International Journal of Applied Psychology 2015, 5(4): 83-89
DOI: 10.5923/j.ijap.20150504.01

Risk Taking in Financial Decisions as a Function of Age, Gender: Mediating Role of Loss Aversion and Regret

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Abstract The present study investigated how age and gender affect risk taking ability of the investors in their financial decisions through psychological biases such as loss aversion and regret. A total of 450 investors (372 Males, 93 Females) of two age groups (25-40 years and 41-55 years) from northern part of India participated in the study. Conceptual framework was formulated and tested using AMOS 20 to understand the relationship of age, gender and risk taking ability through loss aversion and regret. The results supported our proposed hypotheses. Main results have confirmed the proposed model of analysis, pointing that the impact of age, gender on risk taking ability operates through behavioral biases (loss aversion and regret) of the investors.

Keywords Age, Gender, Loss aversion, Regret, Risk Taking Ability

1. Introduction

The recent fluctuations in the stock market from the past few years have made financial decisions more crucial task for investors. Lot of research was conducted with respect to financial decision-making under risk and uncertainty. Risk tolerance was found to be a crucial factor affecting financial decisions of the investors. Moreover, enormous array of studies found that age and gender influence risk tolerance in the financial decisions of the individuals. Dwyer, Gilkeson and List (2002) investigated gender differences in with respect to most recent, largest and riskiest mutual fund investment decisions. They found that women take less risk as compared to men. Women more likely hold risky assets if women are employed, hold higher net worth and envisaged inherited property. However, men invested in risky assets if they were risk seekers, divorced, older, and college educated (Embrey & Fox, 1997). Age, gender, income have nonlinear relation with risk tolerance (Hallahan, Faff & McKenzie, 2009). Hallahan, Faff and McKenzie (1999) found that gender, income and wealth are positively related with risk tolerance while marital status and age are negatively related. It shows that demographic variables such as age and gender are the important contributing factors that explain risk aversion or risk tolerance tendency of the investors.

Though financial advisors take in to account risk tolerance of the individuals while allocating the assets to the investors but in 2008 many investors who were assigned equities in their portfolios according to their risk taking capacity were not able to book their profits. This makes the practitioners and researchers to look beyond risk tolerance. Various researchers suggested that different psychological biases such as loss aversion and regret also affects risk aversion tendency of the individuals. Kahnemann and Lovallo (1993) reported that loss aversion explain widespread risk aversion. In addition to this, various other studies reported that loss aversion also explains a wide range of anomalies such as endowment effect, disposition effect, equity premium puzzle and the overtime premium puzzle, the status quo bias, anticipated and experienced regret. Investors' behavior of taking risks when confronted with losses and avoiding risk when confronted with gains is called Loss aversion. Loss aversion refers to the fact that people tend to be more sensitive to losses as compared to gains. The pain of losing any amount of money is more painful as compared to pleasure of gaining the same amount of money. Similarly, Josephs, Larrick Steele and Nisbett (1992) reported that anticipated regret leads to risk aversion. According to Zeelenberg "Regret is a negative, cognitively determined emotion that we experience when realizing or imagining that our present situation would have been better, had we acted differently (1996, p. 6)". Bell, 1982; Loomes & Sugden, 1982 found that investors base their decision not only on expected value of payoffs but also on expected regret. It is evident from the above studies that loss aversion and regret also affects risk tolerance or risk aversion tendency of the investors.

It is evident from the above that risk tolerance in financial decision making is affected by various biases such as loss aversion, regret, and many others. But the level of biases varies from individual to individual. Gender, age and other

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Published online at http://journal.sapub.org/ijap
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demographic factors can have differential effect on these biases. There are very few studies which address the relationship between gender, age and psychological biases of the individuals. Johnson, Gachter and Herrmann (2006) found that individuals who are older and less educated are more likely to be more loss averse than the young individuals. However, researcher have not come across any study which investigated the effect of gender and age on loss aversion and regret and their subsequent effect on the extent risk taking ability of the individuals in investment decisions. Moreover, there is paucity of such studies in the Indian context.

