Color cognitive distortion in retail investment decisions

-Does the color of the historical performance chart effect investment decisions of retail customers?

Paper within	Experimental methods in economics and finance
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Abstract

The purpose of this research is to discover if human rationality levels are affected by colors. To test it subjects are divided in separate groups, each with their own sheet of paper on which the subject have either a black or a red chart showing historical values of a risky asset. The subjects are also tested for risk aversion. The data collected from these tests show no correlation between the color of the chart and the investment decision, indicating that rationality levels are not affected by the color of a chart. However it must be mentioned that the experiment might had a different result using a different subject group as most subjects belong in the economics/business department and thus can be expected to act more rationally than other people in decisions regarding investment and such.

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1 Introduction

As retail banking sector evolved into a more mature industry, the need for extra services aroused. In other words, retail bank offices have become a place where costumers are rushed to buy as much financial products as feasible. Because of that, investment-banking products such as mutual funds that were thought and marked for experienced investors have filtered down to retail customers. As with any other product, the marketing department designs the brochures and prospectus following the corporate guidelines.

In the field of behavioral finance, there have been studies on the cognitive limitations of human beings and the impact on the financial decisions. Yet, in the practitioners' world the information is presented not taking into account the potential downsides of using the corporate image in the information that is presented to the potential financial investors.
Colors have been tied with different behaviors in different cultures. For instance red color has been associated in the literature with danger, death, loss and other negative feelings. Yet, institutions such as HSBC that has red as a corporate color use it present the details of the investments to potential clients without taking into account the potential effects that red may have. On the other hand, banks such as Credit Suisse have a less potential threating in color in a western environment as a corporate image and thus, they may have a competitive advantage.

Hence, the main goal of the proposed experiment is to assess the affects that color of the charts presented to the costumers affect their end decisions and create competitive advantage among rivals when using a different color set.

Classical economics and any subsequent apprise of economic theory is grounded on the hypothesis that the individuals participating in the market are fully rational. That is, given the technical information that they are able to gather, there choice will maximize their utility and will be consistent over time.
Another statement that is fully accepted as plausible in which theory is built on is the fact that any given population will follow a normal distribution. Therefore it can be assumed that risk aversion will not affect the conclusions of our experiment. However, we

also test for risk aversion by asking the participants to complete a standardized test for risk aversion.

However, in China and Hong Kong the color red is associated with fortune and luck and the color black is associated with death and bad luck. Therefore we believe that the color of the historical chart might confuse the participants' rationale.

The hypothesis is therefore that participants will invest more in the risky asset when the charts has red color.

We firmly consider that there are two important dimensions on the question we are proposing. The first one is the challenge of rational participants. We are rather pondering the fact that participants in the market may also base their decisions on cognitive distortions and this has to be incorporated in the framework when analyzing the behavior participants in that market and thus, at any theoretical model that deals with asset allocation.

The second field the experiment deals with is more applied. This experiment may contribute in the change on how marketers and particularly brand managers and advertisers deal with information design in order not only to maximize their profits but also consumer satisfaction due to a more clear coherent way to deliver the information about their financial products.

Even though there have been studies on the cognitive connotations individuals have with different colors and other distortionary awareness elements such as smell or sound, there is no ceteris paribus experiments to analyze the concrete effects of those in the decision making process of the participants of the market.

2 Experimental design

The experiment design was the following. We recruited a total of 37 students in the City University of Hong Kong. We divided the sample into two treatments. The only difference among them was the color of the chart of the instructions.

We started by introducing them to the task in hand and how the payoff would be determined. After that, once the experimental part was concluded and results were collected, we let them do a questionnaire to test for demographic and risk aversion variables.

The instruction for the experiment were the following:

"Welcome to our experimental study on decision-making. You will receive a budget of 50HKD, given by the experiment conductors, to be allocated between two assets. Your payoff will depend on your investment decisions

You will be given a subject ID number. Please keep it confidentially. Your decisions will be anonymous and kept confidential. Thus, other participants will not be able to link your decisions with your identity. You will be paid in private, using your subject ID, and in cash at the end of the experiment.

When you have any questions, please feel free to ask by raising your hand, one of our assistants will come to answer your questions. Please, DO NOT communicate with other participants.

