OVERCONFIDENCE INVESTORS IN INDONESIA'S SHARIA CAPITAL MARKET: Experimental Study

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ABSTRACT

Investors who have high overconfidence indicated by a high rate of miscalculation will tend to overestimate the price of securities so that they unknowingly buy securities at a higher price or sell securities at a price lower than their fundamental value, causing transaction losses. This paper discusses the overconfident and predictive accuracy of stock prices in the Indonesian Islamic capital market with an experimental laboratory setting to observe investor responses when they receive valuable information. The research design classifies investors into three groups based on overconfidence scores. This study uses two types of treatment, namely market conditions without information and markets receiving bad news. The results show that overconfident investors tend to overestimate the accuracy of their knowledge and information so that they produce higher average and error price predictions than investors who are low overconfident across all experimental market sessions. This evidence suggests that highly confident investors engage in self-deceptive behavior. The results also show that investors who are overconfident do not always suffer losses even though they have higher average prediction errors or prices than investors who are overconfident low.

Keywords: Overconfident, self-deception, price error (prediction), transaction loss

INTRODUCTION

The basic theory of standard finance, as described by Fama, (1970), is that the market is efficient. Market efficiency means that the price of security stays at fair value, even if some investors make mistakes due to bias. In an efficient market, investors are considered as rational, impartial, and consistent actors, who make optimal investment decisions, without being influenced by their souls or emotions (Haseeb et al., 2019). However, psychological research shows that investors as decision-makers are not always rational (De Bont & Thaler, 1985). Irrational investors disrupt the market, by buying when prices are high and selling when prices are low, while rational investors move prices closer to their fundamental values, by buying when prices are low and selling when prices are high (Blasco et al., 2012).

One aspect of irrational behavior that most people suffer from is being overconfident. Overconfident investors exaggerate the information collected, overestimate their own information, have predictive ability, and ignore the real facts (Ali & Haseeb, 2019). Daniel et al., (1998) define overconfidence as an overreaction to the accuracy of private information signals and an underreaction to public information signals. Benos, (1998), Glaser & Weber, (2007), Hirshleifer & Luo, (2001), Barber & Odean, (1999), mention that overconfident investors tend to trade too much based on their own information. Empirical research has also shown that overconfidence leads to lower profits (Biais et al., (2005); Glaser et al., (2013); Deaves et al., (2010); Graham et al., (2006); Kempf et al., (2014) Overconfident behavior is also associated with trading volume and frequency (Grinblatt & Keloharju, 2009). Another effect of overconfidence causes investors to underestimate risk or tend to ignore risk (Pompian, 2006). stock is the risk of falling stock prices (capital loss). Information related to global markets, macroeconomics, and the issuer's fundamentals can be used to explain the increase or decrease in stock prices. The existence of good news and bad news can cause stock prices to rise and fall. Furthermore, investor response to the news will cause price prediction errors.

Empirical research shows that investors tend to fail to keep prediction errors low because they engage in overconfident behavior in the securities market. Therefore, they tend to experience trading losses (Barber & Odean, 1999; Raghubir et al., 1999). These findings indicate that overconfident investors experience trading losses because they do not realize that their predictions deviate relatively far from the prevailing market price. This phenomenon shows that investors engage in self-deception because they overestimate their knowledge and information (Trivers, 2004). Although other empirical evidence suggests that overconfident behavior does not always end in harm (DeLong, Shleifer, Summers, 1990); Hirshleifer & Luo, (2001); Gervais & Odean, (2001).

