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INVESTMENT HORIZON TO INVESTMENT DECISION AND MEAN REVERSION
Indonesian Perspective*

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This study has two research objectives: (1) to find evidence whether investment decisions (allocation of funds in each asset in a portfolio) of Indonesian investors in the short investment horizon diverge with their investment decisions in the long investment horizon, and (2) to examine the belief of Indonesian investors in the mean reversion. This study analyzes the investment horizon from a behavioral point of view by examining the influence of investment horizon on investment decision and mean reversion in Indonesia. We employed the students of Master of Science, Master of Management, and Doctorate Programs at the Faculty of Economics and Business, Universitas Gadjah Mada, Indonesia as the sample in this research. Of the 217 questionnaires delivered, 172 questionnaires were completely filled and utilized in this study.

The main findings of this study are as follows: (1) it is significantly proved that Indonesian investors are inclined to assume higher portfolio risk in the longer investment horizon than that in the shorter investment horizon; (2) it is very interesting to see that on average, the investors are inclined to increase their allocation in the risk-free asset in the longer investment horizon although the difference between the risk-free asset holding in the short investment

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horizon and that in the long investment horizon is not significant; (3) the framing effect significantly influences the investment decisions, both in short investment horizon and in long investment horizon; (4) there is a tendency for the respondents to show a willingness to assume higher portfolio risk when they received the questionnaires that provided the historical five-year returns on the first page; (5) investors predict an asset gaining 50 percent in the first year to continuously gain in the next four years while expecting an asset losing 25 percent in the first year to continuously loss in the next four years.

Keywords: investment horizon; investment decision; mean reversion

Introduction

Investment horizon can be defined as the period of time someone plans to put his or her money aside to invest (Wu 2002). Life expectancy and pensionable age are the salient factors influencing the investment horizon, which then determines portfolio construction since the longer the investment horizon, the less risky the portfolio (Crabtree et al. 2000). A rule of thumb dictates that the older a person, the more risk-averse he will be (Hawawini and Viallet 1999). Crabtree et al. (2000) divide investment strategies into five types, based on investors' investment horizons:

1. ***Income or principal preservation.*** This strategy is primarily used by retired investors who want to "live off" their investments, usually only taking the interest earned and maintaining principal. These investors may invest in corporate bonds, government bonds, utilities funds, or real estate investment trusts.
2. ***Typical conservative growth.*** It is generally mulled for individuals whose investment horizons are between 5 and 10 years. These investors may invest in blue-chip funds (20%), corporate bonds (15%), value funds (10%), utilities funds (15%), high yield funds (15%), growth funds (15%), and equity income funds (10%).
3. ***Typical moderate growth.*** This type is usually used for individuals whose time horizons are 10 – 15 years. They may invest in growth funds (20%), value funds (20%), small cap value funds (20%), high yield funds (20%), and blue-chip funds (20%).
4. ***Typical aggressive growth.*** This strategy is purported for investors whose time frames are more than 15 years. These investors can invest in aggressive growth funds (20%), LQ45 Index funds (20%), small cap growth funds (20%), emerging market funds (20%), and international growth funds (20%).

5. ***Speculation.*** It is adopted by investors who are endeavoring to acquire maximum returns without regarding the risk. Derivatives securities, such as options and futures, are very tempting and challenging for them.

Investment decisions are supposed to be a function of expected returns, variance, and covariance structure of all investment alternatives' returns (Markowitz 1952). However, informational constraints or bounded rationality may prevent ordinary investors from considering correlations or covariances when making portfolio allocations (Siebenmorgen et al. 2000). Nonetheless, at the very least, they should think of the expected returns and likely risk estimate of an investment.

Meanwhile, mean reversion, although sounds formidable, is a simple statistical concept. The concept is more popular with the term "regression to the mean" (Dreman, 1998). Mean reversion or regression toward the mean was discovered over 100 years ago by Sir Francis Galton, and it was named the law of universal regression. In his famous paper, Galton (1886) (in Gujarati 1995; Dreman 1998) finds that although there is a tendency for tall parents to have tall children and for short parents to have short children, the average height of children born of parents of a given height tends to move or regress toward the average height in the population as a whole. Hence, the tallest men usually have shorter sons while the shortest men usually have taller sons (Dreman 1998). Since many tall men come from families of average height, they are likely to have children shorter than they are, and vice versa. In other words, in the long run, the height of men will always return to the mean or average.

The result of Galton can then be applied for the securities market. According to the classic work of Ibbotson and Sinquefield (in Dreman 1998), stocks had returned 10.5 percent annually over the last 70 years while the returns on investing in bonds were 5.6 percent. Short-term returns that are extremely high or low should be treated as deviations from long-term norms (Graflund 2001). Accordingly, investors who realize and believe in mean-reverting phenomenon will as much as possible invest in stocks when their investment horizons are long. The main rationale is that they are convinced that stocks will always give positive and higher returns than will fixed-income securities in the long-term condition. Hence, they will not care about the risk and are sure that average stock returns will always outperform those of fixed-income securities since it is a long-term norm of regression toward the mean. Siebenmorgen and Weber (2000) empirically find that German market participants significantly believe in mean-reverting asset prices, and it is the main explanation for their finding that investors whose investment horizons are long are inclined to allocate a higher proportion of their funds in stocks. A similar result is found by Frennberg and Hansson (1993) (in Graflund 2001) who researched on the Swedish stock market, proving that stock returns exhibit mean reversion. Risager (1998) also finds that mean reversion prevails on the Danish stock market. In contrast, Graflund (2001), using monthly nominal data for the period of 1947-1998, finds evidence that Nordic stock markets (Finland, Sweden, Denmark, and Norway) are not subject to mean reversion. This finding is in line with the result of Nielsen and Olesen (2000) who find a weak support for mean reversion on the Danish stock market. They remark that the mean reversion recently found on many capital markets is due to the recent prevalent high-return-high-volatility regime.

Research Objectives

This study has two research objectives: (1) to find evidence whether investment decisions (allocation of funds in each asset in a portfolio) of Indonesian investors in the short investment horizon diverge with their investment decisions in the long investment horizon, and (2) to examine the belief of Indonesian investors in the mean reversion.

Research Benefits

Benefits to be obtained from this study's findings are: (1) the evidence is supposed to give recommendations for Indonesian investors of how they should allocate their funds in establishing their portfolios, both in the short horizon and in the long horizon, and (2) the results will enrich empirical evidence on this topic and may entice other researchers to further investigate these phenomena in the future.

This paper is divided into five sections. *The first section* is an introduction section. *The second part* discusses literature review and hypotheses development. Subsequently, research method is discussed in the third section. Section 4 comprises data analysis and discussion. Eventually, conclusions, implications, and suggestions are drawn in the final section.

Literature Review and Hypotheses Development

The process of selecting a portfolio can be divided into two stages. *The first stage* starts with observations and experiences, and ends with beliefs about the future performance of available securities. *The second stage* begins with the relevant beliefs about the future performance and ends with the choice of portfolios (Markowitz 1952). Moreover, we recognize two traditional and well-known approaches to analyzing and selecting securities: (1) fundamental analysis and (2) technical analysis. While investors who believe in fundamental analysis are focused on finding the intrinsic value or theoretical value of a security or a portfolio, investors convinced by the technical analysis strive to search for identifiable and recurring stock price patterns (Jones 2000).

The choice of an optimal portfolio of assets is a classic problem both for academics and practitioners. It is generally accepted among practitioners that investment horizon plays a crucial role in determining the optimal composition of an investment portfolio. A common advice from stock market professionals is that long-term investors should invest a larger proportion in more risky assets, such as stocks, than should investors with shorter investment horizons. The idea is that the riskiness of stocks diminishes with the length of an investor's time horizon subsequent to the "time diversification" effect. According to Radcliffe (2002), for young individuals, the value of security investments represents a smaller fraction of their true wealth (present value of future income) than for individuals approaching retirements. Hence, they may take greater risk in their security portfolios when they are young. There is extensive economic research on the question, whether rational investment consultants should advise younger investors with longer investment horizons to hold more risky assets, like stocks and index funds, than older investors with shorter investment horizons (Siebenmorgen and Weber 2000).

Samuelson (1963) (in Siebenmorgen and Weber 2000) launched this discussion by examining single and repeated decisions under risk. He proves that an expected utility-maximizer would never accept a series of lotteries if he is not willing to accept only one single lottery. Predicated on the results, Samuelson (1969) (in Booth 2002; Graflund and Nilsson 2002) then preaches that it is an exact theorem that investment horizon has no effect on the portfolio proportion. Another research was conducted by Albrecht et al. (2001) who examined risk and performance of long-term stock investments in Germany, finding that the question whether stocks dominate bonds or other less risky investments in the long run counts on the used definition of risk. Using different forms of shortfall measures to quantify risk, they find that risk measures have a persistent characteristic, meaning that the corresponding risk measure does not converge rapidly but rather slowly against zero and that even for very long time horizon (30 years), the risk remains at a substantially high level. Accordingly, investors should beware to believe that relative risk in the long-term horizon is lower than that in the short-term horizon since it hinges on the definition of the risk. They conclude that the analysis of mean excess loss reveals the true danger of a long-term investment in stocks. From a worst-case perspective, the risk of a stock investment increases with the investment period and reaches substantial levels.

