of the (EE) of investor is 2.5%. Average IE is the difference between EE and TE according to the Equation (1) is −1.82%, and the average MPE is the difference between the average MP, and TE is equal −0.87%. Similarly, another quadrant is in all sets of securities. The average difference IE and PE statistically tested between quadrants in each set of securities with repeated measures ANOVA within-subject.

4.2. Hypothesis Test and Discussion

4.2.1. Over/under reaction to earnings information

Analysis indicates that investors over-relied on levels and patterns of PEs. Examination of per set of shares and as a whole is statistically significant for prior earnings. PEs became an anchor for the investor. This fact confirms the theory of anchoring heuristic that human being cannot ignore earlier values when wishing to assess something (Tversky and Kahneman, 1974). Over/under reaction to new information level (CEs) starts from here. Why do they over/under react? They over/under react because they have an anchor from which they gain fundamental belief in value. This evidence is consistent with the finding of Bloomfield et al. (2003)

Figure 2: Experimental condition. Note: There are 16 different traded securities according to securities set (four levels), previous earnings (PE) (two levels), current earnings (CE) (two levels). Four different sets of securities according to the average level of return on equity (ROE) as available in the market. PE indicates previous ROE, which is an average ROE of 3 consecutive years. PE differ according to whether the previous ROE is relatively high or low to set securities. CE shows the current ROE. CE differ based on whether the current ROE is relatively high or low to set securities. Target earings (TE) is fundamental/intrinsic value each share. TE obtained by maximum likelihood estimation (MLE) regression (Equations 3 and 4). Estimation earnings (EE) is EEs of investor for each share based on previous earnings. Investor error (IE) is differences between EE and TE of each investor for each share. Market price error (MPE) is differences between market price and TE. Sample total of MPE for price error formally is not equal. Equalize of market price is conducted for met repeated measures ANOVA within-subject method by divided the total number of bid and ask price nearly. This approach used Bloomfield et al. (2003)

Set Securities 1 [(PE + CE)/2 = 8]; Low<8<High				Set Securities 2 [(PE + CE)/2 = 12]; Low<12<High			
Frame/Earnings Level		**CE**		**Frame/Earnings Level**		**CE**	
		Low	High			Low	High
PE	Low	**I** PE = 2; CE = 2; TE = 4,9 EE = 2,5 IE = -1,82 MPE = -0,87	**II** PE = 2; CE = 14; TE = 11,15 EE = 8,65 IE = -2,50 MPE = -2,44	**PE**	Low	**I** PE = 6; CE = 6; TE = 7,52 EE = 6,15 IE = -1,32 MPE = -1,60	**II** PE = 6; CE = 18; TE = 13,75 EE = 11,3 IE = -2,45 MPE = -0,84
	High	**III** PE = 14; CE = 2; TE = 6,48 EE = 8,6 IE = 2,12 MPE = 2,23	**IV** PE = 14; CE = 14; TE = 12,71 EE = 14,3 IE = 1,64 MPE = 2,29		High	**III** PE = 18; CE = 6; TE = 9,1 EE = 11,85 IE = 2,17 MPE = 2,76	**IV** PE = 18; CE = 18; TE = 15,3 EE = 18,1 IE = 2,99 MPE = 2,57

Set Securities 3 [(PE + CE)/2 = 15]; Low <15<High				Set Securities 4 [(PE + CE)/2 = 19]; Low <19<High			
Frame/Earnings Level		**CE**		**Frame/Earnings Level**		**CE**	
		Low	High			Low	High
PE	Low	**I** PE = 10; CE = 10; TE = 10,1 EE = 9,95 IE = -0,07 MPE = -0,42	**II** PE = 10; CE = 20; TE = 15,3 EE = 14,4 IE = -0,91 MPE = -0,38	**PE**	Low	**I** PE = 14; CE = 14; TE = 12,71 EE = 13,85 IE = 1,44 MPE = 0,73	**II** PE = 14; CE = 24; TE = 17,9 EE = 18,6 IE = 0,70 MPE = 2,35
	High	**III** PE = 20; CE = 10; TE = 11,4 EE = 14,65 IE = 2,68 MPE = 1,94	**IV** PE = 20; CE = 20; TE = 16,6 EE = 20,9 IE = 4,84 MPE = 3,73		High	**III** PE = 24; CE = 14; TE = 14,01 EE = 18,9 IE = 2,89 MPE = 1,24	**IV** PE = 24; CE = 24; TE = 19,2 EE =23,75 IE = 4,50 MPE = 1,89

that investors over-rely on old earnings when wishing to predict future earnings.