Many studies focusing on investor overconfidence in capital markets in developed countries have been carried out, both through experimental studies and questionnaires. However, this field is under-explored in emerging markets (Ziane & Abaoub, 2010). As far as researchers know, in Indonesia, there has been no researcher who has proven the effect of overconfident behavior on price predictions in the Indonesian Islamic stock market by using a quasi-experimental experiment. We chose this subject for several reasons. First, there is a methodological gap in overconfidence behavior in the Indonesian Islamic capital market. In addition, very little research has been conducted on overconfidence behavior in the Islamic capital market in Indonesia and in the Islamic capital market in general. Second, over the last few years, the rapid growth of the Islamic capital market with the achievement of sharia share capitalization in 2019 of IDR 3,666.69 trillion and non-stock sharia asset capitalization of IDR 1,363.43 trillion. As the largest Muslim country, Indonesia is attractive for Muslim investors in the world to invest and compare overconfident behavior in Muslim countries. The results of the study were motivated to explore papers on the effect of overconfidence behavior on investors' stock price prediction accuracy, to examine the effect of bad news on stock price accuracy, and to examine the effect of

overconfidence on investors' investment returns as a phenomenon predicted by the Self-Deception Theory. This overconfident behavior can be detected from the magnitude of the error in predicting stock prices. The more overconfident an investor's behavior is, the more errors there will be. In this study, based on their overconfident level, participants were classified into three categories referring to Klayman et al., (1999), namely (1) IOT, investors with high overconfident behavior, (2) IOR, low overconfident investors, and (3) investors moderately overconfident (IOM) behavior. The findings of this study will contribute to the Behavioral Finance theory related to stock price predictions in making investment decisions in the Islamic capital market.

This paper is structured as follows: Section 2 presents the related literature, and Section 3 describes the experimental design. Section 4 discusses the results. Finally, Section 5 concludes.

2. Literature Review

The overconfidence phenomenon is the tendency of unwitting decision-makers to give excessive weight to the accuracy of their knowledge and information accuracy and ignore publicly available information (Lichtenstein & Fischhoff, (1977); Taylor & Brown, (1988); J. Russo & Schoemaker, (1992)). Overconfidence is the belief that individuals have more knowledge or skills than the actual facts in a particular domain or task (Russo & Schoemaker, 2016). According to Moore & Healy (2008), overconfidence usually appears in three different forms. The first is misestimation. This form of overconfidence occurs when people misestimate quantities, usually for predictable things. The second is misplacement. This form of overconfidence relates to relative comparisons which reflects a tendency to overestimate themselves when comparing themselves to others. others. Third, misprecision that is beliefs predict or estimate quantities more accurately than actual facts. When receiving bad news or information, overconfident individuals tend to determine lower predictive values compared to more rational individuals, resulting in higher average prediction errors (Taylor & Brown, 1988; Russo & Schoemaker, 1992; Palomino & Sadrieh, 1988). 2011). Differences in the level or level of overconfidence will cause differences in interpreting and evaluating information so that it will result in differences in finding solutions (Griffin & Tversky, 1992a). Another effect of overconfidence behavior is the tendency of investors to trade in the stock market too much (Barber & Odean, 2001; Graham, et al. 2006; Daniel & Hirshleifer, 2015).

According to Klayman et al., (1999) and Kufepaksi, (2008), a person's confidence level can be identified through a confidence level calibration test. A calibration test is a procedure to test and identify the combination of knowledge level and confidence level that forms a person's level of confidence based on a specific questionnaire designed specifically for this purpose. The level of overconfidence is measured by the overconfidence score, which is the average probability confidence level minus the average percentage of the correct answer values. If the average confidence probability is lower than the average proportion of truth in the judgment, this situation will result in a negative score reflecting insecure behavior. On the other hand, if the

average confidence probability is higher than the average proportion of truth in the judgment, this situation will result in a positive overconfidence score. The value of overconfidence has three levels: low, medium, and high.