However, those prepositions are obviously contradictory with the recommendations of professional advisors who generally recommend variations on "your age in bonds rule", that is at age 30 you should have 30 percent in bonds while at age 70 you should have 70 percent.

This recommendation is in line with our discussion above that investors who have long investment horizons may harness a benefit of lower relative risk in the long run compared to the investors whose investment horizons are short. Besides, Swedroe (1998) proposes two reasons for the recommendation: (1) as the investment horizon increases, so does the likelihood that equities would outperform the "safer" fixed-income alternatives and (2) as the investment horizon increases, so does the risk that inflation would outrun the returns provided by the fixed-income assets.

Much empirical research has yielded results consistent with standard advice given by financial planners to their investors. Historically, holding an investment in equities for a long horizon has lowered the risk of losing money (Yoo 1998). He investigated the Standard & Poor's 500 Composite Index during the period of 1871-1998, and finds that holding equities for a long horizon hardly produces a loss; however, it does not shrink the range of probable outcomes. Anderson and Settle (1996) and Schooley and Worden (1999) (in Siebenmorgen and Weber 2000) also show that long-term investors in fact tend to allocate a greater percentage of their funds to risky investments. Derivatives Strategy (1996) delineates that pension funds increase their allocation in equity assets from 34 percent to 55 percent as the investment horizon changes from 1 year to 10 years due to a reduction in the risk or volatility of equity investments when held over a longer period.

Booth (2002) utilized a model based on chance-constrained programming in order to reconcile the standard advice given by financial planners with the orthodox results from financial economists that the equity allocation is independent of the time horizon. He eventually finds that in the United States, equity allocation increases with the time horizon although the importance of that allocation to the overall portfolio decreases. Graflund and Nilsson (2002) conducted research on the relevance of switching regimes and investment horizon on the four largest stock markets in the world: the United States (S&P 500), Japan (Nikkei), the United Kingdom (FTSE), and Germany (DAX). They established optimal portfolios for investors with investment horizons ranging from 1 month to 10 years. Given a specific regime, an investor is inclined to increase the exposure to stocks when the investment horizon increases. However, Japan is the exception and this is consistent with the finding of Kasuga and Iwamoto (1998). Graflund and Nilsson (2002) reveal that the investor would hold risky assets both since the expected returns are higher than the risk-free rate and since it would serve as an intemporal hedge.

Subsequently, Strong and Taylor (1999) (in Siebenmorgen and Weber 2000) took historical data to confirm such a time diversification that had positive impacts on portfolio allocation problem. Depending on the investment strategy and the utility function of the investors, they were able to rationalize empirically more risky assets in portfolios for longer investment horizons.

Siebenmorgen and Weber (2000) conducted empirical research in Germany where they delivered 110 questionnaires to advanced finance students at M.B.A. Program of the University of Mannheim. They find a significant difference between one-year and five-year portfolio risk envisioned by the participants. When the participants thought of the short-term investment horizon, they invested 28.4 percent in the risk-free asset. For long-term investment horizon, however, they were prone to invest in more risky portfolios with a mean proportion of the risk-free asset of 23.5 percent. Moreover, the evidence exhibits that 51 of the participants increased the portfolio risk for the long-run portfolio compared to their short-term portfolio whereas only 33 participants accepted less portfolio risk for the five-year investment horizon compared to their one-year investment horizon. They conclude that the participants' biases in volatility forecasts and subjective risk assessments significantly influence the willingness to accept the portfolio risk. However, volatility forecast is not synonymous with subjective risk assessment, and Siebenmorgen et al. (2000) and Siebenmorgen and Weber (2000) prove that it is the perceived risk or subjective risk assessment that has a higher explanatory power on asset selection.

The facts that the recommendations of professional advisors and "sages" are so at odds with the orthodox financial theory, and that the topic is so fundamental in finance have tempted significant discussion over the year. The conflict between the professional investment advice with the orthodox financial economic theory has been termed a "puzzle", which has withstood various tweaks to it in order to generate conclusions consistent with reality. Hence, the first hypothesis in this study is:

H_1: *Investment decision (allocation of funds in each asset in a portfolio) in the short investment horizon diverges with the investment decision in the long investment horizon for Indonesian investors.*

Mean reversion, although it sounds formidable, is a simple statistical concept. The concept is more popular with the term "regression to the mean" (Dreman 1998). This statistical phenomenon was noted over 100 years ago by Sir Francis Galton, a pioneer in eugenics. What interesting is that both of proponents of efficient market hypothesis and proponents of behavioral finance claim that the mean reversion phenomenon is in favor of each side. In a world of certainty, efficient allocation of capital would be evidenced by equality of the yield for all forms of investments. However, when we turn to actual world of uncertainty, we find that the yield realized on alternative forms of investment differ drastically (Hirshleifer 1964). He subsequently explains that in general, there are two main types of responses to this evidence. On the one hand, one school reveals that the evidence indicates imperfection of capital market where it is rife with rationing, ignorance, differential tax treatments, reluctance to finance investment from external funds, slow adjustment process, etc. On the other hand, another school maintains that the divergence of observed yields conceals an underlying harmony of the capital market. Those who hold it feel that the search for a consistent structure amid the seeming confusion of observed yields would ultimately be rewarded.

An efficient market can be defined as a market in which prices of securities quickly and fully reflect all available information (Jones 2000; Elton and Gruber 1995). Thus, information is the key to the determination of stock prices and accordingly is the central issue of the efficient market concept. A market is said efficient relative to any information set if investors are unable to earn abnormal profits by using the information set in their investing decisions since it is already impounded in prices (Jones 2000). The information embraces: (1) past information, (2) current information, and (3) information that can be inferred. Academics and practitioners usually discuss the efficient market concept in the form of the efficient market hypothesis. The efficient market hypothesis, proposed by Fama (1970), is an idea that securities markets are efficient, with the prices of securities reflecting their economic value or intrinsic value (in Fama 1998). Therefore, it makes sense to reveal that assets are priced in such a manner that investors are not able to exploit any discrepancies and earn abnormal returns after considering all transaction costs. The efficient market hypothesis can be divided into three cumulative types: (1) weak form, where historical price and volume data should already be reflected in current prices and should be of no value in predicting future price changes; (2) semistrong form, where this form is a more comprehensive level of market efficiency that encompasses not only known and publicly available market data, but also all publicly known and available data; and (3) strong form, where prices are believed to reflect all information, either public or private information.

After the emergence of the efficient market hypothesis, worldwide academics have been endeavoring to empirically examine the hypothesis. Most of the evidence exhibits that efficient market hypothesis obviously holds, at least up to the semistrong-form efficiency. It indicates that investors and capital markets behave rationally such that investors who try to capture abnormal returns by exploiting information will earn nothing although in the short run, they may be skillful or lucky to get abnormal returns. However, many empirical results also show deviations from the efficient market hypothesis. Fama (1998) who defend the efficient market hypothesis calls them market anomalies. By definition, market anomalies are techniques or strategies that appear to be contrary to an efficient market (Jones 2000).

The efficient market hypothesis reached the height of its dominance in academic circles around the 1970s. Faith in the hypothesis was eroded by a succession of discoveries of anomalies, many in the 1980s, and of evidence of excess volatility of returns (Shiller 2002). The salient market anomalies are:

1. ***P/E ratio effect.*** Findings of empirical studies exhibit that low P/E ratio stocks tend to outperform the high P/E ratio stocks. Basu (in Jones 2000) also proves that low P/E ratio stocks generally have higher risk-adjusted returns than stocks with high P/E ratios. Moreover, the P/E ratio effect remains significant even after adjustments are made for differences in firm size.
2. ***Size effect.*** Size effect is the observed tendency for smaller firms to have higher stock returns than do large firms. Zunna, Inc. (2001) examined the New York Stock Exchange, and proves that in the period of 1996-2000, small cap stocks performed better than did large cap stocks. The result was substantiated for a longer investment horizon.
3. ***January effect.*** This is the observed inclination that abnormal returns are more often found in January than in other months, especially for small-company stocks. Algifari (1999) finds a Monday effect on the Indonesian capital market. He empirically proves that stock returns on Monday were lower than those on other trading days in Indonesia.

There are virtually many other market anomalies. The most prominent one is the investor overreaction hypothesis. The hypothesis is underlain by the burgeoning of behavioral finance. According to Shefrin (2000) and Shiller (2002), behavioral finance is financial science that applies broader social science perspectives, including psychology and sociology, and acknowledges their implications on financial behavior. While traditional finance is built on the preposition that investors act rationally on the basis of utility theory, behavioral finance recognizes that investors can and do behave irrationally (Shiller 2001; Barberis and Thaler 2002). Shefrin (2000) elaborates that error is indeed human, but financial practitioners of all types, from portfolio managers to corporate executives, commit the same mistakes repeatedly. Nevertheless, absorbing all lessons of behavioral finance does not mean that we must reject the market efficiency (Barberis and Thaler 2002). Instead, we have to realize that people may sometimes be trapped into cognitive bias which may entice them to deviate from rational behavior. According to Shefrin (2000), there are three themes that distinguish the traditional finance from the behavioral finance:

1. Heuristic-driven bias. Behavioral finance believes that financial practitioners commit errors since they hinge on rules of thumb whereas traditional finance does not acknowledge the use of rules of thumb. One example of the rule of thumb is: past performance is the best predictor of future performance, thus we must invest in a mutual fund showing the best five-year record. Therefore, practitioners hold biased beliefs that predispose them to commit errors. This bias is labeled heuristic-driven bias.