When do they over/under react? When new information confirmed with their initial value, investors overreact to the information as well as to persistent earnings patterns. Overreaction happened both to persistent low and high patterns of earnings. On the contrary, when new data accepted, investors underreact to the information as well as to extreme changes in earnings pattern. Under reaction happened both to extremely negative and positive changes in earnings patterns.

Table 1 provides the result of repeated measures ANOVA within-subject of IE and price error for overall securities. Panel A shows the average IE in the form of a 2×2 which formed by crossing PEs and CE for all shares. When PE and CE are low (Cell I), IE is negative (-0.593). It indicates that individuals estimate the value of the securities income as being too low (underestimated). These results suggest that investors overreact to the level of CEs and the pattern of persistent low earnings. These results support the proposed H_1. Conversely, when PE and CE are high (Cell IV), IE is positive (3.355). It shows that individuals estimate that the value of the securities income is too high (overestimated). These

results indicate that subjects also overreact to the CEs levels and the persistent pattern of high earnings. These results also support the H_2 as proposed.

Conversely, when PE is low, and CE is high (Cells II), IE is still negative (-1.289). These results imply that investors rely on the low PE series that marked with an estimated value which remained close to PE. High dependence on the series PE, causes them to under react to the CE which is to be high and also to the changing patterns of extreme positive earnings. Negative results indicate that investors assess share earnings that are too low (underestimated) as a result of under reacting against CEs and also to the changing patterns of extreme positive earnings. The same thing happens when PE is high, and CE is low (Cell III), IE is positive (3.289). This evidence also points out that investors rely heavily on the great series PE. This action is manifested in the under reaction of the CE low and also to the profit pattern of extreme negative changes marked with assessment stock earnings are too high (overestimated). All of the above results support the hypothesis H_3 and H_4.

In Panel A show that the three independent variables (PE, CE, and Set) provide a significant effect on the IE (F = 56.02; P < 0.01;

Table 1: Summary of investor and MPE

Panel A: IE			Repeated ANOVA within-subject factorial 2×2×4					
PE	CE		Factor	Sum of squares	df	Mean square	F	P value
	Low	High						
Low	−0.593	−1.289	PE	290.93	1	290.93	56.02	0.0000
			CE	30.41	1	30.41	5.76	0.0268
			Set securities (Set)	1253.70	3	417.90	74.77	0.0000
			PE×CE	1.25	1	1.25	0.42	0.5232
High	3.289	3.355	PE×Set	42.76	3	14.25	5.33	0.0026
			CE×Set	8.91	3	2.97	1.18	0.3261
			PE×CE×Set	30.33	3	10.11	3.50	0.0212
Panel B: MPE			Factor	Sum of squares	df	Mean square	F	P value
PE	CE							
	Low	High						
Low	−0.66	−0.698	PE	85.49	1	85.49	71.12	0.0000
			CE	16.01	1	16.01	7.38	0.0114
			Set securities (Set)	878.80	3	292.93	157.32	0.0000
			PE×CE	0.20	1	0.20	0.13	0.7236
High	2.143	2.836	PE×Set	188.88	3	62.96	47.01	0.0000
			CE×Set	133.85	3	44.62	16.49	0.0000
			PE×CE×Set	75.81	3	25.27	14.86	0.0000

IE=EE−TE. MPE=MP−TE. There are 16 securities are traded in different Set (four level), PEs (two level), CEs (two level). Four securities (E, F, G, H) at Cell I, follow securities (I, J, K, L) at Cell II. Whereas at cell III and IV consist of securities remaining (M, N, O, P) and (A, B, C, D). MPE: Market price error. PE: Previous earnings, CE: Current earnings, IE: Investor error, EE: Estimation earnings, TE: Target earnings, MP: Market price

F = 5.76; P < 0.05; and F = 74.77; P < 0.01, respectively). These results indicate that IE is different between the level of each independent variable. In other words, the level of independent variables has different effects on IE. The two-way interaction (first-order interaction) between each of the independent variables shows that only the PE × Set significant (F = 5.33; P < 0.05). These results indicate that the effect of PE on IE is different among the four levels of the Set. It also means that the earnings level of the PE in the securities set has different effects on IE.

On the other hand, the interaction PE × CE and CE × Set are insignificant. This fact shows that the main effect between PE and CE and also between CE and Set against IE are mutually independent. But the three-way interaction (second order interaction), PE × CE × Set, showed a significant (F = 3.5; P < 0.05). These results indicate that the effect of the interaction between PE and CE to IE is different among the level of securities set. It also means a high-low pattern of earnings has an effect on IE.

