

## **The Effect of Feedback on Overconfident Investors, Experimental Evidences of Self Deception in Indonesian Capital Market**

*Mahatma Kufepaksi, University of Lampung, Indonesia*

### **Abstract**

Research in psychology concludes that overconfidence reflects self deception. Such behavior may not only reveal in the daily life but also in the capital market. Empirical research shows that overconfident investors tend to overvalue the price of the securities so that they unconsciously buy the securities at a higher price or sell the securities at a lower price than their fundamental values leading to transaction losses. According to this experimental research design, all investors are classified into three groups based on their levels of overconfidence, namely the rational, the less, and the more informed investors. The result shows that when a feedback in the form of a guidance of securities prediction is given, the less informed investors tend to assess the precision of their knowledge and information excessively so that they increase price error, but the more informed investors tend to reduce it.

**Keywords:** Overconfidence; Self-deception; Feedback; Price error

### **Introduction**

The standard theory of efficient market assumes that all market players in a capital market are rational so that they will trade based on the rational paradigm. When the market players are rational, they would also produce rational market price. However, psychological research suggests that decision makers are not always rational (Thaler, 1992). They show inconsistent behavior when dealing with uncertainty. Generally, irrationality does not only reveal in the daily life but also in the capital market. Previous empirical research demonstrate that investors in a capital market tend to behave irrationally when they deal with the uncertain problems leading to overconfident behavior (DeLong et al., 1990; Bloomfield et al., 1999; Barber & Odean, 2000), under and overreaction (DeBondt & Thaler, 1990; Loughran & Ritter, 1996; Daniel et al., 1998), representative heuristics (Barberis et al., 1998), herding behavior (Welch, 2000), phenomena “sell the winner and keep the loser” (Shefrin & Statman, 1985; Jegadeesh & Titman, 1993, Odean, 1999), January effect (Reinganum, 1983; Lakonishok & Smidt, 1984; Seyhun, 1988), momentum strategy (Jegadeesh, & Titman, 2001; Hong, & Stein, 1999), contrarian strategy (Lakonishok et al., 1994; Lo & McKinley, 1990).

One of the irrational behavior aspects that most people suffer from is overconfidence. This research is all about how the overconfident behavior influences the investors and how the overconfident investors deal with the feedback and then correct the value of the securities in the capital market to obtain profits. The phenomenon of overconfidence is the tendency of decision makers to weigh the accuracy of their knowledge and information more excessively than they really do. Such behavior is unconsciously conducted so that the investors who suffer from overconfident behavior tend to ignore the available public information. Psychological research shows that less informed individuals may suffer from overconfidence (Burson et al., 2006; Moore & Cain, 2007; Kruger & Dunning, 2002). Those who suffer from overconfidence tend to overestimate the precision of their knowledge so that they produce biased decisions leading to decision errors (Camerer, 1995; Kruger & Dunning, 1999). In addition, most individuals see themselves as better than average person and most individuals see themselves better than others see them (Taylor & Brown, 1988).

Basically, each individual has limited cognitive capability which varies from one person to another person. The differences in this knowledge are caused by the differences in their capability in accessing information. Further, each individual also has diverse level of confidence in predicting uncertain phenomena. The combination of knowledge and confidence will determine the level of one's overconfidence which varies from one person to another one (Klayman et al., 1999). The differences in the level of overconfidence will bring about the differences in interpreting and processing information which will also result in the difference of prediction performance (Kahneman & Tversky, 1973, 2001; Lord et al., 1979; Griffin & Tversky, 1992). The lower the level of an individual's knowledge is, the greater the tendency to be overconfident. The results of the research conducted by Lichtenstein et al. (1982), Fischhoff et al. (1977) and Lichtenstein and Fischhoff (1977) reveal that someone who is overconfident is in fact a person who does not have sufficient knowledge that makes his prediction become inaccurate. This phenomenon reveals that those who practice overconfident behavior when making a prediction have basically conducted self deceptive behavior since the ability of perceiving a prediction is not appropriate with their actual ability.