Traditional theories of finance posit that the pricing of securities in financial markets should be conducted according to the quality of their underlying technical fundamentals (MacGregor et al. 2000). However, research on financial markets has indicated that factors other than technical fundamentals are often used by market participants to gauge the value of securities. This phenomenon may be quite prevalent in markets for initial public offerings (IPOs) where securities lack a financial history. MacGregor et al. (2000) find that imaginary and affect are part of a coherent psychological framework for evaluating classes of securities, but the framework may have low validity for predicting performance.

Crowell (1994) summarizes the sources of cognitive bias into: (1) representativeness and (2) aversion to regret. According to Tversky and Kahneman (1982) (in Crowell 1994), representativeness heuristic means that we evaluate the probability of an uncertain event by the degree which it: (a) is similar in essential properties to its parent population or previous events and (b) reflects the salient features by which it is generated. Hence, Shefrin and Statman (1984) find that prominent investors overestimate the probability that a big company is a good stock since good stocks are similar to big companies even though they realized that small cap stocks usually outperform the large cap stocks (in Shefrin 2000). Meanwhile, aversion to regret is acute when an individual must take a responsibility for the final outcome. Aversion to regret is different from aversion to risk (Crowell 1994). For the example of choosing stocks, aversion to regret drives to a preference for stocks of good companies. The choice of stocks of bad companies involves more personal responsibility and higher potential for regret. Conversely, if investors own stocks of good companies and their prices then slump, the investors may argue that unforeseeable events have occurred and accordingly they feel no regret.

Actually, there are other possible sources of the cognitive bias, such as peer pressure, availability bias, anchoring, hindsight bias, social reality, overconfidence, and so on (Institute of Psychology and Markets, 2000).

2. Framing effect. Behavioral finance postulates that in addition to objective considerations, practitioners' perceptions of risk and return are strongly influenced by how decision problems are framed. In turn, traditional finance assumes frame independence, meaning that practitioners view all decisions through the transparent and objective lens of risk and return.

As discussed in the previous section, investors rely on historical returns to set their expected returns since future returns are uncertain. However, the method of describing or exhibiting the historical returns per se may influence the expected returns formulated by an investor. For instance, Crowell (1994) states that people's brains handle visual images much better than a list of numbers. Besides, name of an asset may also influence the investment decision, and hence may enthuse overvaluation and undervaluation (Siebenmorgen and Weber 2000).

Predicated on expected utility theory, the utility of an outcome is weighed by its probability of occurrence and accordingly, individuals should be indifferent to choices involving equal expected utility (Elton and Gruber 1995). Under the classic utility theory, participants are expected to choose among risky alternatives in order to maximize their expected final asset position. However, Kahneman and Tversky (1979) (in Hunton, McEwen, and Bhattacharjee 2001) propose a "prospect theory", which postulates that gains and losses are coded relative to the status quo, not to the final position. The reference point may shift away from status quo if the participant has suffered a recent loss and failed to adapt to it, or failed to achieve an expected gain. Hunton et al. (2001) empirically examined the prospect theory, and conclude that when placed in a loss domain, individuals become more risk-seeking and consequently choose riskier alternatives. Conversely, when placed in a gain situation, investors prefer certainty to risk since their expectation levels have either met or exceeded such that their reference points have not shifted away from the status quo. Bernstein (in Rothery 2001) made a simple survey in which he offered a tricky choice. Participants could choose A to acquire a guaranteed gift of $3,000 or they might choose B to have 80 percent chance of winning $4,000 with 20 percent chance of earning nothing. The result was 80 percent of participants answered A. Subsequently, he offered another alternative. Participants might choose A to have 80 percent chance of losing $4,000 with 20 percent chance of breaking even or they could choose B in order to acquire a guaranteed loss of $3,000. The result was unbelievable in which 92 percent of the participants answered A. Booth (2002) reveals that investors are "loss-averse" rather than "risk-averse". This is not a mere semantic distinction, but recognizes that risk is relative to the investors' current status and not to some absolute levels.

3. Inefficient markets. Behavioral finance preaches that the heuristic-driven bias and the framing effect engender market prices to deviate from fundamental values, thereby leading to inefficient markets. On the contrary, traditional finance retains its stand that each security coincides with its intrinsic value and accordingly, markets are perfectly efficient.

As mentioned above, investor overreaction hypothesis is one of the most prominent evidence of market anomalies. De Bondt and Thaler (1985) find that over the period of 1926-1982, stocks, represented on the Center for Research in Security Prices data set of the University of Chicago, whose returns had been in the top decile across firms over three years (winner stocks) tended to show negative cumulative returns in the succeeding three years. Conversely, they find that loser stocks whose returns had been in the bottom decile over the prior three years were prone to show positive returns over the succeeding three years. In other words, they find that when stocks were ranked on 3- to 5-year past returns, past winners tended to be future losers, and vice versa. They argue that investors overreact to events in a predictable manner, overvaluing the best alternatives while undervaluing the worst. Premiums and discounts then prevail since the past winners become overpriced and past losers become underpriced. Eventually, these circumstances reverse as assets regress toward the mean. In forming expectations, investors give too much weight to the past performance of firms and too little to the fact that performance tends to mean-revert. Meanwhile, Shefrin and Statman (1985) (in Shefrin 2000) discovered the "disposition effect". They explain that investors are predisposed to holding losers too long and selling winners too early. The evidence is substantiated by the research of Tiwari (1999) who proposes that if there is a falling interest rate condition, investors had better sell the bond as soon as possible whereas under rising interest rate condition, investors should hold the bond longer. In this case, investors believe in mean reversion, thereby waiting the loser assets to revert while they shun losses by selling winning assets as soon as possible.

Although many recent studies on long-term returns suggest market inefficiency, Fama (1998) calmly responded that market efficiency theory should not and could not be discarded for two reasons:

1. An efficient market generates categories of events that individually suggest that prices overreact to information. However, in an efficient market, apparent underreaction would be about as frequent as overreaction. If anomalies split randomly between underreaction and overreaction, they are consistent with market efficiency.
2. If the long-term return anomalies are so large that they could not be attributed to chance, then an even split between overreaction and underreaction is a pyrrhic victory for market efficiency. Besides, long-term return anomalies are sensitive to methodology. They tend to become marginal or disappear when exposed to different models or when different statistical approaches are utilized to measure them.

Subsequently, Fama (1998) elaborates that investors falsely perceive that there are two earnings regimes. In regime A, earnings are mean-reverting. When investors decide to hold regime A, a stock's price underreacts to a change in earnings since investors mistakenly think that the change is likely to be temporary. When this expectation is not confirmed by later earnings, the stock price shows a delayed response to earlier earnings. Regime A refers to the disposition effect proposed by Shefrin and Statman. In regime B, a run of earnings changes in the same sign leads investors to perceive that a firm's earnings are trending. Once investors are convinced that regime B holds, they incorrectly extrapolate the trend and then the stock price overreacts. Since earnings are a random walk, the overreaction is exposed by future earnings, leading to the reversal of long-term returns. Regime B is exemplified by overreaction hypothesis of De Bondt and Thaler.

Accordingly, consistent with the efficient market hypothesis that the anomalies are chance results, apparent overreaction of stock prices to information is about as common as underreaction (Fama 1998). Furthermore, post-even continuation of pre-event abnormal returns is also as frequent as post-even reversal. Most importantly, according to Fama (1998), the long-term return anomalies are fragile in which they may disappear with reasonable changes in the way they are measured.

We can see from the review above that both overreaction and underreaction (disposition effect) hypotheses are focused on mean-reverting-return phenomenon. Behavioral finance proponents have been proposing the belief in mean reversion as their salient weapon to prove that market efficiency cannot be perfectly held. On the other hand, Fama, the pioneer and the main proponent of market efficiency postulates that mean reversion of asset returns exactly shows the market efficiency since it proves that stock prices are at random walk, hence either underreaction or overreaction hypothesis has the same possibility and frequency to persist. Besides, mean reversion also exhibits that market can automatically correct the mistakenly-set prices.