The difference between the level of excessive trust will lead to differences in interpreting and evaluating information that results in different solutions (Kahneman & Tversky, (1977, 2001); Griffin & Tversky, (1992). Most of the psychological findings have the same conclusion that overconfidence behavior self tends to encourage decision-makers to make inaccurate predictions that result in prediction errors more than rational (more informed) ones. This conclusion confirms the theory of self-deception (Trivers, 2004). According to Trivers, 2004, people cannot perfectly control indicators of their true internal state. This creates options for the ability to read subtle cues such as facial expressions, eye contact, posture, tone of voice, and speech tempo to infer the mental state of another individual. According to self-deception theory, individuals are designed to think they are better (smarter, stronger) than they really are. The theory explains and predicts that when decision-makers unconsciously perceive that they have above-average abilities, their thinking patterns will guide them to manage their perceptions by seeking other information or arguments to support their behavior and ignoring other information that contradicts their behavior. In these situations, decision-makers follow their false beliefs leading them to engage in overconfident behavior that implies self-deception.

2.1 Investor reaction when the market is without any information

Psychological research has shown that people tend to engage in overconfident behavior when faced with uncertain conditions, especially when they encounter very difficult problems (Juslin et al., 1999; Klayman et al., 1999; Soll & Klayman, 2004). In an uncertain situation such as in the pre-opening period, highly overconfident investors tend to overestimate the accuracy of the level of knowledge and accuracy of the information, so they tend to produce high prediction errors. In contrast, low overconfident investors who generally have sufficient knowledge than high overconfident investors realize that they are individuals who have limited abilities and knowledge, so they tend to trade with caution.

This behavior tends to result in lower prediction errors than highly overconfident investors. This phenomenon shows that highly overconfident investors have carried out self-deceptive behavior because their perception of ability does not match the actual reality. Empirical research shows that investors tend to practice overconfident behavior in pre-opening markets which is reflected in higher average prediction errors than rational ones (Bloomfield et al., 1999; Kirchler & Maciejovsky, 2002; Friedman, 2016).

H_1: Investors with high overconfidence have a higher average prediction error than investors with low overconfidence in the pre-opening market.

Because highly overconfident investors make higher average prediction errors, they will suffer transaction losses. This loss indicates that there will be a transfer of wealth from high overconfident investors to low overconfident investors (Kufepaksi, 2007).

H_2: Highly overconfident investors suffer transaction losses in the pre-opening period

2.2 Investor reaction when the market gives bad news

The size of the increase in market prices due to the influence of news or information is determined by a person's optimism and pessimism about the strength of the information or event in question (Griffin & Tversky, 1992). Bad news for an investor is information that conveys an unsatisfactory message that will lower the stock market price. The decline in stock market prices will reduce the level of shareholder wealth (Shleifer, 2002; Daniel et al., 1998).

When less and more informed investors receive bad news, their predictive value will also not be accurate but high overconfident investors will result in a higher average error price than low overconfident. Empirical research shows that when receiving bad news, high overconfident investors tend to show a larger average price error than low overconfident investors leading to transaction losses (Bloomfield et al., 1999; Bloomfield & Libby, (1996).

H_3: High overconfident investors commit a higher average of price errors than low overconfident investors when the market signals bad news

Because highly overconfident investors make higher average prediction errors, they will suffer transaction losses. This loss indicates that there will be a transfer of wealth from high overconfident investors to low overconfident investors.

H_4: Highly overconfident investors suffer transaction losses when the market signals bad news.

3. Experimental Design

Participants in this study were undergraduate students who had taken minimal courses on financial management, investment management, and capital markets and had never invested in the capital market. The use of students as subjects because they represent genuine characteristics that can be manipulated easily in experiments. In addition, students have adequate academic requirements that will facilitate their understanding of investment (Kufepaksi, 2007). There were 30 participants who had followed and passed the calibration test referring to Klayman et al., (1999). Based on the overconfident level, the thirty participants will be classified into three groups, each consisting of 10 participants, namely the investor group with (1) the highest, (2) moderate, and (3) the lowest overconfident level. These three groups of investors will trade shares with each other to determine the stock market price.

This research design is a mixed design between and within-subject design. Between subjects, the design compares the effect of the same treatment or treatment on different subject groups.