Empirical research shows that investors tend to fail maintaining low prediction errors since they conduct overconfident behavior in the securities market. Therefore, they tend to suffer from trading losses (Odean, 1999<sup>1</sup>; Barber & Odean, 2000; Raghubir & Das, 1999)<sup>1</sup>. Those findings suggest that those overconfident investors

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1. Odean (1999) shows that *overconfident* investors tend to assess the accuracy of information so excessively that they are less cautious and tend to neglect the risks. Overconfident investors tend to buy

suffer from trading losses due to their tendency to value their information and knowledge excessively. They do not realize that their predictions deviate relatively so far from the prevailed market price. The phenomena show that the investors conduct a self-deceptive behavior as they overvalue their knowledge and information. However, other evidences show that overconfident behavior does not always end up with losses (DeLong et al., 1990; Hirshleifer & Luo, 2001). In addition, as the investors trade the securities among themselves, the profit acquired by an investor will also be the loss for others at the same amount. Therefore, when an investor makes money, there will be a transfer of wealth from the loser to the winner. Empirical evidences demonstrate that when investors suffer from overconfidence, they will lose leading to a transfer of wealth from the overconfident investors to the rational ones (Camerer et al., 1989; Odean, 1999; Barber & Odean, 2000; Kirchler & Maciejovsky, 2002).

As adaptive organism, the decision makers tend to decrease their mistakes when they receive feedbacks. Psychological evidences show that feedback will decrease the level of overconfidence and then increase the accuracy of the prediction (Fischhoff et al., 1977; Lichtenstein & Fischhoff, 1980; Russo & Schoemaker, 1992). In other words, the feedbacks would reduce the errors or mistakes. However, the empirical research shows that feedback does not reveal the same conclusive results. Derived from facts or empirical studies, this study deals with the following issues:

Does the state of no available market information affect the investors to conduct overconfident behavior in predicting the value of the securities?

Is there any transfer of wealth between the less and the more informed investors in the pre-opening market?

Does a feedback affect the investors in assessing the value of the securities?

Is there any transfer of wealth between the less and the more informed investors when they adopt the feedback?

The research adopts Self Deception Theory (Trivers, 2004) which attempts to explain overconfident behavior in assessing the value of the securities. The theory predicts that when someone unconsciously perceives himself as having a capability above average and afterward his state of mind directs and manages this perception in such a way that tends to make him look for information supporting his behavior and neglect information which contradicts his behavior, he will be confined in the construction of false belief. It is followed by the construction of overconfident behavior which implies self deception. Trivers (2004) argues that overconfident behavior becomes apparent because people in general cannot completely control the actual ability so that each individual always thinks that he or she is better (smarter,

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(sell) the security at exceedingly high (low) price and do the transaction so excessively that it subsequently makes them lose.

stronger) than his or her actual condition. Accordingly, people tend to pretend that they know everything available in their surroundings even though the fact shows the opposite.

## **Literature Review and Hypotheses**

### **Literature Review**

The decision makers are often confronted by a complicated problem dealing with uncertainty. In such case, they are inclined to make a decision based on their confidence. According to Winkler and Murphy (1968), the level of confidence is the amount of probability which reflects one's judgment toward the accuracy of their assessment. The determination of the probability reflects the level of one's knowledge. For those whose level of knowledge is high, the increase of their knowledge will be followed by the decrease of the probability of the accuracy of their assessment. In other words, the higher the level of knowledge is, the level of confidence on the accuracy of the assessment will be lower. In contrast, for people whose level of knowledge is relatively low, the increase of their knowledge will be followed by the increase of the probability of the assessment accuracy which causes them to raise their level of confidence.

Referring to Klayman et al. (1999), the combination of the level of someone's knowledge and confidence will determine the level of his overconfidence, which afterwards will affect the accuracy of his prediction performance. The level of someone's overconfidence can be identified through test of calibration. Test of calibration is a standard procedure to examine and to get the combination of the level of knowledge and the level of confidence which construct the level of someone's overconfidence based on the questionnaire designed specifically for this purpose. The level of overconfidence is measured by the score of overconfidence, which is the average of the percentage of the level of confidence reduced by the average of percentage of the correct answers. As long as the score of overconfidence is positive, someone in this category has a tendency to behave overconfidently, while the negative score of overconfidence will classify people in this group as being under confident.