Mean reversion or regression toward the mean was discovered over 100 years ago by Sir Francis Galton and it was named the law of universal regression. In his famous paper, Galton (1886) (in Gujarati 1995; Dreman 1998) finds that although there is a tendency for tall parents to have tall children and for short parents to have short children, the average height of children born of parents of a given height tends to move or regress toward the average height in the population as a whole. The result of Galton can be then applied for the securities market. According to the classic work of Ibbotson and Sinquefield (in Dreman 1998), stocks had returned 10.5 percent annually over the last 70 years while the returns on investing in bonds were 5.6 percent. Short-term returns that are extremely high or low should be treated as deviations from long-term norms (Graflund 2001). Accordingly, investors who realize and believe in mean-reverting phenomenon will as much as possible invest in stocks when their investment horizons are long. The main rationale is that they are convinced that stocks will always give positive and higher returns than will fixed-income securities in the long-term condition. Hence, they will not care about the risk and are sure that average stock returns will always outperform those of fixed-income securities since it is a long-term norm of regression toward the mean. Siebenmorgen and Weber (2000) empirically find that German market participants significantly believe in mean-reverting asset prices, and it is the main explanation for their finding that investors whose investment horizons are long are prone to allocate higher proportion of their funds in stocks. Similar result is found by Frennberg and Hansson (1993) (in Graflund 2001) who researched on the Swedish stock market, and prove that stock returns exhibit a mean reversion. Risager (1998) also finds that mean reversion prevails on the Danish stock market. In contrast, Graflund (2001) using monthly nominal data for the period of 1947-1998 finds evidence that Nordic stock markets (Finland, Sweden, Denmark, and Norway) are not subject to mean reversion. This finding is in line with the result of Nielsen and Olesen (2000) who find a weak support for mean reversion on the Danish stock market. They remark that mean reversion recently found on many capital markets is due to the recent prevalent high return-high volatility regime.

Subsequent to the contrary evidence in the international markets, we examine the mean-reverting-asset-prices phenomenon as our second hypothesis:

H_2: Indonesian investors believe in mean-reverting asset prices.

Research Method

Sample

We used the students of Master of Science, Master of Management, and Doctorate Programs at the Faculty of Economics and Business, Universitas Gadjah Mada, Indonesia as the sample in this research. We delivered questionnaires to 217 students. Several rationales underlying our decision are: (1) the population has an infinite characteristic; (2) we do not have a complete list of the population; (3) compared to other types of investors, students are practitioners who capture and master the techniques of investment analysis and portfolio management; and (4) the students of Master of Management Program mostly have backgrounds of practitioners, such as brokers and investment managers, whereas those of Master of Science and Doctorate Programs are mostly academics. Hence, the combination of practitioners' and academics' views may lead to more reliable research evidence.

In order to confirm that the participants really understood the research questions, we required that the participants be students who were taking or had completed the portfolio management course. Nevertheless, students who passed intertwined courses such as corporate finance and financial institutions management were admitted as well.

Data Collection Method

Data collected in this study comprised both primary and secondary data. As mentioned in the previous section, we distributed questionnaires to 217 respondents. The questionnaire consisted of 4 pages. *On the first page*, participants were requested to envisage as though they had inherited IDR1,000,000,000, and they would have invested the money (not for consumption). We then offered three investment alternatives: (1) Indonesian Composite Stock Price Index-Fund (IHSG-Fund), (2) Japanese Nikkei 225 Index-Fund (N225-Fund), and (3) U.S. Dow Jones Industrial Average Index–Fund (DJIA-Fund).

We exhibited the historical returns on those three investment alternatives. Half of the respondents got the historical annual return information, and the others were exhibited historical five-year return information. Subsequently, in depicting the historical returns, we divided the information into five informational conditions:

R+ (1): We showed the participants the names of the three investment alternatives and we also presented historical annual returns on those investments,

R+ (5): In this condition, we again presented the names of the investment alternatives, but we showed the historical five-year returns,

R- (1): The respondents did not know the names of the investment alternatives. They were labelled "Stock Fund 1", "Stock Fund 2", and "Stock Fund 3". In addition, we showed the historical one-year returns,

R- (5): Once again people did not know the real names of the investment alternatives, but they saw the historical five-year returns,

N: In this condition, we only showed the names of the investments without any historical return information.

The second page contained questions regarding the one-year investment horizon. The respondents might envisage that next year would be their pension ages, and they could not withdraw the money up to one year. We asked our participants three types of questions:

1. Market expectations by estimating a lower bound (10%-quantile), a median value (50%-quantile), and an upper bound (90%-quantile) for IDR1,000,000,000 investment in each of the investment alternatives.
2. Subjective risk assessments on each of the three risky investments. The

respondents were requested to assess the risk of those three investment alternatives on a scale from 1 to 9 in which 1 means no risk and 9 refers to the highest risk.

3. Portfolio allocation offering a risk-free investment opportunity and the three risky investment alternatives. Herein, we used an artificial risk-free investment that constantly gave a guaranteed annual return of 10 percent.

No sooner did they complete filling out their answers on page 2 of the questionnaires, the participants went on opening the next page of the questionnaires in which they were not allowed to reopen page 2. *Questions on page 3* resembled those on page 2 with a crucial distinction that we altered the investment horizon into the five-year investment horizon. At the time, the participants were requested to envisage that they had to invest the money but could not withdraw the money up to the next five years. Eventually, on *page 4*, we asked extra questions in order to recognize something about the belief in mean reversion. The participants had to imagine that IHSG-Fund (Stock Fund 1 in condition R-) would have either won 50 percent or lost 25 percent in the first year of investing. We desire to know their expectations regarding this investment for the following four years, both after gaining returns of 50 percent and after losing 25 percent in the first year. In this case, we again asked for estimates of the lower bound, the median value, and the upper bound. We required that the respondents not use the information of other respondents' questionnaires to affirm that cognitive bias did not influence the participants' decisions.

Variables, Measures, and Data Analysis Methods

In the wake of collecting the data, we compiled them to analyze and examine the hypotheses.

Hypothesis 1: Investment decisions (allocation of funds in each asset in a portfolio) in the short investment horizon diverge with the investment decisions in the long investment horizon for Indonesian investors.

On page 2 and page 3 of our questionnaire, we requested the participants to allocate their funds in a portfolio that consisted of a risk-free investment opportunity that offered a guaranteed annual return of 10 percent, and three risky investment alternatives, namely IHSG-Fund, N225-Fund, and DJIA-Fund. The allocation might be compiled for both short-term horizon (one year) and long-term horizon (five years).

It is imperative to explain that we could not include the risk-free asset for calculating the portfolio risk since the covariance between any asset and the risk-free asset must be zero. Hence, in order to calculate the portfolio risk, we made adjustments on the asset allocation of each respondent. In order to obtain the adjusted proportion of funds invested in IHSG-Fund, we use the following adjustment procedure:

$$W_{IHSGj1} = p_{IHSGj1} + \frac{p_{IHSGj1}}{(p_{IHSGj1} + p_{N225j1} + p_{DJIAj1})} . p_{RFj1} \quad \text{.. (1)}$$

w_{IHSGj1} = adjusted proportion of funds of participant *j* invested in IHSG-Fund in one-year investment horizon,

P_{IHSGj1} = proportion of funds invested in IHSG-Fund written by participant j on the questionnaire in one-year horizon,

P_{N225j1} = proportion of funds invested in N225-Fund written by participant *j* on the questionnaire in one-year horizon,

P_{DJIAj1} = proportion of funds invested in DJIA-Fund written by participant *j* on the questionnaire in one-year horizon,

P_{RFj1} = proportion of funds invested in risk-free asset written by participant *j* on the questionnaire in one-year horizon.

Equation (1) was then replicated to find the adjusted proportion of funds invested in N225-Fund and DJIA-Fund of each participant, both in one-year investment horizon and in five-year investment horizon. To find the adjusted proportion of funds invested in N225-Fund in one-year horizon, we replaced the numerator in the equation (1), namely from P_{IHSGj1} to P_{N225j1}, and so forth.

In the wake of collecting the data, we calculated the portfolio risk of each respondent by harnessing the Markowian model.

$$\sqrt{\sum_{i=1}^{3} W_{ij1}^{\,2}.\sigma_{ij1forcast}^{\,2} + \sum_{i=1}^{3}\sum_{u=1}^{3} W_{ij1}.W_{uj1}.\sigma_{1j1forcast}.\sigma_{uj1forcast}.\rho_{iuj1forcast}} \quad \text{...(2)}$$

$$\sigma_{Pj5} = \sqrt{\sum_{i=1}^{3} W_{ij5}^{\,2}.\sigma_{ij5forcast}^{\,2} + \sum_{i=1}^{3}\sum_{u=1}^{3} W_{ij5}.W_{uj5}.\sigma_{1j5forcast}.\sigma_{uj5forcast}.\rho_{iuj5forcast}} \quad \text{..(3)}$$

s_{Pj1} = portfolio risk of participant *j* in one-year investment horizon,

s_{Pj5} = portfolio risk of participant *j* in five-year investment horizon,

w_{ij1} = adjusted proportion of funds invested in asset *i* (IHSG-Fund: i=1, N225-Fund: i=2, DJIA-Fund: i=3) of participant j in one-year horizon,

w_{ij5} = adjusted proportion of funds invested in asset *i* (IHSG-Fund: i=1, N225-Fund: i=2, DJIA-Fund: i=3) of participant j in five-year horizon,

$s_{ij1forecast}$ = standard-deviation-of-expected-return forecast on investment *i* of participant *j* in one-year horizon,

$s_{ij5forecast}$ = standard-deviation-of-expected-return forecast on investment *i* of participant *j* in five-year horizon,

w_{uj1} = proportion of funds invested in asset *u* (IHSG-Fund: u=1, N225- Fund: u=2, DJIA-Fund: u=3) of participant j in one-year horizon,

w_{uj5} = proportion of funds invested in asset u (IHSG-Fund: u=1, N225- Fund: u=2, DJIA-Fund: u=3) of participant *j* in five-year horizon,

$s_{uj1forecast}$ = standard-deviation-of-expected-return forecast on investment u of participant *j* in one-year horizon,

$s_{uj5forecast}$ = standard-deviation-of-expected-return forecast on investment u of participant j in five-year horizon,

$r_{iu1forecast}$ = correlation between expected return on asset *i* in one-year horizon and expected return on asset *u* in one-year horizon, where $r_{iu1forecast} = 1$ for i = u,

$r_{iu5forecast}$ = correlation between expected return on asset *i* in five-year horizon and expected return on asset u in five-year horizon, where $r_{iu5forecast} = 1$ for i = u.