2. Research Gap

Previous studies have shown that age and gender affects risk tolerance and the psychological biases of the investors. As the age increases individuals become more risk averse and loss averse. Similarly, females show more loss aversion and take less risk as compared to males (Beckmann, Lutje and Rebeggiani, 2007; Wang and Hanna, 1997; Hallahan, Faff and McKenzie, 2009; Johnson, Gachter and Herrmann (2006). While studying the influence of age and gender on risk taking ability, the second matter of concern is about the channels how this works. To take a step further, the present study tried to summarize the mechanisms that how age and gender influences on individual risk taking ability. Therefore, a mediational analysis was considered in order to understand the complexities of the relationship between age, gender, behavioral biases, risk taking ability of the investors. Mediation occurs when a given variable function as a mediator between the predictor variable and the outcome variable (Baron & Kenny, 1986). In this case, the predictor variable are age and gender, the possible mediating variables is behavioral biases such as loss aversion and regret and the outcome variable is risk taking ability of the investors.

3. Rationale for the Study

For a long period of time, investors relied on various theories and models of efficient markets and standard finance for calculating risk while taking financial decisions. However, now a day's deviation from rational decision making has been observed in nearly every facet of financial activity. It has been previously discussed that there are numerous factors such as age, gender and behavioral biases influence risk taking ability. But the search of variables influencing the risk preferences of investors continues in the empirical front. All these factors motivated the experimenters to endeavor this study. The present study focuses on to investigate the path, how demographic factors such as age and gender influence risk taking ability of the investors through behavioral biases such as loss aversion and regret. In order to improve financial stability of the investors, we need to understand the behavioral and affective patterns of the investors and how they influence their risk taking ability in their investment decisions. Surely we live in a society that makes a lot of demand on us, but investment decision are never meant to be easy. It takes a lot of effort, hard work and time to study various financial products and services yet investors are not able to book profits. Therefore, it is our responsibility to monitor the impact of various factors on investment decisions to improve the financial well-being of the investors. The importance of explicating, the mechanisms through age and gender influence risk taking ability of the investors is that by understanding these mechanisms leads to the advancement of knowledge and will help in all appropriate portfolios to the investors.

4. Conceptual Framework

The aim of the present study is not to find an exhaustive list of potential correlates of age and gender to risk aversion and loss aversion but rather to construct conceptual framework where loss aversion and regret act as mediator variable between the relationship of age and gender with risk taking ability of the individuals in their financial decisions. Therefore, the present study formulated the following conceptual model to investigate the path, how gender and age affects risk taking ability of the investors through psychological biases such as loss aversion and regret. It is clear from Fig. 1 that age and gender act as antecedents of psychological biases such as loss aversion and regret and these psychological biases further influence the risk taking ability in financial decisions of the investors'.

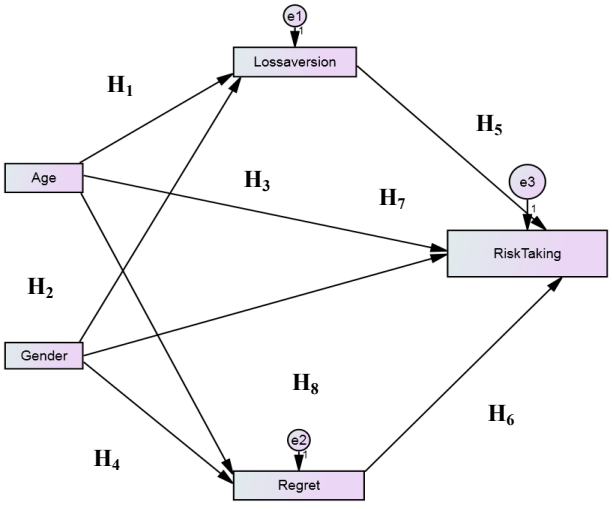

Figure 1.

The dimensions of the conceptual model in an investment context can possibly help to improve the accuracy of the investment decisions by building the knowledge of how age and gender determine psychological biases such as loss aversion and regret which further influence risk tolerance of the investors.

Hypotheses:

An attempt was made to test the models shown in the above figure, which made ensuing predictions. First, we hypothesized that age is positively related to loss aversion. Second, we hypothesized that age is positively related to regret. Third, we hypothesized that gender is positively related to loss aversion. Fourth, we hypothesized that gender is positively related to regret. Fifth, we hypothesized that loss aversion is negatively related to risk taking. Sixth, we hypothesized that regret is negatively related to risk taking. Seventh. We hypothesized that age is negatively related on risk taking. Eighth, we predicted that gender is negatively related on risk taking. Lastly, we hypothesized that age and gender has indirect effect on risk taking of the investors through loss aversion, regret.