According to Pitz (1974), people who are overconfident in general are not aware that they have limited cognitive (knowledge) capability. Since people who are overconfident normally tend to judge their knowledge as too high and tend to reduce the level of difficulties, they do not recognize uncertainty. Pitz (1974) is consistent with Russo and Schoemaker (1992). According to them, a person who is rational will realize that he has some limitations which mean that the higher the level of his knowledge is, the more aware he is of his knowledge limitation. When the level of

one's knowledge is high, he tends to manage the level of his confidence in such a way that he is able to control himself in not giving high probability toward the accuracy of his judgment. This behavior will reduce the possibility of overconfident behavior. This kind of behavior does not occur in overconfident people.

Psychological research also demonstrates that there is a tendency that people give excessive positive assessment on their own capability, which is higher than other people's capability or higher than other people's assessment toward their capability (Svenson, 1981; Taylor & Brown, 1988). Weinstein (1998) confirms the previous research that many people tend to assess themselves as having more achievement and less failure than other people. This phenomenon at least indicates that there are some people, or maybe many people, who assess themselves as having the capability above average. As stated by Taylor and Brown (1988), the tendency of most people to perceive themselves as having the capability above average is understandable because beliefs toward personal capability is a good foundation to encourage people to gain higher achievement. Without self-confidence, someone will not achieve anything in his life. However, managing self-confidence is greatly determined by the level of knowledge (Winkler and Murphy, 1968).

## 2.2. Hypotheses Elaboration

In uncertain situations such as in the period of pre-opening, the less informed investors tend to overestimate the precision of their level of knowledge and the accuracy of information so that they tend to reduce the level of difficulties of problems that they encounter. This behavior tends to result in the high prediction errors. On the contrary, the more informed investors who generally have fairly more knowledge than the less informed investors are aware that they are individuals who have limited capability and knowledge so that they tend to trade carefully. This behavior tends to result in moderately lower prediction error than the less informed investors. This phenomenon indicates that the less informed investors have conducted self deceptive behavior because the perception of their capability is not appropriate with the actual fact. Therefore, the first hypothesis can be drawn is:

Hypothesis 1: The less informed investors perform higher mean of prediction errors than do more informed investors in the pre-opening periods.

As the less informed investors perform higher prediction error due to the overconfidence, they will suffer from the transaction losses. Thus, there will be a transfer of wealth from the less to the more informed investors. This observation leads to the second hypothesis:

Hypothesis 2: There is a transfer of wealth from the less to the more informed investors in the pre-opening periods.

Decision makers normally evaluate and make necessary adjustments to improve their performance. Feedbacks play significant roles in improving the performance. Psychological evidences show that feedbacks will decrease the level of overconfidence and produce less prediction errors (Russo & Schoemaker, 1992; Subbotin, 1996; Flannelly & Flannelly, 2000). However, the empirical research shows that feedbacks do not reveal the same conclusive results. Providing with a guidance of prediction of securities price, the less informed investors tend to decrease the level of overconfidence leading to a lower mean of the prediction errors accordingly (Larrick et al., 1990; Bloomfield et al., 1999). On the other side, given the training for securities trading, the investors fail to decrease the values of the securities which subsequently lead to losses (Kagel & Levin, 1986). In this current paper, the investors are provided with the guidance of prediction as a feedback to predict the value of the securities known as its fundamental value following Bernard (1994).<sup>2</sup> Benefiting from the guidance of securities prediction, it is expected that the investors will predict the value of the securities accurately to obtain profits.

The next hypothesis examines whether the guidance of prediction would increase the accuracy of prediction by decreasing the mean of price errors. Since the less informed investors control less information and knowledge, they will learn a lot from the feedback so that they will have a better progress than the more informed investors. Therefore, this observation leads to the third and the forth hypothesis:

Hypothesis 3: The guidance of prediction reduces the mean of price errors of the less informed investors in higher proportion than do more informed ones.