In order to examine the third hypothesis, we compared s_{Pj1} to s_{Pj5} for finding evidence whether the asset allocation in the portfolio in short investment horizon is the same as or significantly different from that in the long investment horizon. In other words, we wonder if the portfolio risk to be assumed in the short horizon is different from that in the long horizon. Using the Wilcoxon W-test, we might reject the null hypothesis if the p-value is lower than the predetermined credence level (a) of five percent. Alternatively, we also examined the difference between the proportion of funds invested in risk-free asset in the short horizon and the proportion of funds invested in the risk-free asset in the long horizon.

The framing effect was again tested utilizing the Kruskal-Wallis H-test, as examined in the two previous hypotheses. We desire to know whether the respondents who on page 1 of the questionnaires were given either only the names of the investment alternatives (N), only the historical returns (R-), or the names and the historical returns (R+), assumed the same portfolio risk (s_{Pj}) or significantly different. We checked for the framing effect in both one-year horizon and five-year horizon. Besides the testing, we also examined the possible influence of framing effect on the willingness to hold the risk-free asset in the long horizon (increased, decreased, or the same willingness to allocate the funds in the risk-free asset). Since the variables are discrete variables and in nominal scales, we used the chi-square (c^2) test to examine the effect.

Subsequently, we yearn to prove whether there is a difference between

s_{Pj} of the respondents who obtained the historical one-year return information on page 1 of the questionnaires and s_{Pj} of the respondents who acquired the historical five-year return information on page 1 of the questionnaires. We used the Mann-Whitney U-test to examine the statistical informational effect on the willingness to assume the portfolio risk. The test was made for both one-year and five-year investment horizons. Furthermore, we examined the possible influence of statistical informational effect on the willingness to hold the risk-free asset in the long horizon (increased, decreased, or the same willingness to allocate the funds in the risk-free asset). Again, we used the chi-square (c^2) test to examine the effect.

Hypothesis 2: Indonesian investors believe in mean-reverting asset prices

In the hypothesis 4, we desire to know whether the recommendations of investment managers that investors increase the proportion of riskier assets in their portfolios are derived from a belief in mean reversion. For that, we asked extra questions on page 4 of our questionnaire. The participants were requested to envisage that IHSG-Fund (Stock Fund 1 in condition R-) had either won 50 percent or lost 25 percent in the first year of investing. We want to know their expectations regarding this asset for the following four years, both after gaining returns of 50 percent and after losing 25 percent in the first year. In this case, we again asked for the estimates of lower bound, median value, and upper bound.

We utilized the estimator of Pearson and Tukey that had been applied by Siebenmorgen et al. (2000) and Siebenmorgen and Weber (2000). The formula is as follows:

$$\begin{aligned} E(R)_{ij} = {} & 0.3\ \ln(Y_{ijl}^{0.1}/1{,}000{,}000{,}000) + \\ & 0.4\ \ln(Y_{ijm}^{0.5}/1{,}000{,}000{,}000) + \\ & 0.3\ \ln(Y_{iju}^{0.9}/1{,}000{,}000{,}000) \end{aligned} \qquad \text{..(4)}$$

$E(R)_{ij}$ = expected return on investment *i* of participant *j*,
Y_{ijl} = lower bound estimate on investment *i* of participant *j*,
Y_{ijm} = median value estimate on investment *i* of participant *j*,
Y_{iju} = upper bound estimate on investment *i* of participant *j*.

$$\sigma_{1jforecast} = \sqrt{\begin{aligned} & [0.3\ \ln(Y_{ij}^{0.1}/1{,}000{,}000{,}000)^2 + \\ & 0.4\ \ln(Y_{ijm}^{0.5}/1{,}000{,}000{,}000)^2 + \\ & 0.3\ \ln(Y_{ij}^{0.9}/1{,}000{,}000{,}000)^2\ ] - [E(R)_{ij}]^2 \end{aligned}} \qquad \text{..(5)}$$

$s_{ijforecast}$ = standard-deviation-of-expected-return forecast on investment *i* of participant *j*,
Y_{ijl} = lower bound estimate on investment *i* of participant *j*,
Y_{ijm} = median value estimate on investment *i* of participant *j*,
Y_{iju} = upper bound estimate on investment *i* of participant *j*,
$E(R)_{ij}$ = expected return on investment *i* of participant *j*.

Using equation (4), we could transform the lower bound, the median value, and the upper bound into the conditional expected return on IHSG-fund of participant j for the subsequent four years after gaining 50 percent in the first year [denoted as $E(R)_{IHSGj1\rightarrow 5}|R_{IHSGj1} = \ln(1.5)$] and the conditional expected return on IHSG-fund of participant j for the subsequent four years in the wake of losing 25 percent in the first year [denoted as $E(R)_{IHSGj1\rightarrow 5}|R_{IHSGj1} = \ln(0.75)$]. Subsequently, utilizing equation (5), we were able to calculate their standard deviations, namely $\sigma_{IHSGj1\rightarrow 5forecast}|R_{IHSGj1} = \ln(1.5)$ and $\sigma_{IHSGj1\rightarrow 5forecast}|R_{IHSGj1} = \ln(0.75)$, respectively.

The historical returns on the three investment alternatives (IHSG-Fund, N225-Fund, and DJIA-Fund) were calculated, both one-year returns and five-year returns. We calculated the annual returns as follows:

$$R_{it} = \ln(i_{te}/i_{tb}) \quad \text{...(6)}$$

R_{it} = return on investment *i* (i = IHSG-Fund, N225-Fund, DJIA-Fund) in year t (t = 1970-2002 for N225-Fund and DJIA-Fund, but t = 1985-2002 for IHSG-Fund),

i_{te} = value or price of investment *i* the end of year *t*,

i_{tb} = value or price of investment *i* at the beginning of year *t*.

Therefore, we obtained $R_{IHSG1985}$-$R_{IHSG2002}$, $R_{N2251970}$-$R_{N2252002}$, and $R_{DJIA1970}$-$R_{DJIA2002}$. Subsequently, we calculated the average annual returns as follows:

$$\mu_{i1} = \frac{\sum_{t=1970}^{2002} R_{it}}{33} \quad \text{..(7)}$$

μ_{i1} = average annual return on investment *i*,

R_{it} = return on investment *i* in year *t*.

Equation (7) above was intended to calculate the average annual returns on N225-Fund and DJIA-Fund. However, for IHSG-Fund, we had to adjust the number of the years since we only had the historical data of IHSG from 1985.

$$\mu_{i1} = \frac{\sum_{t=1985}^{2002} R_{it}}{18} \quad \text{.......................................(8)}$$

μ_{i1} = average annual return on investment *i* (i = IHSG-Fund),

R_{it} = return on investment i (i = IHSG-Fund) in year *t*.

Eventually, we calculated the historical one-year return on each asset as follows:

$$R_{i1historical(point)} = e^{\mu i1} - 1 \quad \text{...(9)}$$

$R_{i1historical(point)}$ = historical one-year return on investment i,

e = the base of natural logarithms,

m_{i1} = average annual return on investment *i*.

The method of calculating historical five-year returns on each investment alternative was analogous with that of calculating the historical one-year returns.

We then calculated the standard deviation of the annual returns as follows:

$$\sigma_{i1} = \sqrt{\frac{\sum_{t=1970}^{2002} (R_{it} - \mu_{i1})^2}{33}} \qquad \text{..(10)}$$

σ_{i1} = standard deviation of annual return on investment *i*,

μ_{i1} = average annual return on investment *i*,

R_{it} = return on investment *i* in year *t*.

The equation above was used for calculating the standard deviation of the annual returns on N225-Fund and DJIA-Fund. However, for IHSG-Fund, we again had to adjust the number of the years as follows:

$$\sigma_{i1} = \sqrt{\frac{\sum_{t=1985}^{2002} (R_{it} - \mu_{i1})^2}{18}} \qquad \text{...(11)}$$

σ_{i1} = standard deviation of annual return on investment *i* (i = IHSG-Fund),

μ_{i1} = average annual return on investment *i* (i = IHSG-Fund),

R_{it} = return on investment i (i = IHSG-Fund) in year *t*.

Subsequently, we calculated the historical standard deviation of one-year return on each investment using the following formula:

$$\sigma_{i1historical\ (point)} = \sqrt{e^{2\mu_{i1}}.(e^{2\mu_{i1}} - 1)} \qquad \text{...(12)}$$

$\sigma_{i1historical(point)}$ = historical standard deviation of one-year return on investment *i*,

e = the base of natural logarithms,

μ_{i1} = average annual return on investment *i*,

σ_{i1} = standard deviation of annual return on investment *i*.