Method

The present study used a survey approach to collect data from individual investors and used AMOS 20 to test the hypotheses of the above conceptual models.

Participants:

A total of 450 investors from northern part of India were selected. There were 357 males and 93 females volunteered to participate in the study. Two age group were chosen; 25-40 years and 41-55 years. The target group was professionals from various financial organizations, businessmen, and teachers. The author took permission and appointment from various financial and non-financial organizations to conduct the survey among their employees, clients and others. Investors were contacted personally and testing was done individually. It took 30 minutes for each individual to complete the survey. Refreshments were given to every participant instead of any remuneration.

Design:

Age and gender are exogenous variables in model. Loss aversion, regret and risk taking are the endogenous variables in the model. Path analysis was conducted using AMOS to find the path coefficients for all variables. The conceptual model provides quantification of the relationship between each of the exogenous as well the endogenous variables according to the following specification:

1) $LA_i = \beta_{0+} \beta_1 D_{i,AGE} + \beta_2 D_{i,GENDER} + e$
2) $REG_i = \beta_0 + \beta_1 D_{i,AGE} + \beta_2 D_{i,GENDER} + e$
3) $RT_i = \beta_0 + \beta_1 D_{i,AGE} + \beta_2 D_{i,GENDER} + e$
4) $RT_i = \beta_0 + \beta_1 D_{i,LA} + e;$
5) $RT_i = \beta_0 + \beta_1 D_{i,REG} + e$

Where, LA*i* is the loss aversion score for respondent i calculated in lottery choice task experiment based on their switching point from sure outcome to lottery. REG*i* is the regret score for respondent *i* calculated by decision regret scale. RT*i* is the risk taking ability score for respondent *i* calculated based on the answers to questionnaire. D*i* GENDER, a dummy variable taking the value of unity if the respondent is female and zero for male for the respondent *i*. Similarly, D*i*AGE, a dummy variable taking the value of unity if the respondent is of the age group 41-55 years and zero for the age group 25-40 years for the respondent *i*.

Tools used

Loss aversion: To measure loss aversion we used modified version of lottery choice task developed by Gachter, Johnson and Hermann (2010) which was originally developed by Fehr and Goette (2007). Individuals have to decide whether they want to accept sure outcome or the lottery (Appendix A). Loss aversion was measured by investors' switching point from sure outcome to choose the lottery. Higher the switching point, higher is the subject's loss aversion.

Regret: Regret inducing situation given in Ratner and Herbst (2005) study was adapted and modified for the present study. Investors were asked to read the situation in which they had to invest Rs. 50000 with one of the two brokers (Broker A and Broker B) for the period of one year. After taking the decision, investor were asked to judge whether their decision was right or wrong if the broker chosen by you get failed after one year. After this decision regret scale (Connor, 1996) was administered to gauge the extent of regret experienced by the investors (Appendix B).

Risk taking ability: A questionnaire was used to measure the extent of risk taking ability of the investors. Investors have to choose one of best options out of the given options for each of the six questions. The questions asked to elicit the information about the risk taking ability are derived from questions generally asked by financial planners, advisors from the sites such as humfauji .com, duswealth.com and others to measure the risk tolerance of their clients or customers.

Procedure

The present study used self-administered survey. The researcher approached different financial and non-financial organizations of Punjab, explained the purpose of the study to appropriate authorities, and sought their permission for data collection. Once the permission was obtained, the researcher approached the individual investors and asked for appointment for their voluntarily participation in the survey. Investors were tested on all independent (age and gender) and dependent (loss aversion, regret, and risk taking) variables. Respondents were tested on these dimensions with the measures mentioned above. Refreshments were given to the participants toward the end of the data collection session. It took approximately half an hour for each respondent to complete all the questionnaires. Scoring for the collected data was carried according to standard procedures as laid down in manuals for the respective tests. Data were analyzed using SPSS and AMOS (21.0 versions). Results are interpreted in the light of different of conceptual framework.

5. Results

The present study used maximum likelihood method to measure the estimates of different variables. Table 1 shows mean and standard deviation scores of endogenous variables which are loss aversion, regret, and risk taking. Estimates and standard errors of the parameters are shown in Table 2.