Hypothesis 4: There is a transfer of wealth from the more to the less informed investors when they all adopt the guidance of prediction

## **Methodology**

### **Design of Research**

The current research is a quasi experimental research with two groups of pretest-post test design (Isaac & Michael, 1985; Christensen, 1988; Cook & Campbell, 1979). The research design belongs to a 2x2 mixed design, which is a combination of between and within subject design. Between subject design will compare the mean of

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<sup>2</sup> Bernard (1994) documented that the fundamental value of a security is influenced by its ROE, the growth of ROE, the book value, the growth of book value/share in the future.

prediction errors between two groups of investors having different level of overconfidence (the less and the more informed investors) in two different market settings due to implemented treatments. Within subject design will compare the mean of prediction errors of the same subjects in two different market settings due to the treatments using repeated measure design. Through this repeated measure design, the same subjects or participants are repeatedly given different treatments (see the experimental condition in Appendix 1).

### Samples

The samples of this research involved 30 students of Magister of Manajemen and Magister of Sains Program at The Gadjah Mada University majoring in finance and accounting who had already taken or had been taking Advanced Finance Management, Portfolio Theory and Finance Management Seminar and International Finance Management as well.<sup>3</sup> They had no previous experience in taking part in the securities trading activities. Since the samples of the investors were taken from one population (students of the master degree program) and their characteristics were known, the grouping of samples was conducted based on the similarity of their characteristics. Therefore, the grouping was based on a matching technique to classify samples based on the same level of overconfidence which was done using test of calibration referring to Klayman et al. (1999) with some modification adjusted to the Indonesian setting. According to the matching technique, the investors were classified into three categories, namely the less informed investors, the more informed investors and the moderate (rational) investors. In order to answer the research questions, this research design only covered the less and the more informed investors. Nevertheless, those three groups of investors participated in the securities trading to produce the appropriate market price.

### The Trading

The three groups of investors trade the securities in computerized markets similar to the Bloomfield et al. (1999). In this artificial trading, each investor predicted the values of the underlying securities as their fundamental ones derived from values of real world securities.<sup>4</sup> There were 36 different kinds of securities traded in 12 trading rounds each of which implemented in 3 trading sessions. The real

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<sup>3</sup> Magister Manajemen Program is a local master degree program in management and Magister of Sains Program is a local master degree program in economics at Gadjah Mada University, Yogyakarta, Indonesia.

<sup>4</sup> The fundamental value of the security was generated from the price book value approach, following Bernard (1994).

names of the securities were hidden and symbolized into specific numbers to eliminate the bias due to the reputations of the represented companies.

The prevailed markets in this research reflected those as in the Jakarta Stock Exchange, in which a pre-opening market was implemented prior to the main trading sessions to capture the market price that would become the barometer of the expected price of the majority of market players in every single trading day. The pre-opening market in this research took place in about 5 minutes such that all investors were required to deliver their orders representing the numbers of securities they wanted to buy or sell at predicted values of the securities. In this sense, all investors determined and delivered the fundamental values of three different securities in every trading session based on the previous available market prices (see Appendix 2). As the market prices occurred in a trading session, the investors had to move together to the next one. In the following trading sessions, all investors received other manipulated information. In addition, short selling was not allowed. In order to motivate the investors to trade seriously, cash rewards were available for the three winners based on their profits.

#### Treatment

This current experimental research was implemented by exercising two different kinds of treatments. In this research, the experimenter manipulated the information to observe its effects on the price and prediction error. The treatments deal with two kinds of information that entered into the market which might influence the way the investors predict the values of the securities. Those treatments consist of the state of no available market information, the provision of feed back in the form of guidance of prediction. In the first treatment, resembling the pre-opening trading session in Jakarta Stock Exchange, all investors had to predict the value of the securities based on the prevailed market prices that took place in the previous closing trading day. Thus, in this pre-opening market, all investors did not have any available market information when they predicted the value of the securities.

The next treatment is the provision of guidance of prediction. It refers to the information dealing with the effort to predict the values of the securities properly following Bernard (1994). According to Bernard (1994), the determinant factors should be considered to generate fundamental value of a securities are its Rate of Return On Equity (ROE), its growth rate of ROE, its Book Value per share, and its growth of Book Value. Thus, in this research, all investors are encouraged to predict the fundamental value of the securities after the researcher explains and trains how to do so.