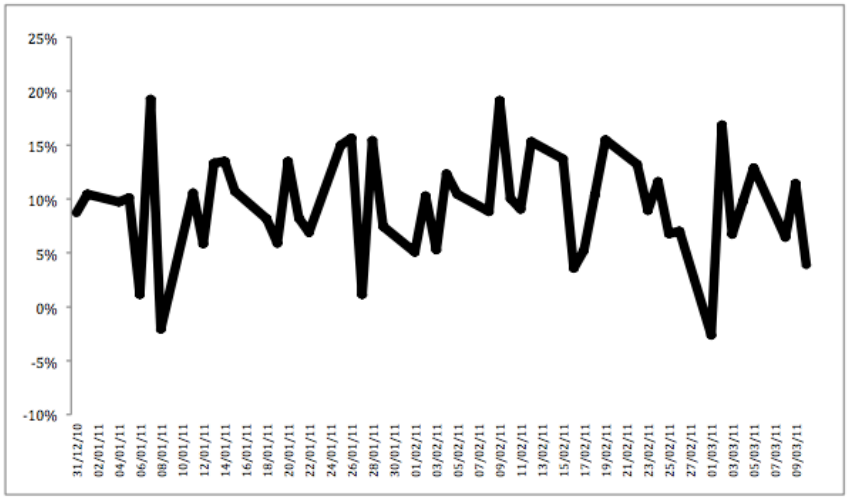
The assets are:

• "Risk-free Asset" with the following statistics:

o Return: 5%

• "Risky-Asset" with the following data:

o A chart of the return for the past 50 days."



As can be seen, the instructions were fairly simple. We ask the participant to allocate the budget between a risky and a risk free asset. For the risk free, they had information about the return. For the risky asset, we showed them a chart of the return of the past 50 days. The sample was randomly generated using the following statistics: the expected return is 10% and the standard deviation was also 10%. One treatment received the chart in red and the other one in black.

After that, we created a questionnaire to check for demographic variables such as age, gender, place of birth as well as risk aversion. The questionnaire is the following:

Questionnaire

- *Subject ID:*
- *Age:*
- *Gender:*
- *Place of birth:*
- *Have you lived in any other country for more than a year? If yes, which?*

Please make your choice for the following gambles.

Choice	Gamble A				Gamble B				Choice
1	10%	HKD 20	90%	HKD 16	10%	HKD 38.5	90%	HKD 1	
2	20%	HKD 20	80%	HKD 16	20%	HKD 38.5	80%	HKD 1	
3	30%	HKD 20	70%	HKD 16	30%	HKD 38.5	70%	HKD 1	
4	40%	HKD 20	60%	HKD 16	40%	HKD 38.5	60%	HKD 1	
5	50%	HKD 20	50%	HKD 16	50%	HKD 38.5	50%	HKD 1	
6	60%	HKD 20	40%	HKD 16	60%	HKD 38.5	40%	HKD 1	
7	70%	HKD 20	30%	HKD 16	70%	HKD 38.5	30%	HKD 1	
8	80%	HKD 20	20%	HKD 16	80%	HKD 38.5	20%	HKD 1	
9	90%	HKD 20	10%	HKD 16	90%	HKD 38.5	10%	HKD 1	
10	100%	HKD 20	0%	HKD 16	100%	HKD 38.5	0%	HKD 1	

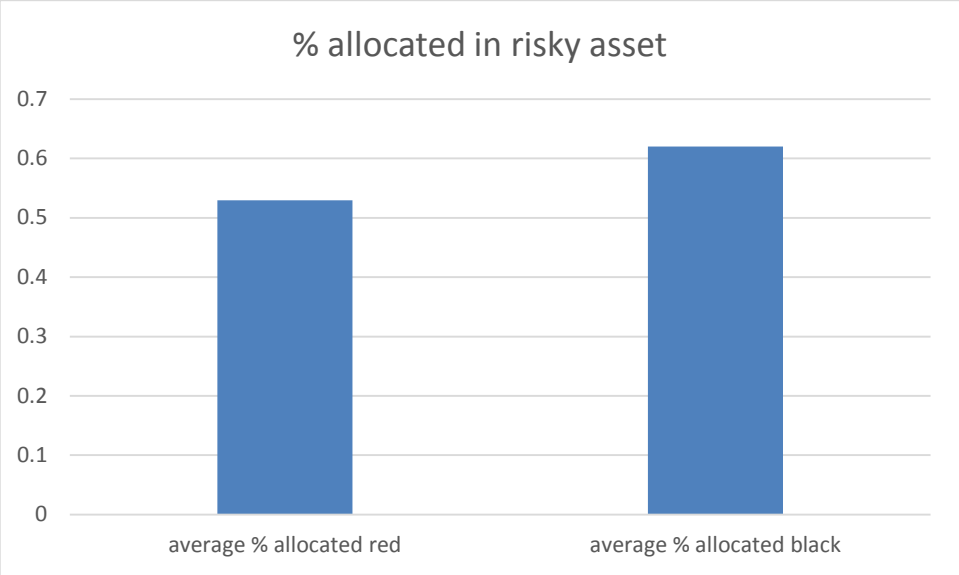
The last part was supposed to create a numerical coefficient for the subjects' risk aversion.

