

# Risk Information Impact on Investment Decisions: Experimental Test of PMM Theory, a Case of Indonesia

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The aim of this study is to examine the Probabilistic Mental Model (PMM) Theory as an explanation of the framing effect in the context of reporting risk in different formats in Indonesia. The study was conducted using an online field experimental method with 3x4x2 mixed design, involving 54 investment analysts as participants. Experiments were conducted to test whether different formats of risk information—given the time sequence associated with the framing effect as explained by the PMM Theory—influence the investment decision-making process. The results show that participants chose to take action that is not at risk when the information presented is in a positive frame. Gains or a loss of information that accompanies the risk information does not affect participants' decision relating to investments they would do. The investment decisions tend to avoid risk. Decision makers in a positive frame risk conditions do not make decision that reduce the risk of gains they already have. When risk information is presented in a negative frame, the participants chose to make decisions that minimize losses that may arise as the results of an investment decision. Practical implication of this study is that the investor needs to respond to the framing effect because a similar problem with a different frame may result in a different choice. Investors need to be encouraged to improve the knowledge and reduce bias in decision-making caused by the presence of framing in a single set of accounting information. This study has proven to be useful in improving the ability to analyze risk reports by financial analyst.

**JEL Classifications:** G11, M20, M21, M41, M48

**Keywords:** Probabilistic Mental Model Theory; framing effect; risk information; financial analyst; and investment decisions

Financial statement analysis is an important part of the investment process. Information in the financial statements has values that are useful in the decision-making process (Smith & Reiter, 1996; Maines & McDaniel, 2000; Barth, Clinch, & Shibano, 2003). Any information that may be disclosed in financial statements is information about the risks. Based on the accounting standards set by International Financial Reporting Standards (IFRS), risk information can be presented by the company in three formats: sensitivity analysis (SA), value at risk (VAR), or a tabular format (TbF). Risk in the banking context is a potential occurrence, which can be estimated (anticipated) or unexpected (unanticipated) to have negative impact on bank earnings and capital. To be able to apply risk management processes in the early stages of the operation, the bank should be able to properly identify risks to know and understand all the risks that may arise from a bank's business, including risks arising from related companies and other affiliates.

Testing the importance of risk reports in an alternative format will be conducted within the proof Probabilistic Mental Models (PMM) Theory. PMM states that a person will go through the stages of the thought process that uses inductive inference in completing the task, which is by linking a specific task to a larger context (Gigerenzer, Hoffrage, & Kleinbölting, 1991). PMM will link the specific structure of a task with probability structure associated with the environment, which is stored in one's long-term memory. PMM is used as a theory to predict the behavior of individuals associated with overconfident decision.

Kühberger (1995) and Chang, Yen, and Duh (2002) suggested that PMM can be used to explain the framing effect in the context of managerial accounting decisions and testing the strength to explain the impact. Framing effect is a form of information delivery in several different ways, to a situation or a similar problem, and the resulting representation and decision-makers make a different response to

each issue presented by these different ways. Framing effect occurs when the information presented risks (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981).

Li (1998) and Chang et al. (2002) in their researches showed that there are different explanations for the framing effect using the PMM Theory and the Prospect Theory. Framing effect in PMM focuses on how to frame the issue (problem frame) on the case or event that is presented by ignoring the problem domain (gain/loss). Framing effects within the framework of the PMM point to the existence of certain options presented in the form of incomplete information. This gives space for decision makers to determine other variables that are potentially relevant to the issues. Meanwhile, the framing effect in the framework of Prospect Theory suggests that decision makers will choose a certain option (or risk) other than the risky option (or would) when the problem is assumed to be included in the domain of gains (losses), regardless of the frame problem (positive or negative).

This study attempts to test PMM as an explanation of the framing effect in the context of the delivery of risk information in different formats. The specific objective of this study is to examine differences in the decisions made by investment analysts on the presentation of risk information stated in the gain/loss positive frame and gain/loss negative frame as described in the PMM. This study is different from previous studies because it is done in the context of Indonesia's emerging capital market.

## LITERATURE REVIEW

### *Behavioral Finance Theory*

Investors sometimes do not act rationally in the capital market. Behavioral Finance Theory explains the irrational acts through Prospect Theory. Prospect Theory, developed by Kahneman and Tversky (1979), shows how a

person makes decisions in uncertain conditions. This theory explains the habits of human behavior when they have to do an assessment of risk under conditions of uncertainty, which is presented in the form of information to a specific frame.

Prospect Theory distinguishes two phases in the decision making process: the initial phase of editing the information and the advanced phase of evaluating the information. Editing phase consists of a preliminary analysis of the prospects offered, and on the next phase, edited prospects are evaluated and the election of the prospect with the highest value. This theory suggests that a person does not always behave rationally by being risk averse, but sometimes has the nature of the risk takers. People generally become risk averse when they are getting gains. Risk averse behavior occurs because someone will give greater weight to the outcome that they consider to have a higher degree of certainty than the outcome they think is uncertain. This became known as the certainty effect. However, a risk averse person can also become risk taker when he suffered the greater losses. This is because further failures will result in lower than the subjective value of success.