## Variable Measurement

The causal relationship in the current research is that overconfident behavior affects the prediction errors. Therefore, the dependent variable in this current research was the prediction errors. The prediction errors showed the level of uncertain prediction produced by the less and the more informed investors when carrying out securities trading which was shown in ratio. In the pre-opening sessions, the prediction error was measured by the difference between predicted value of the securities and its fundamental value which was shown in ratio (Bloomfield et al. 1999). In the main trading sessions, the prediction error was labeled as price error measured by the difference between the bid/ask price and the fundamental value, shown in ratio.

$$\text{Prediction error} = (\text{Predicted value} - \text{Fundamental value})$$

Fundamental value

$$\text{Price error} = (\text{Bid/ask price} - \text{Fundamental value})$$

Fundamental price of stock

The independent variable in this research was overconfident behavior measured by the score of overconfidence obtained from the test of calibration, referring to Klayman et al. (1999). The score of overconfidence had two levels, namely the high level of overconfidence represented by the behavior of the less informed investors and the low level of overconfidence represented by the behavior of the more informed investors.

## Results

### Prediction and Price Errors

Pre-opening session was the earliest trading in each trading period so that it may involve the greatest uncertainty since the market did not provide any available information for all investors.<sup>5</sup> The uncertainty would trigger the overconfident behavior to emerge. When participating in the pre-opening sessions, the less informed investors tended to overweigh the precision of their knowledge and information so that they tended to make more mistakes in the three pre-opening sessions reflected by the prediction errors as shown in panel A, B and C of Table 1. The test shows that the means of prediction errors of the less informed investors are significantly different from the more informed investors. It implies that the less informed investors demonstrate higher mean of prediction errors than do more informed investors in those three pre-opening markets. This phenomenon indicates that less informed

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<sup>5</sup> In this session, the researcher imposes the tick size rule that reflects the real pre-opening one; however, the maximum change is not implemented to detect the barometer price during the day.

investors have practiced self deceptive behavior since the ability of perceiving a prediction is not appropriate with their actual ability.

In the following session, the researcher did not impose any treatment. In this session, the tick size rule was fully implemented including the maximum change so that the value of the securities only moved in the specific range. However, all investors could access and took advantage of the available market information. The result shows that the difference of price error between the less and the more informed investors is significant (see panel D in Table 1). This result implies that less informed investors show higher mean of price errors than do more informed ones. In the next session, all investors received a feedback in the form of the guidance of prediction. The result shows that the difference of price error between the less and the more informed investors is significant meaning that the less informed investors document higher mean of price errors than do more informed ones (see panel E in Table 1).

Table 1. Summary of test of the mean of prediction and price errors

Prevailed Markets	N		Mean of Prediction (Price) Errors		Standard Deviation		<i>P-Value*</i>
	Total Prediction (Price) Errors						
	LII <sup>1</sup>	MII <sup>2</sup>	LII	MII	LII	MII	
A. The first pre-opening market	65	65	-2,2511	-1,6694	0,9737	0,8351	0,000
B. The second pre-opening market	65	65	-2,4375	-1,5882	0,8995	0,7249	0,000
C. The third pre-opening market	65	65	-2,8949	-2,0935	1,0674	1,0025	0,000
D. The absence of feedback	65	65	-2,6588	-2,1515	0,9996	1,0342	0,005
E. The presence of feedback	65	65	-2,9202	-2,0352	0,3058	1,0098	0,000

Note: \* = significance values

LII1 = Less Informed Investors

MII2 = More Informed Investors

### Profit and Loss

The profit and loss of all investors during the trading sessions are presented in Table 2. Table 2 shows that the less informed investors who perform overconfident behavior do not always suffer from transaction losses. They have the opportunity to obtain profits as presented in panels B, although they perform higher mean of prediction or price errors than do more informed ones. Those findings confirm the results of previous research (DeLong et al., 1990; Hirshleifer & Luo, 2001; Gervais & Odean, 2001).