The calculation of the historical standard deviation of five-year returns on each investment alternative was analogous with that of historical standard deviation of one-year returns.

Using equations (6), (7), (8), (9), (10), (11), and (12), we obtained $E(R)_{IHSGj1}$ and $E(R)_{IHSGj5}$ with their standard deviations, viz. $\sigma_{IHSGj1forecast}$ and $\sigma_{IHSGj5forecast}$, respectively. Hence, due to the additivity of the log-returns (Siebenmorgen and Weber 2000), we calculated the unconditional expected return on IHSG-Fund of participant j for the next four years after the end of the first year using the following formula:

$$E(R)_{IHSGj1\rightarrow5} = E(R)_{IHSGj5} - E(R)_{IHSGj1} \qquad \text{..(13)}$$

It must be noted that $E(R)_{IHSGj1à5}$ is different from $E(R)_{IHSGj1\rightarrow5}|R_{IHSGj1} = \ln(1.5)$ and $E(R)_{IHSGj1\rightarrow5}|R_{IHSGj1} = \ln(0.75)$ where $E(R)_{IHSGj1\rightarrow5}$ is the unconditional expected returns yielded by harnessing the additivity of the log-returns whereas the latter two are the conditional expected returns after gaining 50 percent and losing 25 percent in the first year, respectively. However, $\sigma_{IHSGj1\rightarrow5forecast}{}^{1}\sigma_{IHSGj5forecast} - \sigma_{IHSGj1forecast}$. In order to find $\sigma_{IHSGj1\rightarrow5forecast}$, we have to utilize the following formula:

$$\sigma_{IHSGj5forecast}{}^2 = \sigma_{IHSGj1forecast}{}^2 + \sigma_{IHSGj1\rightarrow5forecast}{}^2 + 2\,Cov[E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5}] \quad \text{...(14)}$$

Subsequently, we looked for the covariance between the expected return on IHSG-Fund in the first year and the expected return on IHSG-Fund in the subsequent four years, in both winning 50 percent in the first year condition (denoted as $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_1$) and losing 25 percent in the first year condition (denoted as $[Cov(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow5})]_2$). We calculated the covariances using the following formula:

$$[E(R)_{IHSGj1\rightarrow5}|\,R_{IHSGj1} = \ln(1.5)] = E(R)_{IHSGj1\rightarrow5} + \frac{[Cov(E(R)_{IHSGj1},\ E(R)_{IHSGj1\rightarrow5}]_1}{\sigma_{IHSGj5forecast}} \times (\ln(1.5) - E(R)_{IHSGj1}) \quad \text{..(15)}$$

$$[E(R)_{IHSGj1\rightarrow5}|\,R_{IHSGj1} = \ln(0.75)] = E(R)_{IHSGj1\rightarrow5} + \frac{[Cov(E(R)_{IHSGj1},\ E(R)_{IHSGj1\rightarrow5}]_2}{\sigma_{IHSGj5forecast}} \times (\ln(0.75) - E(R)_{IHSGj1}) \quad \text{..(16)}$$

$[E(R)_{IHSGj1\rightarrow5}\,|\,R_{IHSGj1} = \ln(1.5)]$ = conditional expected return on IHSG-fund of vparticipant j for the subsequent four years after gaining 50 percent in the first year,

$[E(R)_{IHSGj1\rightarrow5}\,|\,R_{IHSGj1} = \ln(0.75)]$ = conditional expected return on IHSG-fund of participant j for the subsequent four years in the wake of losing 25 percent in the first year,

$E(R)_{IHSGj1\rightarrow5}$ = unconditional expected return on IHSG-Fund of participant j for the next four years after the end of the first year,

$E(R)_{IHSGj1}$ = expected return on IHSG-Fund of participant j in one-year investment horizon,

$\sigma_{IHSGj1forecast}$ = standard-deviation-of-expected-return forecast on IHSG-Fund of participant j in one-year investment horizon,

$[Cov(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow5})]_1$ = covariance between the expected return on IHSG-Fund of participant j in the first year and the expected return on IHSG-Fund of participant j in the subsequent four years, in the condition of gaining 50 percent in the first year,

$[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_2$ = covariance between the expected return on IHSG-Fund of participant j in the first year and the expected return on IHSG-Fund of participant j in the subsequent four years, in the condition of losing 25 percent in the first year.

Since $[E(R)_{IHSGj1\rightarrow5}|R_{IHSGj1} = \ln(1.5)]$, $[E(R)_{IHSGj1\rightarrow5}|R_{IHSGj1} = \ln(0.75)]$, $E(R)_{IHSGj1\rightarrow5}$, $E(R)_{IHSGj1}$, and $s_{IHSGj1forecast}$ were known, using equation (15) and equation (16), we could find $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_1$ and $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_2$. We then substituted $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_1$ and $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1à5})]_2$ into the equation (14) in order to obtain $(s_{IHSGj1\rightarrow5forecast})_1$ and $(s_{IHSGj1\rightarrow5forecast})_2$. It is realized that a covariance is derived from a correlation between two variables multiplied by their standard deviations. Hence, we then applied the concept into $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_1$ and $[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_2$ where:

$$[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_1 = \sigma_{IHSGj1forecast} \cdot (\sigma_{IHSGj1\rightarrow5forecast})_1 \cdot \rho(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_1 \quad \text{...(17)}$$

$$[Cov(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})]_2 = \sigma_{IHSGj1forecast} \cdot (\sigma_{IHSGj1\rightarrow5forecast})_2 \cdot \sigma(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_2 \quad \text{...(18)}$$

Eventually, utilizing Equations (17) and (18), we could find $\rho(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_1$, which is the correlation between the expected return on IHSG-Fund of participant j in the first year and the expected return on IHSG-Fund of participant *j* in the subsequent four years, in the condition of gaining 50 percent in the first year, and $r(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_2$, which is the correlation between the expected return on IHSG-Fund of participant j in the first year and the expected return on IHSG-Fund of participant j in the subsequent four years, in the condition of having a loss of 25 percent in the first year.

We examined $\rho(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_1$ and $\rho(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_2$ by harnessing the one-sample t-test. We might reject the null hypothesis if $r(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_1$ and $r(E(R)_{IHSGj1}, E(R)_{IHSGj1\rightarrow5})_2$ were significantly below zero at the credence level of five percent. In other words, if both correlations are significantly negative, it indicates that investors who remarkably experience gaining 50 percent in the first year tend to expect less for the next four years and on the contrary, the investors who sadly experience having a loss of 25 percent in the first year are prone to expect higher returns for the subsequent four years.

Data Analysis and Discussion

The first null hypothesis postulates that the asset allocation in the portfolio in short investment horizon

Table 1. **Normality Tests on the Portfolio Risk Data**

Variable	Kolmogorov-Smirnov Z
σ_{Pj1}	0.545
σ_{Pj5}	1.402*

* significant at the credence level of 5 percent,

** significant at the credence level of 1 percent

Table 2. **Tests of the Difference between Portfolio Risk in One-year Horizon and That in Five-year Horizon**

Variable		Mean	Median	Z
σ_{Pj}	**One-year**	0.388610729	0.397088988	-11.120 **
	Five-year	0.644150315	0.668705984	

* significant at the credence level of 5 percent,

** significant at the credence level of 1 percent.

is the same as that in the long investment horizon The portfolio allocation in each asset in the short horizon and that in the long horizon mirror the influence of different investment horizons on the investment decision. Besides, the difference between the risk-free asset holding in the short horizon and that in the long horizon was also examined. We firstly tested the normality of the data whose results are exhibited in the Table 1.

The results above show that at the confidence level of five percent, the data of portfolio risk in the long investment horizon were not normally distributed. Consequently, we used the nonparametric tests to examine the first hypothesis.

In order to examine the first hypothesis, we compared σ_{Pj1} with s_{Pj5} using the Wilcoxon test. Since the portfolio risk is influenced by the weights or the proportion of funds on each asset and the covariances among the assets, we are able to know whether the allocation of funds in the risky assets in the short horizon is the same as that in the long horizon. In other words, we can find whether the investment decisions of participants in the shorter investment horizon are the same as those in the longer investment horizon. The testing results are shown in Table 2.