Irrational behavior according to the Behavioral Finance Theory in relation to the capital markets will tend to move prices away from fundamental values in order to earn abnormal profits. Market imperfections in a given time have been tried to be exploited by utilizing information imperfections for gain (Shefrin & Statman, 1985).

Irrational behavior can be influenced by one's level of overconfidence. When associated with decision making under conditions of uncertainty, Kishore (2005) explained that a person will behave with overconfidence when he hopes something good will happen in the future. Besides, someone would overestimate the level of confidence when positive things happen in the past and often only remember the success achieved compared to a failure they have experienced. Behavior lead to overconfidence and overestimate the irrational decision the person takes when faced with certain situations.

### *Framing Effect in Terms of PMM Theory Explanation*

PMM Theory states that a rational person will go through the stages of the thought process that uses inductive inference in completing the task, which is by linking a specific task within a larger context (Kühberger, 1995; Gigerenzer et al., 1991). PMM will link the specific structure of a task with probability structure associated with the environment, which is stored in one's long-term memory.

PMM, with respect to the spontaneous self confidence, is a sudden reaction and not the reaction that comes from a long reflection. When presented with two alternative tasks that involve a person's confidence level, the subject will first attempt to develop what is known as the Local Mental Model (LMM) of the task. It is a solution by the memory and logical operations with a rational basis. If that fails, a PMM will be developed later by involving probabilistic information from the environment around it.

LMM will be successful if: (a) a person obtains an exact picture taken from one's memory for the two alternatives presented; (b) obtained intervals do not overlap between the two alternatives, or (c) carried out activities that are the basis of logic, such as exclusion method, can replace the knowledge that is not owned. In general, LMM had composed an image that can definitely be traced from long-term memory and compared with existing alternatives. However, the LMM will fail if the assigned task is more common and requires extensive knowledge. If unable to do a LMM, the PMM will be used to complete a task. PMM is a stage of one's thought process in solving the task using inductive inference. PMM will link the specific structure of a task with probability structure associated with the environment (which is stored in long-term memory).

Therefore, there are some differences between the PMM and LMM in some ways. First, the PMM contains a reference class as an object. Second, PMM uses a variable related to the target variable to perform indirect inference.

Probability inference is part of the cognitive process, and outcome uncertainty becomes part of the inference, so the answer to someone above the target set in the PMM will not reach 100%. In addition, the PMM requires a pause between the structure of the task and the structure of the environment; and the PMM assumed inferences about a criterion variable is based on certain clues that are related to the probabilistic criterion variable (Dougherty, Franco-Watkins, & Thomas, 2008).

PMM is used in many decision-making processes in accounting and management. PMM states that decision makers solve problems by applying the inductive inference, for example, by putting certain specific decisions into a broader context in a rational way. Based on PMM, in preparing the decision, a person would first create a class reference to a specific problem. Reference class is defined as an object or event that is in a PMM. Therefore, PMM is considered a theory capable of explaining the process of solving problems, using an inductive approach. PMM connects the particular structure of a task environment with a probability structure associated with these duties, which are stored in long-term memory.

### ***Framing Effect of Information Presented in Positive Frame and the First Hypothesis***

The studies made by Kühberger (1998) and Levin, Schneider, & Gaeth (1998) suggested that individuals react differently to the same decision if problems appear in a different way. This phenomenon is referred to as framing. Framing consists of three types: standard risky choice, attribute framing, and goal framing. This is described by Tversky and Kahneman (1981) as using the theory of good prospects, although perhaps only to explain risky choice framing effect. Found evidence further suggests that the framing depends on the task, content, and context of the variables inherent in the choice problem.

In experiments using the Asian disease problem (Kühberger, 1995; Chang et al., 2002),

researchers tested the persistence of framing effects that depend on the number and quality of the information displayed. In the preparation of a standard sentence, the issue is not fully disclosed. It was reported that the information is incomplete. Variations of the things that did not complete the information generated framing that resulted in different effects. If the problems are fully disclosed, no framing effect occurs.

When risk averse behavior with positive framing is not too strong, researchers found the opposite effect. Issues are interpreted by the subject as a matter of ambiguity, but ambiguity is not related to the selection of subjects. These results are discussed in the framework that explicitly separates the effect of the framing effect domain.

In PMM, the options must be presented in a form that the information is incomplete, so that decision makers have the opportunity to determine other variables that are potentially relevant to the issues. Testing PMM focuses on the frame problem. Therefore, according to the PMM, emphasis on the presentation of a problem frame becomes important. In the context of this research, qualitative and quantitative risk information in three different formats of risk reports are to be framed using sentences that show positive and negative frame.

The studies of Kahneman and Tversky (1979), Emby (1994), and Chang et al. (2002) showed that based on the assumption that people behave rationally, if an information involve risks that are positive and will generate a certain level of gain, a person would have responded with a decision that has a tendency to reduce the gains. Decisions that have a tendency to not reduce these gains were the decision containing the smallest risk.