Specifically, the between-subject design will compare the average prediction error (price) of stocks and returns between two groups of investors with different levels of overconfidence after receiving the same treatment. Within-subject design compares the effect of different treatments on the same subject group using a repeated measure design. Through this repeated measurement, the same subject or participant will be given different treatments repeatedly (Kufepaksi, 2007; Trinugroho & Sembel, 2011).

This experiment will utilize software in the form of a stock trading system which will be the main means of answering research questions. The prevailing market in this study reflects the Islamic capital market in Indonesia, where the pre-opening market is carried out before the main trading session to capture the market price which will be a price barometer expected from most market participants in each trading day. The market pre-opening in this study lasted approximately 5 minutes so all investors were asked to provide their orders representing the number of securities they wish to buy or sell at the predicted value of the securities. The experimental design in this study is summarized in Table 1, the measurement of the variables in Table 2, and the method of testing the hypothesis in Table 3.

4. Hypothesis Testing Results

4.1 Prediction Error (Price) in Pre-Open session

Based on Table 4, Panels A, B, and C show that across the three pre-opening markets, all investors made valuations related to the value of the stock in order to make a profit in the absence of market information. Referring to the uncertain situation, investors focus their decisions on their knowledge and confidence. High overconfident investors tend to overestimate the accuracy of their knowledge and the accuracy of their information, they perform higher stock prediction values than low overconfident investors. Therefore, high overconfident investors exhibit higher mean prediction errors than low overconfident investors in the three pre-opening markets. The t-test results for the mean equations imply that the difference in the mean prediction error between high overconfident investors and low overconfident investors in each pre-opening market is significant. In other words, high overconfident investors produce significantly higher mean prediction errors than low overconfident investors. The findings reflect that high overconfident investors cannot prove that they have better knowledge and information than low overconfident investors because they fail to produce lower predictive errors. Thus, highly overconfident investors engaged in self-deception across the three pre-open markets. These findings confirm the results of research by Gervais & Odean, (2001); Kufepaksi, (2007).

High overconfident investors performed overconfident behavior because they generated higher prediction errors than low overconfident investors in the three pre-opening markets, supporting hypothesis 1.

Table 4. Price Prediction Errors

Market Situation	N		Average Prediction Error (Price)		Standard Deviation		*P-Value**	
	IOT	IOR	IOT	IOR	IOT	IOR	IOT	IOR
A. Pre-Opening 1	82	82	0,876	0,653	0,473	0,397	0,000	0,000
B. Pre-Opening 2	82	82	0,906	0,438	1,145	1,200	0,000	0,000
C. Pre-Opening 3	82	82	0,579	-0,257	1,172	0,976	0,000	0,000
D. Market without news	82	82	0,416	-0,636	1,610	1,610	0,000	0,000
E. Bad news	82	82	1,387	-0,273	2,038	1,769	0,000	0,000

The study also found that when the market gave bad news, high overconfident investors decreased their prediction accuracy, while low overconfident investors increased prediction accuracy by reducing the average price error (see panels D and E in Table 4). This phenomenon indicates that highly overconfident investors practice the self-deception hypothesis. When bad news hits the market, high overconfident investors increase the average error price by a higher proportion than low overconfident investors decrease so the difference in average error price is wider. The calculation results imply that highly overconfident investors engage in overconfident behavior because they overestimate the accuracy of their knowledge and information in such a way as to result in higher mean price errors. Thus, they engage in self-deceptive behavior in those trading sessions. These results support hypothesis 3.

4.2. Trading Profit and Loss

Trading results in the form of investor profits and losses during the trading session are presented in Table 5. Table 5 shows that highly overconfident investors who make price prediction errors do not always suffer transaction losses. They have profit opportunities as presented in panels A, D, and E, even though they make higher average predictions or price errors than low overconfident investors. These findings confirm the results of previous studies (DeLong, Shleifer, Summers, 1990; Hirshleifer & Luo, 2001; Gervais & Odean, 2001). This phenomenon implies that as long as investors are able to convey the predictive value of their shares accurately and quickly, they will have a greater chance of making a profit even though they produce a higher average prediction error or price.