Table 2. The summary of means of the profits and losses during the market sessions

Prevailed market sessions	N	Mean	Std. dev
A. The first pre-opening market			
The less informed investors	30	-0.029	0.285
The more informed investors	30	0.029	0.285
B. The second pre-opening market			
The less informed investors	29	0.103	0.240
The more informed investors	29	- 0.103	0.240
C. The third pre-opening market			
The less informed investors	35	-0.021	0.184
The more informed investors	35	0.021	0.184
D. Guidance market			
The less informed investors	29	-0.014	0.224
The more informed investors	29	0.014	0.224

## Discussion

### *Experiment 1: The effect of “no available market information” on the prediction errors*

When the market does not provide any information in the three pre-opening sessions as shown in Panel A, B and C in Table 1, all investors will anticipate this uncertain situation through the conviction of their knowledge and confidence. Since the less informed investors perceive themselves as having precise knowledge and accurate information, they are inclined to produce the mean of prediction errors higher than do more informed investors in all pre-opening sessions. This finding supports Hypothesis 1. This phenomenon also proves that the less informed investors conduct self deceptive behavior because they assess their knowledge and information excessively (more than the actual fact). In addition, since the less informed investors produce higher mean of prediction errors than do more informed ones, they suffer from trading losses as presented in panel A and C in Table 2. Thus, there are transfers of wealth from the less to the more informed investors that supports Hypothesis 2. However, an interesting point to note is that although some investors conduct a self-deceptive behavior in the capital market, they do not necessarily suffer from the transaction losses as previous empirical research has already concluded (Odean, 1999; Barber & Odean, 2000; Raghubir & Das, 1999). When the less informed investors deliver the predicted values of the securities that close to the prevailed market price, they will have a greater chance to obtain profits, although their predictions produce

higher mean of prediction errors than those of more informed investors as presented in the second pre-opening market (see panel B in Table 2). This phenomenon implies that the majority of the market players also conduct overconfident behavior in the second pre-opening market just as same as those less informed investors. As the majority of the market players conduct overconfident behavior, the less informed investors take advantage of that situation by delivering the accurate values of the securities that close to the prevailed market price in such a way that they could obtain the profits.

*Experiment 2: The effect of feedback on the price error*

Referring to panel D and E in Table 1, the guidance of prediction decreases the mean of price errors of more informed investors and increases the mean of price errors of less informed investors that contradicts Hypothesis 3. The investors should have reduced the price errors when they became smarter in acquiring the additional knowledge such as the guidance of prediction. The fact shows that more informed investors learn and use the guidance very well so that they could reduce their confidence by decreasing their true beliefs to conform to the axioms of probability theory. Therefore, their mean of price errors declines so that the price error line moves upward as depicted in Figure 1. On the other hand, acquiring the guidance of prediction, less informed investors increase their predicted values reflecting the amount of knowledge of the topic area contained in the assessments. They tend to increase their true beliefs leading to higher mean of price errors. This result suggests that less informed investors conduct a self-deceptive behavior. Since less informed investors increase their mean of price errors, their price error line moves downward. Thus, the guidance of prediction increases the difference mean of price errors between those two groups of investors.

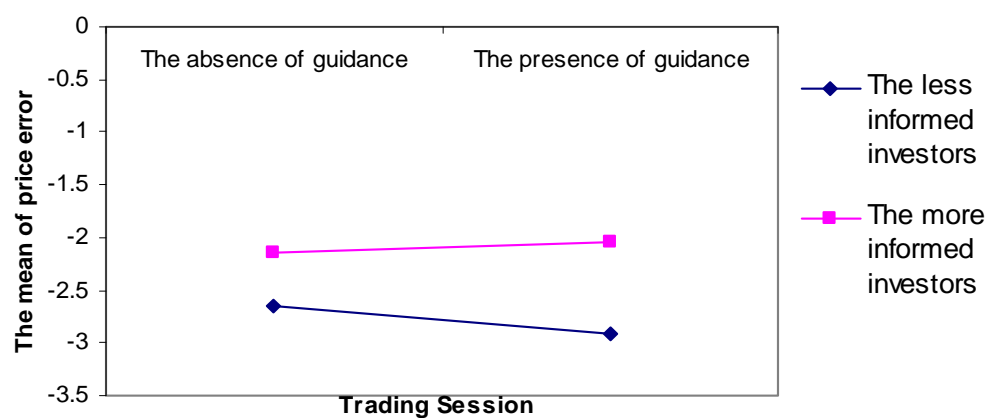


Fig. 1 The mean of price errors of the more and the less informed investors in trading session based on the absence and the presence of guidance

In psychology, the tendency to increase the true belief after acquiring additional information or knowledge is known as a phenomenon of self-attribution. A phenomenon of self-attribution is a signal of the overconfidence (Daniel et al., 1998). Due to the self-attribution, the less informed investors suffer from transaction loss (see panel D in Table 2). Therefore, there is a transfer of wealth from the less to the more informed investors that contradicts Hypothesis 4.