This study sought to examine the impact of the presentation of risk information in the context of PMM Theory. Risk information is displayed in three formats (VAR, SA, and TbF). The third risk report format is then assumed as the reference class and anchor for investment analysts in making investment decisions. Therefore, according to PMM, when all three formats is presented in

a positive framing (ignoring domain losses or gains), it will cause someone to think that they are in a safe position as a result of their attempt to avoid the risk by taking a less risky decision or no risk (Chang et al., 2002).

Thus, this study hypothesizes that:

*H1: Presentation of risk information in a VAR, SA, and TbF format that is indicated by loss/gain-positive frame will lead the investment analyst to choose a less risky decision.*

### ***Framing Effect of Information Presented in Negative Frame and the Second Hypothesis***

Some studies relating to the preparation of a rational decision found out that humans are basically risk averse (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981; Quattrone & Tversky, 1988; Chang et al., 2002). Prospect Theory explains that when someone is faced with a choice and its reference point in the domain of profits, then it will tend to be risk averse, as described by the model of rational choice. However, when a person is in a negative situation or lose, they tend to choose the risky option.

Quattrone and Tversky (1988) examined the decision of voters in the election of the leader of a hypothetical candidate. The results showed that if a person thinks he is in the domain of losses, he will have a tendency to provide support to riskier challenger. While they are at the profit domain, someone will be more risk averse, like things that are well known, and more secure. For the case of a hypothetical election in these studies, one would choose an incumbent candidate.

Shiller (1995) described how a person faced with a problem with a risky option will result in that person's irrational acts. The study concluded that a person takes actions or decisions because of an irrational fear to accept disappointment. A person generally has a tendency to feel disappointed when they make mistakes from the decisions they take. To avoid disappointment, someone often takes action that makes his

behavior seem irrational. Irrational act of a person is often performed in unsafe and loss conditions. Irrational action is performed to minimize regret.

Meanwhile, according to PMM, when the information is presented in the negative framing (ignoring domain losses or gains), it will cause someone to think that they are in a position of disadvantage causing them to make decisions that lead to higher risk in hopes of obtaining the higher benefits in case of improvement in the future (Chang et al., 2002).

Thus, the second hypothesis for this study is:

*H2: Presentation of risk information in a VAR, SA, and TbF format that is indicated by loss/gain-negative frame will lead the investment analyst to choose a risky decision.*

## **METHODOLOGY**

### ***Experimental Design***

This study will use an online field experiment method. The experiment will use a 3x4x2 mixed design. Two variables are manipulated: frame (positive and negative) and the problem domain (loss/gain). In addition, there are three risk reporting format consisting of SA, VAR, and TBF. Table 1 shows the experimental design of the study and treatment of the criteria that will be provided and can be replicated.

There are two independent variables, namely the risk report format (SA, VAR and TBF) and frame reports (loss/gain positive and loss/gain negative frame).

Participants in this study are 54 investment analysts from Indonesia. Investment analyst is a professional manager who manages a variety of securities such as stocks, bonds, and other assets in order to achieve a profitable investment for the investor, taking into account the level of risk attached to them. Investment analysts were chosen as participants because the information and decisions from investment analyst to buy, sell,

**Table 1**  
*Experimental Design*

Information Risk Format	Frame & Problems Domain			
	Loss Positive Frame (Instrument A)	Gain Positive Frame (Instrument B)	Gain Negative Frame (Instrument C)	Loss Negative Frame (Instrument D)
<i>VAR Format</i>	Scenario A.2, option A.2.1 (qualitative risk information)	Scenario B.1, option B.1.1 (qualitative risk information)	Scenario C.1, option C.1.1 (qualitative risk information)	Scenario D.3, option D.3.1 (qualitative risk information)
	Scenario A.2, option A.2.2 (qualitative & quantitative risk information)	Scenario B.1, option B.1.2 (qualitative & quantitative risk information)	Scenario C.1, option C.1.2 (qualitative & quantitative risk information)	Scenario D.3, option D.3.2 (qualitative & quantitative risk information)
<i>SA Format</i>	Scenario A.1, option A.1.1 (qualitative risk information)	Scenario B.2, option B.2.1 (qualitative risk information)	Scenario C.2, option C.2.1 (qualitative risk information)	Scenario D.2, option D.2.1 (qualitative risk information)
	Scenario A.1, option A.1.2 (qualitative & quantitative risk information)	Scenario B.2, option B.2.2 (qualitative & quantitative risk information)	Scenario C.2, option C.2.2 (qualitative & quantitative risk information)	Scenario D.2, option D.2.2 (qualitative & quantitative risk information)
<i>TbF Format</i>	Scenario A.3, option A.3.1 (qualitative risk information)	Scenario B.3, option B.3.1 (qualitative risk information)	Scenario C.3, option C.3.1 (qualitative risk information)	Scenario D.1, option D.1.1 (qualitative risk information)
	Scenario A.3, option A.3.2 (qualitative & quantitative risk information)	Scenario B.3, option B.3.2 (qualitative & quantitative risk information)	Scenario C.3, option C.3.2 (qualitative & quantitative risk information)	Scenario D.1, option D.1.2 (qualitative & quantitative risk information)

VAR: Value at Risk; SA: Sensitivity Analysis; TbF: Tabular Format

or hold on to a particular stock will be followed by investors.