Panel B in Table 1 shows the average MPE. When PE and CE are low (Cell I), MPE is negative (−0.66). It indicates that the MP is too low (underpriced). This evidence supports the H_1. Conversely, when PE and CE are high (Cell IV), MPE is positive (2.836). It indicates that the price of the securities market is too high (overpriced). This fact supports H_2. Conversely, when PE is low, and CE is high (Cell II), MPE is still negative (−0.698). Negative results indicate that investors assessed the stock is too low (underpriced). These results support H_3. The same thing when PE is high, and CE is low (Cell III), MPE is positive (3.289). This evidence also pointed out that investors assess the stock price is too high (overpriced). This evidence also supports H_4.

Furthermore, Panel B shows that the three independent variables (PE, CE, and Set) provides a significant effect on the MPE (F = 71.12; P < 0.01; F = 7.38; P < 0.05; and F = 157.32; P < 0.01,

respectively). These results indicate that the MPE is different between the level of each independent variable. In other words, the level of independent variables has different effects on the MPE. While the two-way interaction (first-order interaction) between each independent variable showed that PE × CE again is not significant, PE × Set and CE × Set are significant (F = 47.01; P < 0.01; and F = 16.49; P < 0.01). These results indicate that the effect of PE and CE on the MPE are different among levels of securities Set. It also means that the earnings level of the PE and CE in the securities set have a different effect on the MPE. Although interaction PE and CE is not significant, from the three-way interaction (second order interaction), PE × CE × Set, showed a significant (F = 4.86; P < 0.01). These results indicate that the effect of the interaction between PE and CE on the MPE differs between levels of security set.

4.2.2. Over/under reaction and heuristic cognitive

How do investors over/under react to earnings information? Investors behave to CE levels and to earning patterns because the investor embraces and uses heuristics in response to the information. The heuristics used, in this case, are representativeness and anchoring-adjustment.

Panel A in Table 2 is a test of the nature of the representativeness heuristic stating that the valuation and assessment of things based on the representation of the proximity or the suitability of the previous values. The evaluation of future earnings based on a series of past earnings. When a series of past earnings are persistently in the low (high) income level, then according to this heuristic theory, investors overreact on the earnings pattern and estimate the future earnings in low (high) level. On this basis, when the average earnings of the previous series compared with earnings forecasts, it should not be significantly different.

In Panel A the result of testing the difference between the average EE and the average earnings of the summation series

Table 2: Test of representativeness and anchoring-adjustment heuristics

Heuristics	Securities	N	Mean EE	SD	Test value	t	df	P value*
				Panel A				
Representativeness	A	20	23.75	2.149	24	−0.520	19	0.609
	B	20	20.9	2.075	20	1.940	19	0.067
	C	20	18.1	1.373	18	0.326	19	0.748
	D	20	14.3	1.261	14	1.064	19	0.301
	E	20	13.85	1.387	14	−0.484	19	0.634
	F	20	9.95	1.191	10	−0.188	19	0.853
	G	20	6.15	1.348	6	0.497	19	0.625
	H	20	2.5	1.100	2	2.032	19	0.056
	Mean			1.486				
				Panel B				
Anchoring-adjustment	I	20	18.6	1.875	19	−0.954	19	0.352
	J	20	14.4	1.429	15	−1.878	19	0.076
	K	20	11.3	2.130	12	−1.470	19	0.158
	N	20	14.65	2.834	15	−0.552	19	0.587
	O	20	11.85	1.387	12	−0.484	19	0.634
	P	20	8.6	1.930	8	1.390	19	0.181
	Mean			2.042				

*Two-tailed. Test value of representativeness heuristic is average of sum PE and CE series ([3PE+CE]/4), test value of anchoring-adjustment heuristic is average of sum PE and CE series ([3PE/3+CE]/2). EE: Estimation earnings, PE: Previous earnings, CE: Current earnings, SD: Standard deviation

PE with CE ([PE + CE]/4) is shown. In column 6, t value of each share is not significant (P > 0.05). These results indicate that the EE investors are no different from the average of PEs. In other words, investors estimate future earnings using the principle of proximity and compatibility with PEs. It means investors have been using the representativeness heuristic in assessing or estimating the future value. This finding strengthens support for H_1 and H_2.

Investor overreacts to new information, in this case, the CEs, because they are using the approach of equality. CEs considered as being representative of PEs series (representativeness: The law of small number). They assume PEs series are representative of CEs, and CEs are representative of past earnings. They overreact to the pattern. Consequently, their appraisal of future earnings is not far from PEs series. This matter causes them to estimate earnings wrongly. This analysis explains why investors overreact to level and an earnings pattern that is persistence in the long term.