## **Conclusion**

The current experimental research has focused on the role of the overconfident investors in assessing or predicting the value of securities after getting certain treatments. The research findings demonstrate that the less informed investors are inclined to assess the precision of their knowledge and information excessively so that they produce higher mean of prediction and price errors than do more informed investors in pre-opening and guidance market sessions. The phenomenon indicates that the less informed investors conduct self deceptive behavior. Due to higher mean of prediction and price error, the less informed investors suffer from trading losses leading to a transfer of wealth from the less to the more informed investors. However, in a specific condition, the less informed investors may enjoy profits although they implement higher mean of prediction errors than those more informed investors as long as they are able to deliver predicted value of the securities accurately and swiftly that close to the market price. Investors believe that the market price of securities is the equilibrium price of securities that reflects the expected price of the majority of the market players. Thus, the less informed investors enjoy profits since the majority of the market players implements the overconfident behavior as well.

## **Implication**

This current research in general demonstrates that the level of prediction and price errors reflects someone's overconfidence level. Those who have high level of overconfidence (represented by the less informed investors) are proved to have a tendency to produce higher mean of prediction errors than those whose level of overconfidence is low (represented by the more informed investors). The important message that can be drawn from this research is that low level of knowledge would trigger the overconfident behavior to emerge. Therefore, the decision makers are encouraged to increase and develop their knowledge to improve the quality of their judgments to achieve better solutions. In addition, this current research may give theoretical contributions in that it offers a new perspective of price discovery which is highly affected by overconfident behavior reflecting self deceptive behavior. This

new perspective is supported by a relatively new theory of finance, namely Behavioral Finance. In order to strengthen this new theory, further research topics may elaborate other irrational behavior or phenomena practiced in the stock market which generally construct anomalous research such as heuristics, herding phenomena, phenomena “sell the winner and keep the loser”, January effect, size effect, under and overreaction etc.

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## Appendix 1.

### Experimental Conditions

Market Conditions	Prediction or Price Error	
	Level	Level of
	<i>Overconfidence</i>	<i>Overconfidence</i>
	High	Low
No Treated Market (No information available) ( Pre-opening periods and main trading periods)	High	Low
	Hypothesis 1 & 2	
Treated Market (The treatment was implemented in the form of provision of guidance of prediction in the main trading periods)	High	Low
	Hypothesis 3 & 4	

## Appendix 2.

### Experimental Design

Trading period	Trading round	Pre-opening periods			Main trading periods						
		No treatment			No treatment			Treatments			
		Session 1			Session 2						
I	1	S-1	S-2	S-3	S-1	S-2	S-3				
	2	S-4	S-5	S-6	S-4	S-5	S-6				
	3	S-7	S-8	S-9	S-7	S-8	S-9				
	4	S-10	S-11	S-12	S-10	S-11	S-12				
								Guidance of prediction			
		Session 1			Session 2			Session 3			
II	1	S-13	S-14	S-15	S-13	S-14	S-15	S-13	S-14	S-15	
	2	S-16	S-17	S-18	S-16	S-17	S-18	S-16	S-17	S-18	
	3	S-19	S-20	S-21	S-19	S-20	S-21	S-19	S-20	S-21	
	4	S-22	S-23	S-24	S-22	S-23	S-24	S-22	S-23	S-24	

		Session 1			Session 2				
III	1	S-25	S-26	S-27	S-25	S-26	S-27		
	2	S-28	S-29	S-30	S-28	S-29	S-30		
	3	S-31	S-32	S-33	S-31	S-32	S-33		
	4	S-34	S-35	S-36	S-34	S-35	S-36		
	Prediction error				Price error				

Note: S-i = The market price of the securities i

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