Table 1. Descriptive statistics

	Males		Females	
	Age25-40	**Age 41-55**	**Age25-40**	**Age 41-55**
Loss Aversion	N = 258 M = 1.82 (0.92)	N = 104 M = 2.45 (0.95)	N= 55 M = 2.25 (0.98)	N = 40 M = 2.43 (1.067)
Regret	N = 258 M = 14.03 (4.91)	N = 104 M = 16.25 (4.71)	N = 55 M = 18.13 (4.79)	N = 40 M = 18.25 (5.10)
Risk Taking	N = 258 M = 26.26 (5.21)	N = 104 M = 22.81 (5.108)	N = 55 M = 23.37 (5.14)	N = 40 M = 20.9 (5.32)

Table 2. Regression Weights

			Estimate	**S.E.**	**C.R.**	**P**
Regret	<	**Gender**	3.622	.563	6.429	.000
Regret	<	**Age**	1.842	.517	3.567	.000
Loss aversion	<	**Gender**	.325	.110	2.946	.003
Loss aversion	<	**Age**	.546	.101	5.400	.000
Risk Taking	<	**Gender**	-1.745	.616	-2.834	.005
Risk Taking	<	**Age**	-2.498	.560	-4.462	.000
Risk Taking	<	**Regret**	-.178	.049	-3.649	.000
Risk Taking	<	**Loss aversion**	-.809	.250	-3.235	.001

The results confirmed our expectations that loss aversion and regret act as mediator variable between the effect of age and gender on risk taking ability of the investors. The study depicted the default model and the significance of its relationships is given in Fig. 2. The data confirm all hypotheses H_1-H_8 in the model. The default model 1 fits the data ($\chi 2/df$= 2.798, GFI=0.99, CFI= 0.99, NFI=0.98, TLI= 0.97, RMSEA=0.030.

The present study confirmed that age and gender not only has direct effects on risk taking ability (H_7: β = -2.49, $p<0.001$). (H_8: β = -1.74, $p<0.01$) but it was found that age and gender indirectly affects risk taking ability through loss aversion and regret. Age and gender are found to be significantly predictor of loss aversion (H_1: β = 0.55, $p<0.001$; H_3: β = 0.32, $p< 0.01$) and regret (H_2: β = 1.84, $p<0.001$; H_4: β = 3.55, $p<0.001$) respectively. In addition to this, loss aversion and regret significantly influence risk taking ability of the investors (H_5: β = -0.81, $p<0.01$; H_6: β = -0.18, $p<0.001$).

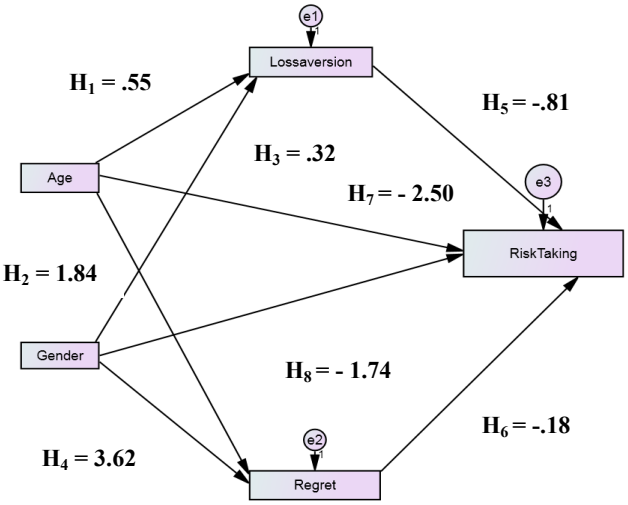

Figure 2.

6. Discussion

The main goal of this study was to propose a mediational model for explaining the path between age, gender and risk taking ability of the investors. The results of the present study provide an integration of several important aspects of age, gender, behavioral biases and risk taking ability, by examining their interactions and relations. The variations in behavioral biases play a significant mediating role in the relationships of age, gender to risk taking ability of the investors. Main results have confirmed the proposed model of analysis, pointing that the impact of age, gender on risk taking ability operates through behavioral biases of the investors.