Table 5. Trading Profit and Loss

Market Situation	N		Average Profit and Loss		Standard Deviation	
	IOT	IOR	IOT	IOR	IOT	IOR
A. Pre-Opening 1	32	32	0,422	0,463	0,584	0,653
B. Pre-Opening 2	34	34	-0,051	0,050	0,390	0,553
C. Pre-Opening 3	18	18	-0,195	-0,213	0,251	0,220
D. market without news	24	24	0,638	0,609	2,504	2,509
E. Bad news	24	24	0,053	-0,012	0,440	0,446

In addition, because high overconfident investors produce a higher average error of prediction than low overconfident investors, they suffer trading losses as presented in panels B and C in Table 5. The profits earned by overconfident investors are low. Although in panel A, high overconfident investors earn profits, on average the value is smaller than those of low overconfident investors. Thus, there is a transfer of wealth from high overconfident investors to low overconfident investors and this supports Hypothesis 2. When high overconfident investors provide stock value predictions that are close to the prevailing market price, they will have a greater chance of making a profit, even though their predictions yield positive results. What is interesting to note is that although some investors engage in self-deceptive behavior in capital markets, they do not necessarily suffer transaction losses as previous empirical research has concluded (Barber & Odean, 2000; Raghubir et al., 1999).

This study finds an interesting result that when receiving bad news, highly overconfident investors make a profit even though they have a higher average error price. Investors have the opportunity to earn profits only if they are able to provide accurate stock value predictions that are close to market prices that reflect the prices expected of most market participants. This fact implies that most market participants also perform overconfident behavior similar to high overconfident investors. So, highly overconfident investors take advantage of such situations to make money. They make a profit because they have sold the security at a market price that is higher than its fundamental price. This finding proves that overconfident investors do not necessarily suffer trading losses based on bad news. In addition, the fact shows that highly overconfident investors gain when they receive bad news, resulting in a transfer of wealth from low overconfident investors to high overconfident investors. This finding does not contradict hypothesis 4 (see panel E in Table 5).

5. Conclusion

Our experimental study provides empirical evidence regarding overconfident behavior in Islamic capital markets and evidence supporting behavioral finance theory. This research can make a theoretical contribution in offering a new perspective of price discovery which is strongly influenced by overconfident behavior that reflects self-deceptive behavior. Highly overconfident behavior tends to overestimate the accuracy of their knowledge and information so that they

result in higher average prediction errors and prices than low overconfident investors in the pre-opening session and bad news. This phenomenon indicates that highly overconfident investors engage in self-deceptive behavior. Due to the higher average of predictions and price errors, high overconfident investors suffer trading losses leading to a transfer of wealth from high overconfident investors to low overconfident investors. However, under certain conditions, high overconfident investors can enjoy profits even though they apply a higher average prediction error than low overconfident investors as long as they are able to provide accurate and fast predictive values of securities that are close to market prices. Thus, highly overconfident investors enjoy the benefits because most market participants also adopt overconfident behavior.

Recommendations and Limitations

The important message that can be drawn from this research is that a low level of knowledge will trigger the emergence of overconfident behavior. Therefore, we recommend practical suggestions as an implication of the results of this study so that investment companies need to provide insight and training to investors, brokers, and investment managers about investment mistakes that can occur due to overconfident behavior. Hopefully, this training to increase knowledge and understanding of overconfidence behavior will reduce errors that result in a decrease in investors' investment wealth.