Prior to the experiments, the experiment instrument was first tested through a pilot experiment to some investment analysts. The pilot experiment is a preliminary investigation conducted before the full-scale study with the primary aim to reduce the disadvantages that may arise in the task instruction and research instruments (Gould, 2001).

Participants were asked to complete a hypothetical case experiment on a single frame, which contains three risk reporting format (SA, VAR, and TBF). The third risk report format is divided into two categories, qualitative and

comprehensive (qualitative and quantitative). Criteria and treatment of framing consists of framing effect for all three risk reporting format. The dependent variable is represented by the investment decision to buy or sell stocks. The experiment asks the participants to draw up an investment decision from several choices of risk in the risk report presented with positive and negative frames. The investment decision is to buy or sell the shares, after they conducted an analysis of the financial statements. Participants were also asked to indicate the degree of confidence when developing their investment decisions, from very unsure (0%) to very sure (100%). This study also uses manipulation check procedure to be

followed by prospective participants after they completed the experiment. Manipulation check is drawn in five statements about bad news and good news, which has links to the analysis of a hypothetical company's financial information. Participants were asked to specify the categories of information in semantic differential scale (10 scales). In addition, participants also had to answer some demographic questions. Participants in this experiment got a reward as compensation for the time they took for this experiment.

### ***Experimental Procedures***

Each participant received three experimental scenarios consisting of two options. The first option is an experimental case that comes with the qualitative picture of the risk report. The participants were asked to draw up an investment decision—to buy or to sell the shares analysis report. Participants were also asked to indicate the degree of confidence when developing their investment decisions. The second option contains an overview of qualitative and quantitative risk reports for all three risk reporting formats. The participants were then asked to draw up an investment decision—to buy or to sell the shares analysis report (see Appendix 1).

### ***Hypothesis Testing***

Hypotheses H1 and H2 in this study were tested using Chi-square. If the obtained p-values are significantly different at the third inter-test report format in the fourth frame, it shows that the participants feel a difference in the presentation of information they received. Difference is with the different frames of presenting the questions in whether to buy/sell or hold stocks. PMM Theory framework will significantly influence the investment decisions for each risk reporting format. This test is used to compare the data in the form of a decision for each scenario on the four cases before the analyst was given a full report on the risks of each option instrument. Testing will also be made to the case analysts

following a full risk report, that report being qualitative and quantitative, on each instrument scenario for each risk reporting format.

Chi-square test was performed by comparing the participants' decisions to buy/sell or hold the shares for each risk reporting format (SA, VAR, and TBF) in the fourth frame (loss/gain positive and the loss/gain negative frame). If the obtained p-value is less than 0.05 with a confidence level of 95% in testing the difference between the frames, it means that there is a difference of a decision made due to the different framing of the issue.

## **RESULT AND DISCUSSION**

### ***Participant Demographic Data***

The 54 participants were divided into four groups: 14 people in Panel A (loss positive frame), 14 people in Panel B (gain positive frame), 13 people in Panel C (gain negative frame), and 13 people in Panel D (loss negative frame). Participants consisted of 35 (64.8%) men and 19 (35.2%) women. Ages of participants ranged from 20–30 years old (59.3%), 31–40 years old (37%), and between 41–50 years old (3.7%). Working experience (tenure) of participants ranged from 0–1 year (six people or 11.1%), 1–3 years (20 people or 37%); 3–5 years (24 people or 44.4%), and more than five years for four people (7.4%). Most of the participants have not been certified (37 people or 68.5%), while participants who had certified were 17 people (31.5%).

### ***Hypothesis H1 Testing***

Hypothesis H1 was tested using Chi-square. The answer to every option is divided into three: 1-4 to buy categories, 5-6 to hold, and 7-10 to sell category. Each category in each option has a different meaning of risk.

When risk information is presented in its entirety (qualitative and quantitative) with loss positive frame, the data from Panel A revealed

that 11 people (20.4%) chose the risky decisions to buy, 23 people (42.6%) chose the less risky option to sell, and eight people (14.8%) chose to hold on to the shares. When risk information is presented only qualitatively with the loss-frame positive, the data from Panel A revealed that eight people (14.8%) chose the risky decision (buy), 29 people (53.7%) chose the decision that is less risky (sell), and five people (9.3%) chose the decision to hold (Table 2).

The results of cross tabulations for complete risk information (qualitative and quantitative), which is indicated by loss positive frame on Chi-square test, showed a value of 12.429 and a significance of 0.133. Meanwhile, the results of cross tabulations Chi-square test for risk information presented only qualitatively with the loss frame showed positive values of 24.429 and a significance of 0.001. This shows that the participants did not feel any difference in the presentation of information they received relating to the presentation format of risk information at the time the risk information is presented in its entirety (qualitative and quantitative). That is, all three formats of risk information in a loss positive frame in the PMM framework does

not affect the investment decision to buy or sell shares made by the participants. Participants who received positive information in the loss frame will take a less risky decision, whatever the format of the presentation of risk information that accompanies it.