Findings of the study confirmed all hypotheses. Individuals with age group 41-55 years show more loss aversion as compared to individuals with age group 25-40 years. One of the reasons for this could be due to the fact that older individuals have less number of years to recover from losses. Moreover, they don't have enough income to lose and they have to save for their retirement. These findings are in line with earlier work done on age and loss aversion. Johnson, Gachter and Herrmann (2006) found that in both riskless and risky choice tasks loss aversion increases with age, income, and wealth while decreases with education. Similarly, the present study found that individuals with age group 41-55 years regret more as compared to individuals of age group 25-40 years. Therefore, this tendency of more loss aversion and regret in older individuals make them to take less risk in their investments as confirmed in the present study.

Gender also proves to be an important determinant of loss aversion and regret. Females show more loss aversion and regret more as compared to males. In addition to this, it was also found that females make less risky choice in their investments as compared to males. This difference can be

attributed to the loss aversive and regret minimizing tendency of females which further plummet their self-image in the event of a failure.

Lastly, we conclude by saying that to the best of our knowledge the present study is first to confirm that psychological biases such as loss aversion and regret act as mediating factors which influence the linkage between age, gender and risk taking ability of the individuals.

7. Implications

These results have several important implications for investors, researchers and others. One of the most important implications is that the investment industry should not consider investors as homogenous groups instead every individual should be treated as unique and different strategies according to their characteristics while taking financial decisions. Financial advisors should take into account the impact of loss aversion and regret on risk taking ability while formulating investment portfolios of the various individuals. And also practitioners and researchers, family economists and resource management professionals should design financial products according to the profile and characteristics of every individual. Moreover, investors would not only be cognizant about their own psychological biases but will also be cautious while selecting their investment managers for their investment decisions. Investment companies and other financial institutions may also be benefitted while recruiting the fund managers whose decisions can influence the profits of their esteemed customers.

8. Future Research

The present study will pave the way for researchers and practitioners for future research in investigating the psychological or neuro-physiological mechanisms explaining why and how risk taking ability, loss aversion and regret are associated with age and gender. One possibility is that age declines the cognitive scores of the individual (Dohmen etal, 2007). It is also likely that investors with low cognitive ability are more prone to emotions and feelings. This is consistent with the prior findings which indicated that behavioral biases are significantly more pronounced for individuals with low cognitive abilities (Oechssler, Roider and Schmitz, 2008). Dohmen, Falk, Huffmann and Sunde (2007) reported that lower cognitive ability is associated with greater risk aversion and more impatience. Therefore, decline in the abilities due to increase in age results in more proneness to behavioral biases which further makes them to take less risk in their investment decisions.

Researchers and practitioners for future research can take a different sample frame so as to prove the generalizability of these findings in other populations. Similar studies can also be attempted taking additional demographics factors, such as income, family background and culture, and other factors affecting loss aversion and regret. Moreover, the researchers can also study the effect of gender and age on other psychological biases such endowment effect, anchoring, others and their subsequent effect on financial decisions. Learning more about psychological biases will enable financial professionals to further explore how this dimension of personality affects complex investment decisions that shape financial well-being of the individual.

Appendix (A) for Loss Aversion

Instructions: Assume that you are given 12 set of events where you have to choose either option (**A)** or option (**B)** for each event (1-12). Start from Row 1 and proceed further. Tick Mark the option you choose in every event (that is option A or option B).

Event No.	Safe Payment **(A)**	Vs	Lottery **(B)**
1	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 20000
2	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000. , 50% chance of **winning** Rs. Rs. 24000
3	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. Rs. 20000, 50% chance of **winning** Rs. Rs. 28000
4	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. Rs. 20000, 50% chance of **winning** Rs. 32000
5	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 36000
6	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 40000
7	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 44000
8	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 48000
9	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 52000
10	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 56000
11	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 60000
12	100% chance of winning Rs. 0	Vs	50% chance of **losing** Rs. 20000, 50% chance of **winning** Rs. 64000

Appendix (B) for Regret

Assume that you have Rs. 50000 to invest with one of two brokers (Broker A or Broker B). Broker A has a 43% chance of success, that your investment will increase by 15% after one year and Broker B has a 54% chance of success; that your investment will increase by 12% after one year. Which of the two brokers you would like to invest the Rs. 50000? Please circle the option you choose.