Nevertheless, we point out some limitations of this study. First, the proxy variables used to measure trading activity are limited to prediction errors and stock prices, and trading profit and loss. Other variables, such as the bid-ask spread, other behavioral variables, were not included in the analysis. Participants rarely place buy orders at the best bid or sell orders at the best bid. They prefer to place limited orders (make orders in queues). Second, the overall duration of this experimental study was relatively long (4 hours or 240 minutes). Long-duration experiments can cause maturation effects, changes in participant behavior that may be due to the influence of other factors that occur during the experiment but not intentionally in the experimental treatment. This study measures overconfidence using overestimated calibration, further researchers can explore measurements with over-placement, and over-precision.

References

Ali, A., & Haseeb, M. (2019). Radio frequency identification (RFID) technology as a strategic tool towards higher performance of supply chain operations in textile and apparel industry of Malaysia. *Uncertain Supply Chain Management*, *7*(2), 215–226. https://doi.org/10.5267/j.uscm.2018.10.004

Barber, B. M., & Odean, T. (1999). The Courage of Misguided Convictions. *Financial Analysts Journal*, *55*(6), 41–55. https://doi.org/10.2469/faj.v55.n6.2313

Barber, B. M., & Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *The Journal of Finance*, *55*(2), 773–806.

Barber, B. M., & Odean, T. (2001). Trading is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. *SSRN Electronic Journal*, *LV*(2), 773–806. https://doi.org/10.2139/ssrn.219228

Benos, A. V. (1998). Aggressiveness and survival of overconfident traders. *Journal of Financial Markets*, *1*(3–4), 353–383. https://doi.org/10.1016/S1386-4181(97)00010-4

Biais, B., Hilton, D., Mazurier, K., & Pouget, S. (2005). Judgemental overconfidence, self-monitoring, and trading performance in an experimental financial market. *Review of Economic Studies*, *72*(2), 287–312. https://doi.org/10.1111/j.1467-937X.2005.00333.x

Blasco, N., Corredor, P., & Ferreruela, S. (2012). Market sentiment: A key factor of investors' imitative behaviour. *Accounting and Finance*, *52*(3), 663–689. https://doi.org/10.1111/j.1467-629X.2011.00412.x

Bloomfield, R., & Libby, R. (1996). Market reactions to differentially available information in the laboratory. *Journal of Accounting Research*, *34*(2), 183–207.

Bloomfield, R., Libby, R., & Nelson, M. W. (1999). Confidence and the welfare of less-informed investors. *Accounting, Organizations and Society*, *24*(8), 623–647.

Daniel, K., & Hirshleifer, D. (2015). Overconfident investors, predictable returns, and excessive trading. *Journal of Economic Perspectives*, *29*(4), 61–88. https://doi.org/10.1257/jep.29.4.61

Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor psychology and security market under- and overreactions. *Journal of Finance*, *53*(6), 1839–1885. https://doi.org/10.1111/0022-1082.00077

De Bont, W. F. M., & Thaler, R. (1985). Does the Stock Market Overreact? *The Journal of Finance*, *40*(3), 793–805. https://doi.org/10.1111/j.1540-6261.1985.tb05004.x

Deaves, R., Lüders, E., & Schröder, M. (2010). The dynamics of overconfidence: Evidence from stock market forecasters. *Journal of Economic Behavior and Organization*, *75*(3), 402–412. https://doi.org/10.1016/j.jebo.2010.05.001

DeLong, Shleifer, Summers, W. (1990). Noise Trader Risk in Financial Markets. *Inefficient Markets*, *98*(4), 28–52. https://doi.org/10.1093/0198292279.003.0002

Fama, E. F. (1970). Session Topic: Stock Market Price Behavior Session Chairman: Burton G. Malkiel Efficient Capital Markets: A Review Of Theory And Empirical Work. *The Journal of Finance*, *25*(2), 383–417.

Friedman, D. (2016). *Privileged Traders and Asset Market Efficiency : A Laboratory Study Author (s): Daniel Friedman Source : The Journal of Financial and Quantitative Analysis , Vol . 28 , No . 4 (Dec ., 1993), pp . Published by : Cambridge University Press on behalf of* . *28*(4), 515–534.