From the Table 2, it is significantly proved that the participants are inclined to assume higher portfolio risk in the longer investment horizon than the portfolio risk in the shorter investment horizon. Accordingly, the participants' underestimation of risk in the longer investment horizon drives to the higher risk-adjusted expected returns in the long investment horizon than the risk-adjusted expected returns in the short horizon. Finally, it leads to their willingness to assume higher portfolio risk in the longer investment horizon than in the shorter investment horizon. Hence, we may reject the first null hypothesis since there is a significant difference between the portfolio risk to be assumed by the respondents in the short investment horizon and that in the long investment horizon. The finding seems more consistent with the common belief of investment practitioners and the recommendation of investment managers for their investors that the longer their investment horizons, the higher the invest-

Figure 1. **Asset Allocation in Short Investment Horizon**

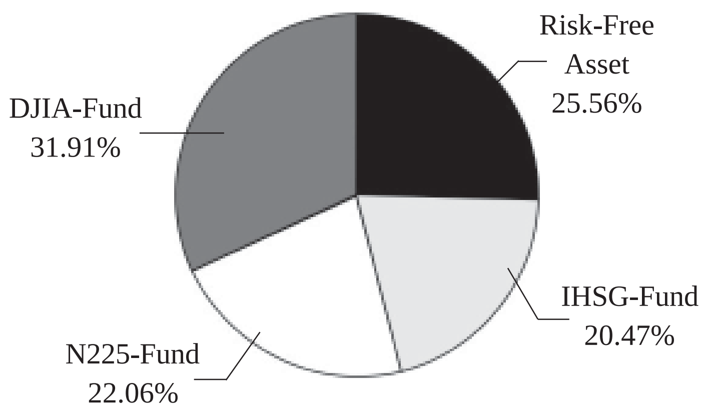

Figure 2. **Asset Allocation in Long Investment Horizon**

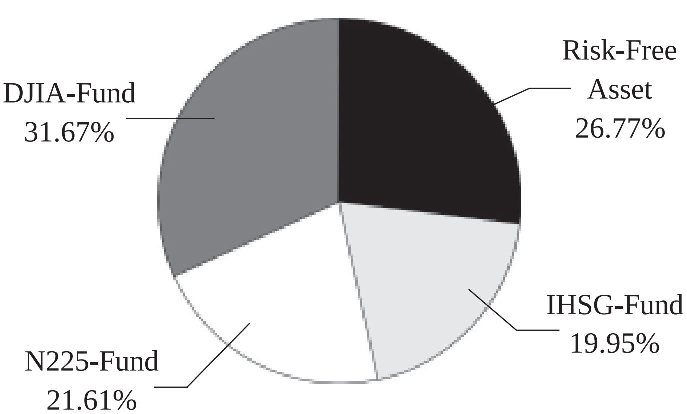

Table 3. **Tests of the Difference between Risk-free Asset Holding in One-year Horizon and That in Five-year Horizon**

Variable		Mean	Median	Z
RF	**One-year**	0.255610465	0.200000000	-1.520
	Five-year	0.267674419	0.205000000	

* significant at the credence level of 5 percent,

** significant at the credence level of 1 percent.

ment risk to be assumed by investing in riskier assets.

Alternatively, we also examined the difference between the risk-free asset holding in the short horizon and that in the long horizon. The result is depicted in Figure 1, Figure 2, and Table 3.

From the data received, we have calculated and found that 58 participants increased their allocation in the risk-free asset, 41 respondents decreased their risk-free asset proportion in their portfolios, and 73 respondents allocated the same proportion of risk-free asset in their portfolios. It is very startling to see in Figure 1 and Figure 2 that on average, the participants are prone to increase their allocation in the risk-free asset in the longer investment horizon. Indeed, most of the respondents desire to allocate the same proportion of their funds in the risk-free asset. Moreover, the difference between the risk-free asset holding in the short investment horizon and that in the long investment horizon is not significant. Nevertheless, the finding that the participants tend to have a willingness to assume higher portfolio risk in the longer investment horizon while they tend to increase their allocation of funds in risk-free asset as well seems to be conflicting one another. This study's result yields a phenomenon associated to the basic assumption of financial theory. The financial theory postulates that investors are risk averse, meaning that in order for the investors to assume higher risk on their investments, they must be sufficiently compensated by higher expected returns. However, the evidence of this study indicates that the investors are loss averse. They tend to have a willingness to assume higher risk on their portfolios in the long investment horizon as they tend to give higher risk-adjusted expected returns in the long horizon, but at the same time they also increase their holdings of risk-free asset. Accordingly, not only are the investors risk averse, but they are also loss-averse investors.

Subsequently, the possibility that the framing effect influences the investment decisions was examined. The Kruskal-Wallis test was harnessed to find whether the participants who received either only the names and descriptions of the three risky investments (N), only the historical returns

(R-), or the names and the historical returns (R+) had a willingness to make the same investment decisions by assuming the same portfolio risk. The results are depicted in the following table.

Table 4 shows that the framing effect significantly influences the investment decisions, both in short investment horizon and in long investment horizon. The respondents who received our questionnaires in N condition tended to have a willingness to assume higher portfolio risk than those who received the questionnaires in R+ and R- conditions. Therefore, the evidence substantiates the finding that when the respondents only know the names of the assets but do not have any information on the historical return on the risky assets, they hinge on their personal judgments about the prospect and the riskiness of those assets, including the popularity of those investment alternatives. Overall, we find that the participants who received the research questionnaires in N condition tended to give higher expectations, either the expected returns, the standard deviation forecasts, or the invest-

Table 4. **Tests of Framing Effect on the Expected Return Biases**

Variable		Frame						χ^2
		N		R-		R+		
		Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**	
σ_{pj}	**One-year**	0.4326	0.4168	0.3784	0.3651	0.3718	0.3629	7.221*
	Five-year	0.6841	0.6927	0.6217	0.6595	0.6397	0.6586	7.434*

* significant at the credence level of 5 percent,

** significant at the credence level of 1 percent.

Table 5. **Tests of Framing Effect on the Risk-free Asset Holdings**

Variable		Frame			$\chi 2$
		N	**R-**	**R+**	
		Number of Respondents	**Number of Respondents**	**Number of Respondents**	
RF Holdings	**Increase**	16	15	27	0.462
	Decrease	8	18	15	
	The same	17	26	30	

* significant at the credence level of 5 percent,

** significant at the credence level of 1 percent.

ment decisions, than those who received the questionnaires in R+ and R- conditions.

Alternatively, we tested the influence of framing effect on the risk-free asset holdings, both in short horizon and in long horizon. We used the chi-square test to examine the effect. Table 5 exhibits the findings.

We do not find any significant influence of the framing effect on the risk-free asset holdings, either increased, decreased, or the same holdings of the risk-free asset in the long investment horizon.

Furthermore, using the Mann-Whitney test, we checked for the statistical informational effect on the investment decisions. This study tries to find whether the willingness to assume the portfolio risk is different if it is conditioned by the statistical information presented on the first page of the research questionnaires, either the historical annual returns or the historical five-year returns.

Table 6. **Tests of Statistical Informational Effect on the Investment Decisions**

Variable		**Statistical Information**				
		Annual Returns		**Five-year Returns**		
		Mean	**Median**	**Mean**	**Median**	**U**
σ_{Pj}	**One-year**	0.35658	0.34317	0.39653	0.39708	1792.000
	Five-year	0.62789	0.66100	0.63603	0.65836	2081.000

* significant at the credence level of 5 percent,
** significant at the credence level of 1 percent.

Table 7. **Tests of Statistical Informational Effect on the Risk-free Asset Holdings**

Variable		**Statistical Information**		χ^2
		Annual Returns	**Five-year Returns**	
		Number of Respondents	**Number of Respondents**	
RF Holdings	**Increase**	20	22	4.044
	Decrease	15	18	
	The same	36	20	

* significant at the credence level of 5 percent,
** significant at the credence level of 1 percent.

From Table 6, we can see that there is a tendency for the respondents to show a willingness to assume higher portfolio risk when they received the questionnaires that provided the historical five-year returns on the first page. The possible rationale for this evidence is that the historical five-year returns seldom show negative returns or show losses while the historical annual returns seem to be more volatile in terms of gains and losses. Hence, investors were inclined to assume higher portfolio risk when they got the historical five-year returns on the first page of the questionnaires subsequent to their feelings of high possibility to earn positive returns. However, the statistical informational effect is not significant, both in short horizon and in long horizon.

Afterwards, we also examined the statistical informational effect on the risk-free asset holdings. The following table depicts the results.

The results shown in Table 7 indicate that the investors' willingness to increase, decrease, or maintain their proportion of funds in risk-free asset is not associated with the statistical information provided on the first page of the questionnaires.

Subsequently, we examined the second hypothesis, which is whether the investors' willingness to assume higher portfolio risk in the long investment horizon is derived from a belief in mean-reverting asset prices. Mean reversion means that in the long run, the value of any security will always return to the mean value although in the short run, the value may fluctuate. It indicates that the price of an asset recently experiencing a huge loss compared to its average returns will increase in the future, and vice versa, the price of an asset lately experiencing a much-above-average-return gain will decline in the future.

Technically, we examined $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_1$ and $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_2$ utilizing the one-sample t-test. $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_1$ is the correlation between the expected return on IHSG-Fund (Stock Fund 1 in R- condition) of participant j in the first year and the expected return on IHSG-Fund of participant j in the subsequent four years, in the condition of gaining 50 percent in the first year, whereas $(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_2$ is the correlation between the expected return on IHSG-Fund (Stock Fund 1 in R- condition) of participant *j* in the first year and the expected return on IHSG-Fund of participant j in the subsequent four years, in the condition of having a loss of 25 percent in the first year. We reject the null hypothesis that Indonesian investors do not believe in mean reversion if $r(E(R)_{IHSGj1},E(R)_{IHSGj1à5})_1$ is significantly below zero and the $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_2$ likewise. The testing results are depicted in Figure 3, Figure 4, and Table 8.