Hypothesis H1 states that the presentation of risk information in a format SA, VAR, and TBF are expressed with gain positive frame will result in an investment analyst to choose a less risky decision. When risk information is presented in its entirety (qualitative and quantitative) with a gain-positive frame, the data from 14 participants in Panel B revealed that seven people (13%) chose risky decision (sell), 33 people (61.1%) chose the less risky decisions (buy), and three people (3.7%) chose to hold. Meanwhile, when risk information is presented only qualitatively with the loss positive frame to Panel B participants, there were nine people (16.7%) who chose the risky decision (sell), 31 men (57.4%) chose the decision that is less risky (buy), and two (3.7%) chose the decision to hold (Table 3).

The results of cross tabulations for complete risk information (qualitative and quantitative), which is indicated by loss positive frame on

**Table 2**

*Recommendation Made by Participants and Chi-square Test Result in Panel Loss Positive Frame*

Format	Participant made riskier recommendation (%)	Participant made less risky recommendation (%)	Hold recommendation (%)	Cross Tabulations	
				Chi square test	Sig.
<i>Loss Positive Frame I _qualitative and quantitative</i>					
SA	6	6	2	12.429	0.133
VAR	2	8	4		
TbF	3	9	2		
Total	11 (20.4%)	23 (42.6%)	8 (14.8%)		
<i>Loss Positive Frame II _qualitative</i>					
SA	3	9	2	24.429	0.001
VAR	4	8	2		
TbF	1	12	1		
Total	8 (14.8%)	29 (53.7%)	5 (9.3%)		

VAR: Value at Risk; SA: Sensitivity Analysis; TbF: Tabular Format

**Table 3***Recommendation Made by Participants and Chi-square Test Result in Panel Gain Positive Frame*

Format	Participant made riskier recommendation (%)	Participant made less risky recommendation (%)	Hold recommendation (%)	Cross Tabulations	
				Chi square test	Sig.
<i>Gain Positive Frame I_ qualitative and quantitative</i>					
SA	2	12	0	22.333	0.001
VAR	2	10	2		
TbF	3	11	0		
Total	7 (13.0%)	33 (61.1%)	2 (3.7%)		
<i>Gain Positive Frame II_ qualitative</i>					
SA	4	10	0	17.000	0.009
VAR	2	10	2		
TbF	3	11	0		
Total	9 (16.7%)	31 (57.4%)	2 (3.7%)		

VAR: Value at Risk; SA: Sensitivity Analysis; TbF: Tabular Format

Chi-square test, showed a value of 22.333 and a significance of 0.001, whereas the results of cross tabulations Chi-square test for risk information presented in a qualitative way only with loss positive frame shows a value of 17.000 and a significance of 0.009. It shows the difference in how the participants felt on the received information relating to the presentation format of risk information, whether the risk information was presented in its entirety (qualitative and quantitative) or when the information was presented in the form of qualitative information only. Although there are differences in the presentation format of risk information, investment decisions to buy or sell shares made by the majority of participants remained in the form of a less risky decision. Such findings support the hypothesis H1 in this study.

### ***Hypothesis H2 Testing***

Hypothesis H2 states that the presentation of risk information in a format SA, VAR, and TBF when expressed with a gain negative frame will result in an investment analyst selecting a risky decision. When risk information is presented in its entirety (qualitative and quantitative)

with a gain negative frame, the data from Panel C showed that two people (3.7%) chose risky decision (sell), 35 people (64.8%) opt for the less risky (buy), and two people (3.7%) chose to hold. Meanwhile, when risk information is presented only qualitatively with the gain negative frame, one (1.9%) chose the risky decision (sell), 36 (66.7%) chose less risky decisions (buy), and two people (3.7%) chose to hold (Table 4).

The results of cross tabulations for complete risk information (qualitative and quantitative) which is indicated by loss positive frame on Chi-square test showed a value of 24.846 and a significance of 0.000, whereas the results of cross tabulations Chi-square test for risk information presented qualitatively loss positive frame shows a value of 27.923 and a significance of 0.000. It shows the difference of how the participants felt with the received information relating to the presentation format of risk information, whether the risk information presented in its entirety (qualitative and quantitative) or when the risk information presented in the form of qualitative information only. However, investment decisions to buy or sell shares made by the majority of participants remained in the form of a less risky decision.