1. Broker A
2. Broker B

If the broker chosen by you in above question get failed,

Please show how strongly agree or disagree with these statements by circling number 1 (strongly agree) to 5 (strongly disagree) which best fits your decision in the above question?

1. It was the right decision

a) Strongly agree b) Agree
c) Neither agree nor disagree d) Disagree
e) Strongly disagree.

2. I regret the choice that was made

a) Strongly agree b) Agree
c) Neither agree nor disagree d) Disagree
e) Strongly disagree.

3. I would go for the same choice if I had to do it for again

a) Strongly agree b) Agree
c) Neither agree nor disagree d) Disagree
e) Strongly disagree.

4. The choice did me a lot of harm

a) Strongly agree b) Agree
c) Neither agree nor disagree d) Disagree
e) Strongly disagree.

5. The decision made was wise one

a) Strongly agree b) Agree
c) Neither agree nor disagree d) Disagree
e) Strongly disagree

Appendix (C) Questionnaire for Risk Taking Ability

Instructions: You have to choose one of the five or four options for each question which suits you the best.

Q1. What proportion of your assets would you wish to invest in instruments other than risk-free deposits?

a) 0%
b) Between 1 and 25%
c) Between 25% and 50%
d) Between 50% and 75%
e) More than 75%

Q2. You have saved the equivalent of 10% of your gross annual salary and it is proposed that you invest this sum in a risky stock. You have a 50/50 chance that the value of your investment will triple over the next three years or that you will lose the entire amount invested. What will you do?

a) will automatically refuse the proposal.
b) will carefully examine the proposal and then refuse.
c) will have difficulty making a decision.
d) will carefully examine the proposal and then accept.
e) will automatically accept the proposal.

Q3. If you had to invest 2, 00000 which of the following investment choices would you find most appealing?

a) 60% in low-risk investments 30% in medium-risk investments 10% in high-risk investments
b) 30% in low-risk investments 40% in medium-risk investments 30% in high-risk investments
c) 10% in low-risk investments 40% in medium-risk investments 50% in high-risk investments.

Q4.You are on a TV game show and can choose one of the following. Which would you take?

a) 10,000 in cash
b) A 75% chance of winning 25000
c) A 50% chance at winning 50,000
d) A 25% chance at winning 1,00,000
e) A 5% chance at winning 1,000,000

Q5. What minimum/maximum potential value would you choose for Rs.10,000 invested over a 1-year period?

Minimum value after 1 year: - Maximum value after 1 year: -

a) Rs. 9900 a) Rs. 10300
b) Rs. 9500 b) Rs.11000
c) Rs. 9000 c) Rs. 11500
d) Rs. 12000 d) Rs. 8500
e) Rs. 12500 e) Rs. 8000

Q6. Suppose the markets go through a difficult period, what decrease in the value of your investments could you tolerate?

a) No decrease b) Less than 5%
c) Between 5% and 10% d) Between 10% and 20%
e) Over 20%

Q7. From August 31, 2000 through March 31, 2001, stocks lost more than 25%. If you owned a stock investment that fell more than 25% in seven months, you would... (If you owned stocks during this period, please select the answer that matches your actions at that time.)

a) Sell all of the remaining investment
b) Sell some of the remaining investment
c) Hold on to the investment and sell nothing
d) Buy more of the investment

Q8. Investments carrying a higher risk come with a bigger chance of achieving higher returns, but also a bigger chance of incurring substantial losses. Each investor has a different appetite for risk. Suppose you had 1 crore to invest which of following return scenarios would be most attractive?

a. Between a loss of 2% and a gain of 13%
b. Between a loss of 12% and a gain of 28%
c. Between a loss of 26% and a gain of 46%
d. Between a loss of 50% and a gain of 100%

Q9. Please tick which of the following portfolio volatilities would you be most comfortable with? (Assume an inflation rate of say 3% p.a.)

Year	1	2	3	4	5
Portfolio A	5%	5%	5%	5%	5%
Portfolio B	-5%	11%	3%	15%	-2%
Portfolio C	10%	-10%	8%	0%	20%
Portfolio D	38%	-17%	-5%	14%	26%
Portfolio E	15%	18%	-28%	63%	32%

Note: Each question was coded from 1 to 5 or 1 to 4 according to number of options having in each question and then they are totaled up to get scores of risk taking ability with higher scores indicating higher risk taking ability.

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