Figure 3. **Descriptive Statistics of $\rho(E(R)_{IHSGj1}, E(R)_{IHSGj1\to5})_1$**

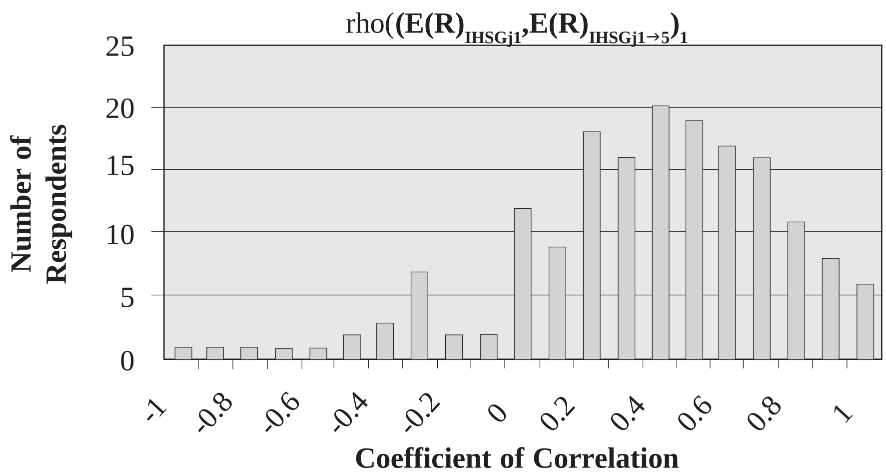

Figure 4**. Descriptive Statistics of $\rho(E(R)_{IHSGj1}, E(R)_{IHSGj1\to5})_2$**

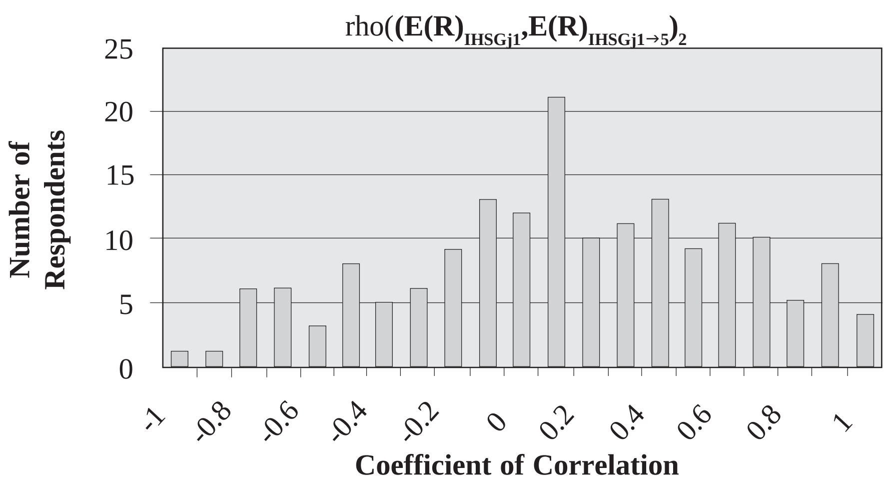

Table 8. **Tests of the Belief in Mean-reverting Asset Prices**

Variable	Mean	t
$\rho(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_1$	0.361638233	12.465 **
$r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_2$	0.131290085	3.607 **

* significant at the credence level of 5 percent,
** significant at the credence level of 1 percent.

Either $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_1$ or $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_2$ exhibits a positive and significant value. Accordingly, this study cannot reject the second null hypothesis. What interesting is that not only do we not find the belief in mean-reverting asset prices in Indonesia, but we also find a reverse phenomenon of the belief. The positive value of $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_1$ indicates that the investors predict an asset gaining 50 percent in the first year to continuously gain in the next four years. In turn, the positive value exhibited by $r(E(R)_{IHSGj1},E(R)_{IHSGj1\rightarrow 5})_2$ means that the investors expect an asset losing 25 percent in the first year to continuously loss in the next four years. This phenomenon can be labeled as a belief in "persistent asset prices". Hence, Indonesian investors do not believe in mean-reverting asset prices.

Conclusions

After examining the two hypotheses and several effects, we find evidence as follows:

1. It is significantly proved that Indonesian investors are inclined to assume higher portfolio risk in the longer investment horizon than that in the shorter investment horizon. The investors' underestimation of risk in the longer investment horizon drives to the higher risk-adjusted expected returns in the long investment horizon than those in the short horizon. Finally, it leads to their willingness to assume higher portfolio risk in the longer investment horizon than that in the shorter investment horizon. Hence, we may reject the first null hypothesis. The finding seems more consistent with the common belief of investment practitioners and the recommendation of investment managers for their investors that the longer their investment horizons, the higher the investment risk to be assumed by investing in riskier assets.
2. It is very interesting to see that on average, the investors are inclined to increase their allocation in the risk-free asset in the longer investment horizon although the difference between the risk-free asset holding in the short investment horizon and that in the long investment horizon is not significant. The

evidence of this study indicates that the investors are loss averse. They tend to have a willingness to assume higher risk on their portfolios in the long investment horizon as they tend to give higher risk-adjusted expected returns in the long horizon, but at the same time they also increase their holdings of risk-free asset. Accordingly, not only are the investors risk-averse, but they are also loss-averse investors.

3. The framing effect significantly influences the investment decisions, both in short investment horizon and in long investment horizon. The respondents who received our questionnaires in N condition tended to have a willingness to assume higher portfolio risk than the respondents who received the questionnaires in R+ and R- conditions. However, we do not find any significant influence of the framing effect on the risk-free asset holdings, either increased, decreased, or the same holdings of the risk-free asset in the long investment horizon.
4. There is a tendency for the respondents to show a willingness to assume higher portfolio risk when they received the questionnaires that provided the historical five-year returns on the first page. The possible rationale for this evidence is that the historical five-year returns seldom show negative returns or show losses while the historical annual returns seem to fluctuate more in terms of gains and losses. However, the statistical informational effect is not significant, both in short horizon and in long horizon.
5. Either $r(E(R)_{\text{IHSGj1}},E(R)_{\text{IHSGj1à5}})_1$ or $r(E(R)_{\text{IHSGj1}},E(R)_{\text{IHSGj1à5}})_2$ exhibits a positive and significant value. The positive value of $r(E(R)_{\text{IHSGj1}},E(R)_{\text{IHSGj1à5}})_1$ indicates that the investors predict an asset gaining 50 percent in the first year to continuously gain in the next four years. On the other hand, the positive value exhibited by $r(E(R)_{\text{IHSGj1}},E(R)_{\text{IHSGj1à5}})_2$ means that the investors expect an asset losing 25 percent in the first year to continuously loss in the next four years. This phenomenon can be labeled as a belief in "persistent asset prices". Accordingly, Indonesian investors do not believe in mean-reverting asset prices, and hence this study substantiates the second null hypothesis.

Implications

Based on the findings, there are several implications for investment community:

1. In making investment decisions, investors should consider their investment horizons. The longer their horizons, the higher their opportunities to put their funds in riskier assets.
2. Due to the tendency of the investors to have a willingness to assume

higher portfolio risk in the longer investment horizon, the investment managers, including the mutual fund managers, should accommodate this intent. The investment professionals should recommend and offer their investors whose investment horizons are long to invest in riskier assets while recommending their investors whose horizons are short to invest in less risky assets.

3. This study finds that the framing effect is inclined to have an influence on the expected returns, the risk perception, and the investment decisions when the investors do not well recognize the characteristics of the assets. In the situation, they hinge on their personal judgments on the assets where the popularity of the assets may also affect the investors' decisions. Unfortunately, the fact shows that the popular assets do not necessarily provide higher risk-adjusted returns vis-à-vis the less popular assets. Hence, in order to minimize the framing effect in the real investing circumstances, investors should analyze the fundamentals of those assets prior to choosing assets or establishing portfolios.

Limitations and Suggestions

Research on the investment horizons is still a new study in Indonesia, and we acknowledge that this study has limitations to be improved by future researchers. The limitations are as follows:

1. Sample used in this research is postgraduate students of Universitas Gadjah Mada, Indonesia. The students may come from various backgrounds, not necessarily financial managers or investors. Hence, next research had better add people who have experienced trading securities in the capital market in the research sample.
2. This study does not examine the sequence effect, which is whether the investment decisions of respondents who firstly answer the questions regarding short horizon and finally answer the questions regarding long horizon are different from those of respondents who firstly answer the questions regarding long horizon and then answer the questions regarding short horizon. Therefore, future studies would rather examine this effect.
3. This study tries to analyze the influence of investment horizons and the belief in mean reversion from the behavioral point of view. It will be better if there is research on this topic in Inzdonesia that analyzes the influence of investment horizon from the market point of view, which is how the stock prices reflect the influence of the different investment horizons and the belief in mean reversion.
4. One of the natural weaknesses of behavioral finance is the distinc-

tion between the perceptions and the virtual behaviors. The perceptions given by the participants do not necessarily mean that the respondents will precisely conduct what they have answered in the questionnaires. Hence, biases in behavioral finance research are not impossible.

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