**Table 4***Recommendation Made by Participants and Chi-square Test Result in Panel Gain Negative Frame*

Format	Participant made riskier recommendation (%)	Participant made less risky recommendation (%)	Hold recommendation (%)	Cross Tabulations	
				Chi square test	Sig.
<i>Gain Negative Frame I _qualitative and quantitative</i>					
SA	0	12	1	24.846	0.000
VAR	0	12	1		
TbF	2	11	0		
Total	2 (3.7%)	35 (64.8%)	2 (3.7%)		
<i>Gain Negative Frame II _qualitative</i>					
SA	0	12	1	27.923	0.000
VAR	0	12	1		
TbF	1	12	0		
Total	1 (1.9%)	36 (66.7%)	2 (3.7%)		

VAR: Value at Risk; SA: Sensitivity Analysis; TbF: Tabular Format

Hypothesis H2 also stated that the presentation of risk information in a format SA, VAR, and TBF expressed with a loss negative frame will result in an investment analyst selecting a risky decision. When risk information is presented in its entirety (qualitative and quantitative) with loss negative frame, the data from 13 participants in Panel D showed that 11 people (20.4%) chose risky decisions (buy), 19 people (35.2%) chose the less risky decisions (sell), and 9 people (16.7%) decided to hold. Meanwhile, when risk information is presented only qualitatively with the loss negative frame, there were 13 people (24.1%) who chose the risky decision (buy), 23 people (42.6%) chose the less risky (sell) decision, and three people (5.6%) chose to hold (Table 5).

The results of cross tabulations for complete risk information (qualitative and quantitative) that is indicated by the loss negative frame Chi-square test showed a value of 4.615 and a significance of 0.798, whereas the results of cross tabulations Chi-square for risk information presented in a qualitative way only with loss positive frame shows a value of 11.256 and a significance of 0.128. These show that the participants did not feel any difference in the presentation of information

they received relating to the presentation format of risk information (SA, VAR and TBF), both when risk information is presented in its entirety (qualitative and quantitative) or when the information is presented in the form of qualitative information only. However, from the results of the frequency of testing options for investment decisions to buy/sell shares, most of the participants tend to make a less risky investment decision.

## DISCUSSION

Participants in this study chose to take action that is not at risk when information is presented in a positive frame. Gains or losses of information with accompanying risk information do not affect participants' decision relating to investments they would do. Investment decisions that they are a part of tend to avoid risk. Thus, the first hypothesis is supported in this study.

These results are in line with PMM Theory that focuses on the testing frame problem. The findings in this study are also consistent with findings in the study of Kahneman and Tversky (1979),

**Table 5***Recommendation Made by Participants and Chi-square Test Result in Panel Loss Negative Frame*

Format	Participant made riskier recommendation (%)	Participant made less risky recommendation (%)	Hold recommendation (%)	Cross Tabulations	
				Chi square test	Sig.
<i>Loss Negative Frame I _qualitative and quantitative</i>					
SA	4	6	3	4.615	0.798
VAR	4	6	3		
TbF	3	7	3		
Total	11 (20.4%)	19 (35.2%)	9 (16.7%)		
<i>Loss Negative Frame II _qualitative</i>					
SA	5	6	2	11.256	0.128
VAR	3	9	1		
TbF	5	8	0		
Total	13 (24.1%)	23 (42.6%)	3 (5.6%)		

VAR: Value at Risk; SA: Sensitivity Analysis; TbF: Tabular Format

Emby (1994), and Chang et al. (2002). With the assumption that people behave rationally, an information that involve positive risks will result in levels of certain gains and will be responded with a decision that has a tendency to not reduce the gains. Decisions that have a tendency to not reduce these gains were the decision containing the smallest risk.

Meanwhile, when the information is presented in a negative frame, participants have a tendency to make decisions that are less risky. The findings are not consistent with the hypothesis that the PMM is a risky decision to be taken once a person is confronted with the information presented by the loss/gain-frame negative.

## CONCLUSIONS, LIMITATIONS AND SUGGESTED FURTHER RESEARCH

Results showed that participants in this study chose to take action that is not at risk when information is presented in a positive frame. Gains or losses of information accompanying the instrument of risk information in the experiment did not influence the investment decisions they

do. Investment decisions they made are decisions that tend to avoid risk. This is in line with PMM Theory that focuses on the testing frame problem. PMM Theory states that no decision will be taken at risk when he was confronted with the information presented by the loss/gain-positive frame.

The results are consistent with findings in the study of Kahneman and Tversky (1979), Emby (1994), and Chang et al. (2002). Information that involves risks, although framed in a positive manner, will generate a certain level of gains that would have responded with a decision that has a tendency to reduce the gains that will be acceptable.

Other findings obtained in this study are the tendency of participants to take less risky decisions when information is presented in a negative frame. The findings are not consistent with the hypothesis in PMM Theory that a risky decision will be taken when someone is confronted with the information presented by the loss/gain-negative frame (Kahneman & Tversky, 1979; Chang et al., 2002).

The data showed that when risk information is presented with a negative frame, participants in this study chose to make a decision with the least

risk. When they get information in a negative frame, the majority of participants tend to give advice or make investment decisions that it is more secure to sell or hold shares. Participants do not give advice to buy shares when information is presented in a negative frame.