Gervais, S., & Odean, T. (2001). Learning To Be Overconfident. *SSRN Electronic Journal*, *June*. https://doi.org/10.2139/ssrn.36313

Glaser, M., Langer, T., & Weber, M. (2013). True Overconfidence in Interval Estimates: Evidence Based on a New Measure of Miscalibration. *Journal of Behavioral Decision Making*, *26*(5), 405–417. https://doi.org/10.1002/bdm.1773

Glaser, M., & Weber, M. (2005). Overconfidence and Trading Volume. *SSRN Electronic Journal*, *M*. https://doi.org/10.2139/ssrn.626761

Graham, J. R., Harvey, C. R., & Huang, H. (2006). Investor Competence, Trading Frequency, and Home Bias. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.620801

Griffin, D., & Tversky, A. (1992a). The weighing of evidence and the determinants of confidence. *Cognitive Psychology*, *24*(3), 411–435. https://doi.org/10.1016/0010-0285(92)90013-R

Grinblatt, M., & Keloharju, M. (2009). American Finance Association Sensation Seeking , Overconfidence , and Trading Activity All use subject to JSTOR Terms and Conditions Sensation Seeking , Overconfidence , and Trading Activity. *Journal of Finance*, *64*(2), 549–578.

Haseeb, M., Abidin, I. S. Z., Hye, Q. M. A., & Hartani, N. H. (2019). The impact of renewable energy on economic well-being of Malaysia: Fresh evidence from auto regressive distributed lag bound testing approach. *International Journal of Energy Economics and Policy*, *9*(1), 269–275. https://doi.org/10.32479/ijeep.7229

Hirshleifer, D., & Luo, G. Y. (2001a). On the survival of overconfident traders in a competitive securities market. *Journal of Financial Markets*, *4*(1), 73–84.

Juslin, P., Wennerholm, P., & Olsson, H. (1999). Format Dependence in Subjective Probability Calibration. *Journal of Experimental Psychology: Learning Memory and Cognition*, *25*(4), 1038–1052. https://doi.org/10.1037/0278-7393.25.4.1038

Kahneman, D., & Tversky, A. (1977). *Intuitive prediction: Biases and corrective procedures*. Decisions and Designs Inc Mclean Va.

Kempf, A., Merkle, C., & Niessen-Ruenzi, A. (2014). Low risk and high return - Affective attitudes and stock market expectations. *European Financial Management*, *20*(5), 995–1030. https://doi.org/10.1111/eufm.12001

Kirchler, E., & Maciejovsky, B. (2002). Simultaneous over- and underconfidence: Evidence from experimental asset markets. *Journal of Risk and Uncertainty*, *25*(1), 65–85. https://doi.org/10.1023/A:1016319430881

Klayman, J., Soll, J. B., & Gonza, C. (1999). Overconfidence: It Depends on How, What, and Whom You Ask. *Organizational Behavior and Human Decision Processes*, *79*(3), 216–247.

Kufepaksi, M. (2007). The Contribution of Self-Deceptive Behavior on Price Discovery , An Experimental Approach. *Asia Pacific Management Review*, *13*(1), 419–434.

Lichtenstein, S., & Fischhoff, B. (1977). Do those who know more also know more about how much they know? *Organizational Behavior and Human Performance*, *20*(2), 159–183.

https://doi.org/10.1016/0030-5073(77)90001-0

Moore, D. A., & Healy, P. J. (2008). The Trouble With Overconfidence. *Psychological Review*, *115*(2), 502–517. https://doi.org/10.1037/0033-295X.115.2.502

Palomino, F., & Sadrieh, A. (2011). Overconfidence and delegated portfolio management. *Journal of Financial Intermediation*, *20*(2), 159–177. https://doi.org/10.1016/j.jfi.2010.02.003

Pompian, M. M. (2006). *Behavioral Finance and Wealth Management: How to Build Optimal Portfolios That Account for Investor Biases*.