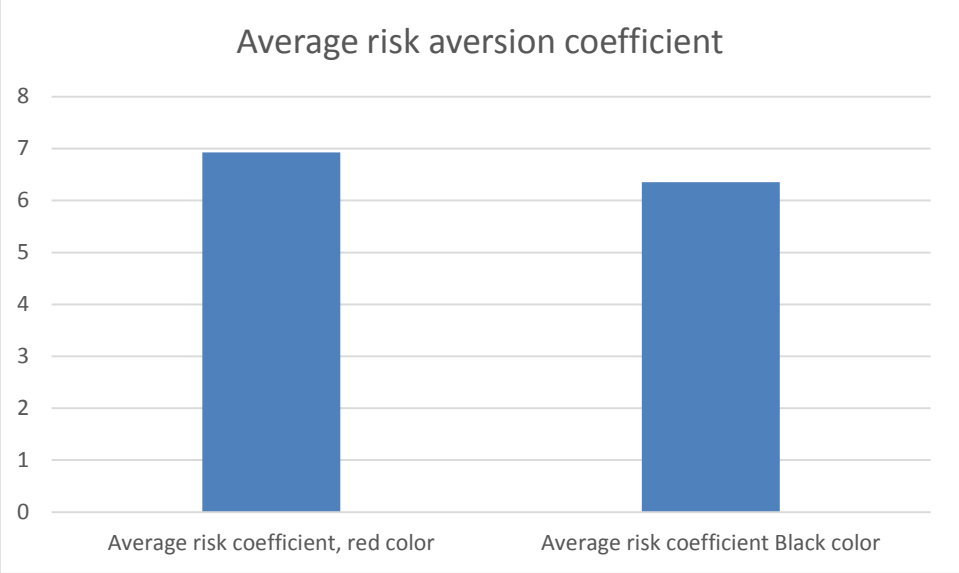
3 Results

According to the theoretical framework there should be no relation between investment decisions and the color of a chart. The null hypothesis thus is that there will be no difference between the amounts allocated in the risky asset between the two groups (red charts or black charts). The data from our experiment confirms that the null hypothesis is correct. In fact there was a higher amount allocated in the risky asset in the subject group given the black chart than were in the red as opposing to our research hypothesis.

Results Color and risk aversion: The black charted group allocated 62 percent on average in the risky asset while the red group only allocated 53 percent as can be seen in

table 1 below. However, the red charted group scored slightly higher on the risk aversion test as can be seen in table 2, though this score difference was not found to be significant on an alpha level of 5 percent not even after removing other uncorrelated variables. This was a surprising discovery as our hypothesis expected positive correlation between the red color and percentage allocated in the risky asset to at least some degree.





Results Gender and age: Males did not allocate significantly more money than females in the risky asset according to the least squares method, but they did allocate more than the female subjects (72 percent was allocated in the risky asset by males vs 53,9 percent by the females).