The results in this study do not fully support all four hypotheses in PMM. PMM Theory which is based on the assumption that the decision makers tend to be risk seekers (Shiller, 1995; Quattrone and Tversky, 1988) at the time the information is presented in a negative frame. The underlying reason for this was that it takes a more courageous behavior to take risks in the investment decision-making process. The participants in this experimental study are thought to be investment analyst in Indonesian stock market that has a tendency to be risk averse. This can be explained by the characteristics of the participants in this study when asked to fill in demographic data: the majority (75.9%) chose to make investments that are not risky and more assured (risk averse). Risk averse behavior occurs when a person gives greater weight to the outcome that they consider to have a higher degree of certainty than the outcome that they think is still uncertain (Abdellaoui, Bleichrodt, & Paraschiv, 2007; Barberis & Huang, 2001). That is, when risk information is presented in a negative frame, the participants in this study chose to make a decision by the smallest level of risk possible. This is done to minimize losses that may arise as a result of the investment decisions made. When they get information in a negative frame, more than half of the participants tend to give advice or make more secure investment decisions: sell or hold shares. Participants do not give advice to buy stocks when the information are conveyed in a negative frame, regardless of the risks that accompany the report format information.

Therefore, the implications of these findings are that investors need to pay attention to the framing effect with caution because a similar problem with a different frame may result in an increase/decrease option or a different choice. Investors need to be encouraged to improve and develop

the knowledge to reduce bias in decision-making caused by the presence of framing in a single set of accounting information. In addition, because the accounting information published by public companies will attract users of such information, then the accounting information submitted by the company should be able to form a positive value, regardless of the conditions being experienced by the company issuing the information.

This study has several limitations. First, the study involved investment analysts in Indonesia who mostly have a tendency to be risk averse. It is also alleged to be one reason for the hypothesis in the PMM Theory to be not fully supported. Future studies need to be made to the participant or an investment analyst or investor in Indonesia or more in ASEAN region who has a tendency to be risk seekers, as a further test of PMM Theory. Someone who receives information in the negative domain will take action as a risk seeker (Shiller, 1995; Quattrone & Tversky, 1988). Second, participants in this study consisted of participants who are not only analyzing the financial statements of banking only. Therefore, further experiments and field studies can examine decisions made by analysts who focus on the financial statements of companies in specific industry categories.

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## APPENDIX 1.

### *Experiment Material*

Thank you for visiting the website of Research Risk Analysis.

In this website, you are required to be a participant in full by filling some of the questions that came with the case and fundamental data provided. Cases and questions are provided in the form of a simulation game buy/ sell shares. You are also asked to complete a demographic data at the end of this research.

There is no right or wrong answers to any questions.

The time available to answer all the questions for approximately 30 minutes.

For those of you who participated in this research are complete and pass the test of manipulation check will get a reward, which will be converted from the number of answers in the simulation game buy / sell shares in this research.

We will maintain the confidentiality of the identity of each participant.

Thank you.

### Case A1.

Indonesia's banking regulator plans to decrease the Bank Indonesia interest rate benchmark (SBI) by 5 basis points (bps), from the original 17% to a maximum of 12% per year.

All banks in Indonesia must comply with the interest rate benchmark gradually, over a period of 3 months from the specified regulations.

If the benchmark done in loan interest rates gradually by PT. Bank Corp., over 3 months it is expected a decrease in loan interest income annually, bringing total revenue to Rp 7-10 billion dollars.

Indicate your choice/recommendation (buy or sell) the shares of PT. Bank Corp.:

1	2	3	4	5	6	7	8	9	10
Strong buy					Strong sell				

According to your prediction, the choice of buy or sell the share price will result in:

Increasing in share price

Decreasing in share price

How confident are you in establishing that "my choice is worth"? (Show your faith by giving marks out of 10 points).

1	2	3	4	5	6	7	8	9	10
Very unconfident/unsure					Very confident/sure				

### Case A2.

Indonesia's banking regulator plans to decrease the Bank Indonesia interest rate benchmark (SBI) by 5 basis points (bps), from the original 17% to a maximum of 12% per year.

All banks in Indonesia must comply with the interest rate benchmark gradually, over a period of 3 months from the specified regulations.

If the benchmark done in loan interest rates gradually by PT. Bank Corp., over 3 months it is expected a decrease in loan interest income annually, bringing total revenue to Rp 7-10 billion dollars.



How confident are you in establishing that “my choice is worth”? (Show your faith by giving marks out of 10 points).

1	2	3	4	5	6	7	8	9	10
Very unconfident/unsure					Very confident/sure				

### Case B2.

Indonesia’s banking regulator plans to decrease the Bank Indonesia interest rate benchmark (SBI) by 5 basis points (bps), from the original 17% to a maximum of 12% per year.

All banks in Indonesia must comply with the interest rate benchmark gradually, over a period of 3 months from the specified regulations.

If the benchmark done in loan interest rates gradually by PT. Bank Corp., over 3 months it is expected a decrease in loan interest income annually, bringing total revenue to Rp 7-10 billion dollars.