Panel B in Table 2 is a test of the anchoring-adjustment heuristic stating that the investor will assess or judge something based on the starting point or initial belief. The original value is an anchor that's hard to change the corresponding (resistance to change) new value that is different or contrary to the initial value. On this basis, testing anchoring-adjustment did by analyzing the EEs of investors and whether they move towards the average or not. If so, EE of investors will not differ significantly from the mean of earnings of the summation series PE with CE which is a test value ([3PE/3 + CE]/2). T-test results between the average value of EE with a test for all of the shares as shown in Panel B was of no significance (P > 0.05). These results indicate that the investors' EE is the average. With these results, it can be said that the investor is conservative when estimating future earnings. In other words, investors slowly adjust their initial value to new information (under reaction). It is because investors are highly dependent (anchor) on the pattern and the rate of PEs. It can be

concluded that the behavior of investors is an under reaction to new information, resulting in an earnings forecast error and share mispricing, which caused the anchoring-adjustment heuristic bias. These findings support the H_3 and H_4. This analysis explains why investors underreact to level and an earnings pattern which extreme change in short-range.

4.2.3. Prediction error and securities mispriced
The data analysis indicates that investors conduct an error in prediction followed by an error in price. The error in estimation and mispricing shares happened after investors overreacted to levels and patterns of CEs due to the effect of usage of the representativeness heuristic. Evidence indicates that future earnings are overestimated (underestimated), as when an earnings pattern is high (low) persistence and securities are overpriced (underpriced). The error of estimation and mispricing shares also happened after investor underreacts to CEs level and earnings pattern changes as an effect of usage of anchoring-adjustment heuristic. Evidence indicates that future earnings overestimated (underestimated) when earning patterns become negative (positive), and securities are overpriced (underpriced).

Share mispricing in a capital market (PEAD) is indisputable after being confirmed by laboratory examination. The error of estimation and mispricing shares can partially be explained from a behavioral side. This matter supports the interpretation of De Bond and Thaler (1985; 1987), Bernard and Thomas (1989; 1990) that share mispricing (PEAD) can be explained from a psychological side. This finding strengthens PEAD in the capital market as it has documented by the conclusion of previous studies. The mispricing does not only because of the weaknesses of research method, deficiencies of existing financial model, as well as costly of the transaction but also because investors use the heuristic in the decision making of economics. This result supports the finding of Bloomfield et al., (2003), Habbe (2006), Boussaidi (2013), and it become a challenges the establishment of efficient market theory (Fama and French, 1996; Fama, 1998).

5. CONCLUSION, IMPLICATION, AND LIMITATION

5.1. Conclusion

Research results indicate that investors over-relied on PEs and have set it to an initial value (anchors). They overreact to CEs information when confirming the initial value, as well as an overreacting to persistent earnings patterns that formed. The overreaction occurred because they embrace the representativeness heuristic. Contrary, investors underreact to CEs information when disconfirming the initial value, as well as under reacting to extreme changes in earnings pattern that formed. The under reaction occurred because they embrace the anchoring-adjustment heuristic. As a result, when PEs and CEs are low (high), investors estimate underestimated (overestimated) future earnings and the price of stocks are underpriced (overpriced). That way when PEs and CEs pattern are subject to extreme positive (negative) change, investors underestimated (overestimated), and price of stocks are underpriced (overpriced).

5.2. Implication

The findings of this research give a positive confirmation concerning prediction error and share mispricing in a capital market. The implication for analysts and investors is that they are vulnerable to a mistake, and so, they can be made a fool of by a certain party, for example by the short-range merchant, using emotion and heuristic. Another implication is for the firm. The firm can arrange the earnings series to create a selected persistence pattern which can increase share price, for example, through a definite persistence pattern or persistently positive change pattern. Because of this pattern, with the heuristic, investors will overestimate the share price. This matter can explain the phenomenon of earnings management in a capital market. The implication, which is not less important, is that modern financial theories settled condition which base on rationality will be no longer dominant. Empirical evidence in this research strengthens the existence of formula and behavioral finance models based on psychology raised during the time.

5.3. Limitation

This research notes some limitations. Firstly, the research does not test how long mispricing takes place (PEAD). Secondly, this research does not consider another psychology aspect; that is that possibilities partake to the accuracy of investor estimation. Thirdly, this research only uses 20 participants and selection was not random. This matter can lessen the internal validity of the research.

5.4. Extension

Some possibilities for the development of this investigation in the future are, among others, testing the influence of high and low of investor anchors to prediction error. Another possibility is directly examining PEAD, to perceive how many times information is required to reach a new balance price. Besides it can also be seen from the side of how time depth requested by an investor to adjust the confidence of which accommodated incompletely before.

Finally, Investors can be divided into investor's using their shares (seller) and investors that do not have shares (buyer). This division is expected to give a different response to level and earnings patterns. Setting and software of this research can be developed to test momentum strategy or reversal in commerce when obtaining an earnings pattern and certain share price pattern as found by De Bond and Thaler (1985; 1987).

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