Dependent Variable: __RISKY
Method: Least Squares
Date: 05/08/15 Time: 14:12
Sample: 1 37
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGE	0.010673	0.017729	0.602005	0.5531
COLOR	-0.141964	0.078059	-1.818666	0.0820
GENDER__1_MALE	0.105209	0.092241	1.140588	0.2658
RISK	-0.046554	0.025043	-1.858908	0.0759
C	0.777182	0.366675	2.119539	0.0451

R-squared	0.312634	Mean dependent var	0.649286
Adjusted R-squared	0.193092	S.D. dependent var	0.224531
S.E. of regression	0.201692	Akaike info criterion	-0.203716
Sum squared resid	0.935633	Schwarz criterion	0.034178
Log likelihood	7.852026	Hannan-Quinn criter.	-0.130990
F-statistic	2.615261	Durbin-Watson stat	1.875469
Prob(F-statistic)	0.061656		

Dependent Variable: __RISKY
Method: Least Squares
Date: 05/08/15 Time: 14:16
Sample: 1 37
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COLOR	-0.127799	0.077518	-1.648636	0.1117
RISK	-0.048851	0.023773	-2.054922	0.0505
C	1.037699	0.160474	6.466465	0.0000

R-squared	0.251175	Mean dependent var	0.649286
Adjusted R-squared	0.191268	S.D. dependent var	0.224531
S.E. of regression	0.201920	Akaike info criterion	-0.260935
Sum squared resid	1.019291	Schwarz criterion	-0.118199
Log likelihood	6.653088	Hannan-Quinn criter.	-0.217299
F-statistic	4.192808	Durbin-Watson stat	1.845079
Prob(F-statistic)	0.026900		

Dependent Variable: __RISKY
Method: Least Squares
Date: 05/08/15 Time: 14:18

Sample: 1 37
Included observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COLOR	-0.090370	0.078303	-1.154112	0.2563
C	0.620000	0.054615	11.35215	0.0000

R-squared	0.036661	Mean dependent var	0.576036
Adjusted R-squared	0.009137	S.D. dependent var	0.239157
S.E. of regression	0.238062	Akaike info criterion	0.019968
Sum squared resid	1.983575	Schwarz criterion	0.107045
Log likelihood	1.630588	Hannan-Quinn criter.	0.050667
F-statistic	1.331974	Durbin-Watson stat	1.935437
Prob(F-statistic)	0.256274		

4 Conclusion

The research experiment was conducted in order to test if a person's rationality when making an investment decision can be affected by the color of the investment chart. The data showed no such correlation between the variables color and percentage allocated. The hypothesis of this paper is therefore wrong at least in this case. Questions raised are now whether the amount of color was too small for it to affect the frontal cortex or if there is another variable that we have not tested for. The results of this experiment is mainly that no conclusions can be drawn as nothing is certain.

5 Discussions

Worth mentioning is that the data in the regression model does not use nine of the participants. This is due to the fact that these subject were put in a group we like to call "irrational risk". The subjects in this group basically either like taking stupid risks or did not understand the risk aversion test (subjects switched back and forth between gamble A and gamble B). As for why these subjects did not ask for help while performing the experiment can only be speculated in but they had to be removed for the regression as they might not have taken the test seriously or maybe not understood the first main part of the experiment either. As the 9 subjects were removed only 28 observed subjects were added to the regression model, this is a little short to completely feel safe assuming a normal distribution.

6 Appendix

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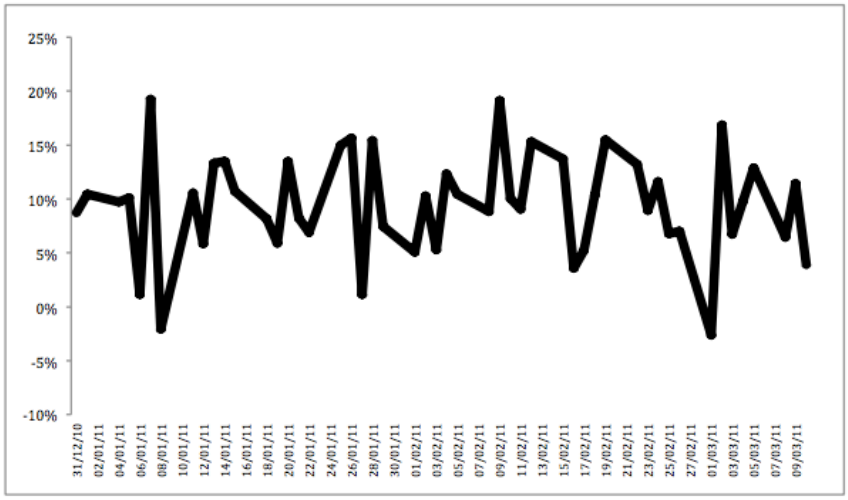

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