Raghubir, P., Das, S. R., Lichtenstein, D., & Lyons, R. (1999). The Psychology of Financial Decision Making : A Case for Theory-Driven Experimental Enquiry. *Financial Analysts Journal*, *55*(6), 56–80.

Russo, J. E., & Schoemaker, P. (2016). The Palgrave Encyclopedia of Strategic Management. *The Palgrave Encyclopedia of Strategic Management*, *November 2017*. https://doi.org/10.1057/978-1-349-94848-2

Russo, J., & Schoemaker, P. (1992). Managing overconfidence. *Sloan Management Review*, *33*(2), 7.

Shleifer, A. (2002). Inefficient Markets: An Introduction to Behavioral Finance. In *Journal of Institutional and Theoretical Economics* (Vol. 158, Issue 2, p. 369). https://doi.org/10.1628/0932456022975402

Soll, J. B., & Klayman, J. (2004). Overconfidence in Interval Estimates. *Journal of Experimental Psychology: Learning Memory and Cognition*, *30*(2), 299–314. https://doi.org/10.1037/0278-7393.30.2.299

Taylor, S. E., & Brown, J. D. (1988). Illusion and Well-Being: A Social Psychological Perspective on Mental Health. *Psychological Bulletin*, *103*(2), 193–210. https://doi.org/10.1037/0033-2909.103.2.193

Trinugroho, I., & Sembel, R. (2011). Overconfidence and Excessive Trading Behavior: An Experimental Study. *International Journal of Business and Management*, *6*(7), 147–152. https://doi.org/10.5539/ijbm.v6n7p147

Trivers, R. (2004). The elements of a scientific theory of self-deception. *Annals of the New York Academy of Sciences*, *907*, 114–131. https://doi.org/10.1111/j.1749-6632.2000.tb06619.x

Table 1. Design of Experiment

Step	Description
1	Calibration test to determine the level of subject confidence

2	Based on the calibration test, determine the number of participants 30 people. Participants were grouped into three groups: high, medium, and low overconfidence levels. Each group consists of 10 participants who obtained a positive calibration value (>0)
3	Prior to the simulation, participants were given an explanation and guidance on the simulation mechanism.
4	Trading simulation experiments using software programs. Each participant in this study was given a virtual initial capital to invest Rp. 100,000,000, -. The experiment was carried out for 4 (four) hours, divided into 3 sessions.
5	At the end of the experiment, participants who made 1-3 trading profits will receive cash prizes. Meanwhile, other participants also received cash for their participation in the simulation with a smaller number than the winner of the simulation.

Table 2. Measurement of Variables

Variables	Measurement
Overconfidence	Measured using a calibration test based on the calibration model of Klayman et.al (1999) and Kufepaksi (2007).
Bad news	Announcement of losses and recommendations not to buy (Stikel et.al, 1995; Kufepaksi, 2007; Trinugroho and Sembel, 2011)
Prediction Error	Measured by = (Predicted Price – Stock Fundamental Price) / Stock Fundamental Price
Price Error	Measured by the amount = (Price (bid/ask) – Fundamental price of the stock) / The price of the fundamental stock
Return	Measured by the profit or loss earned by investors in stock trading simulations = (market price - fundamental price) / fundamental price.

Table 3. Method of Hypothesis Testing

Step	Description
1	One-way analysis of variance (ANOVA) was used to test whether there was a significant difference in overconfidence scores between groups.
2	Independent samples t-test is used to test H1 and H2 (between subject), whether there is a difference in stock price predictions between high overconfidence investors and low overconfidence investors. Is there a profit or loss difference between high and low overconfidence investors.

3	Paired samples t-test was used to test H3 and H4, whether there is a difference in stock price predictions between high overconfidence investors and low overconfidence investors before and after bad news. Is there a profit or loss difference between high and low overconfidence investors.