As a result of these regulations, companies are condemned to gain\*/loss\*\*/a lose of revenue\*\*\*/ will not lose revenue\*\*\*\* in the annual loan interest income of Rp 3 billion dollars. The following risk analysis report Value at Risk PT. Bank Corp., for three consecutive years:

*VAR analysis calculates the potential risks with 99% confidence level for disclosure of commitments made by the company (cash flows), including the effect of foreign currency derivatives. VAR model assumes stock prices generally normally distributed data and volatility derived from the currency market. Based on the overall disclosure of the currency on the date December 31, 2009, which include derivative positions, diroyeksikan currency change will affect the pre-tax cash flow of \$ 250 million, with a 99% confidence level. The following table calculations that take into account the potential loss of interest rates, exchange rates, commodity and equity risk inherent in trading activity based on the analysis of VAR for three consecutive years 2007, 2008, and 2009:*

Year/Rate	2007			2008			2009		
	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low
<i>Based on perfect positive correlation interest rate</i>	85.6	126.8	66.8	120.2	163.8	92.7	143.8	187.9	102.5
<i>Based on zero correlation interest rate</i>	25.7	41.2	18.6	37.6	49.9	29.3	41.8	53.7	34.7

Indicate your choice/recommendation (buy or sell) the shares of PT. Bank Corp.:

1	2	3	4	5	6	7	8	9	10
Strong buy					Strong sell				

According to your prediction, the choice of buy or sell the share price will result in:

Increasing in share price

Decreasing in share price

How confident are you in establishing that “my choice is worth”? (Show your faith by giving marks out of 10 points).

1	2	3	4	5	6	7	8	9	10
Very unconfident/unsure					Very confident/sure				

**Case C1.**

Indonesia's banking regulator plans to decrease the Bank Indonesia interest rate benchmark (SBI) by 5 basis points (bps), from the original 17% to a maximum of 12% per year.

All banks in Indonesia must comply with the interest rate benchmark gradually, over a period of 3 months from the specified regulations.

If the benchmark done in loan interest rates gradually by PT. Bank Corp., over 3 months it is expected a decrease in loan interest income annually, bringing total revenue to Rp 7-10 billion dollars.

Indicate your choice/recommendation (buy or sell) the shares of PT. Bank Corp.:

1	2	3	4	5	6	7	8	9	10
Strong buy					Strong sell				

According to your prediction, the choice of buy or sell the share price will result in:

Increasing in share price

Decreasing in share price

How confident are you in establishing that "my choice is worth"? (Show your faith by giving marks out of 10 points).

1	2	3	4	5	6	7	8	9	10
Very unconfident/unsure					Very confident/sure				

**Case C2.**

Indonesia's banking regulator plans to decrease the Bank Indonesia interest rate benchmark (SBI) by 5 basis points (bps), from the original 17% to a maximum of 12% per year.

All banks in Indonesia must comply with the interest rate benchmark gradually, over a period of 3 months from the specified regulations.

If the benchmark done in loan interest rates gradually by PT. Bank Corp., over 3 months it is expected a decrease in loan interest income annually, bringing total revenue to Rp 7-10 billion dollars.

As a result of these regulations, companies are condemned to gain\*/loss\*\*/a lose of revenue\*\*\*/ will not lose revenue\*\*\*\* in the annual loan interest income of Rp 3 billion dollars. The following risk analysis report Tabular Format PT. Bank Corp., for three consecutive years:

*For assets and liabilities, the following table displays the major cash flows that exist on the maturity date and the average interest rate. For interest rate swaps, the table below represent the nominal value and the interest rate is expected to be received by the company for three consecutive years 2007, 2008, and 2009:*

Assets	Year				
	2007	2008	2009	Thereafter	Total
<i>Variable-rate loans</i>	181,137	156,395	142,033	728,680	2,056,408
<i>Change in interest income when rates decrease 100 bps</i>	-1,811	-1,564	-1,420	-7,287	-20,564
<i>Liabilities</i>					
<i>Variable-rate time deposits</i>	50,814	12,812	0	0	63,626
<i>Variable-rate long-term obligations</i>	0	564	0	0	564
<i>Total variable-rate liabilities</i>	50,814	13,376	0	0	64,190
<i>Change in interest income when rates decrease 100 bps</i>	-508	-134	0	0	-642
<i>Change in NII when rates decrease 100 bps</i>	-5,538	-2,301	-1,811	-7,287	-16,937

Indicate your choice/recommendation (buy or sell) the shares of PT. Bank Corp.:

1	2	3	4	5	6	7	8	9	10
Strong buy					Strong sell				

According to your prediction, the choice of buy or sell the share price will result in:

Increasing in share price

Decreasing in share price

How confident are you in establishing that “my choice is worth”? (Show your faith by giving marks out of 10 points).

1	2	3	4	5	6	7	8	9	10
Very unconfident/unsure					Very confident/sure				

Finish,  
Thank You.

**Note:**

- \* : for gain positive frame
- \*\* : for loss negative frame
- \*\*\* : for loss positive frame
- \*\*\*\* : for gain negative frame