Behavioral Investigation of Trust Building in Online Banking: New Marketing Methodology for Suruga Bank

by

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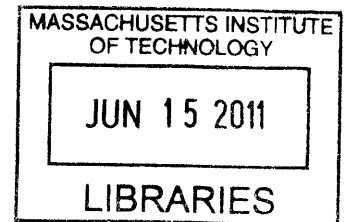
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ABSTRACT

The recent financial crisis has brought a huge loss of faith in economic rationality and the economic discipline. For the current financial industry, how to re-build "Trust" with customers is the one of biggest issues. Although we know that the strong relationship between the deep level of trust and the banking business has high potential, it has not yet been optimized, especially in online transaction banking. This is in part due to customers' perception of higher risk in the absence of traditional face to face interaction.

Recent findings have shown that facial cues can have a powerful impact on trust building. However, there is also evidence that images of faces in some cases can decrease online interactions. Thus, the goal of this thesis is to investigate the impact of different types of facial attributes and which customer profiles will most benefit from such facial images in online banking.

In an experimental setting, this research created a personalized web site which features the banker's representative, and conducted an investment game in order to correlate them with investment performance. This research also included rating trustworthiness on a banking advisor's photo and a demographic questionnaire for statistic trust profiling.

Understanding a subject's decision making mechanism by giving them advisor's facial stimuli in a naturalistic online context, with integrating communication will provide an important potential for building and promoting trust, which further suggest Suruga Bank will be in an unique position by capitalizing on the new marketing methodology.

ACKNOWLEDGEMENT

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1. Introduction

1.1 The impacts of financial crisis and customer's financial behavior

Asset prices suddenly dropped down in September 2008 due to the 'Financial Crisis' after the subprime loan problem in 2007. Asset prices and individual financial assets in Japan also decreased in unprecedented fashion. Individual financial assets of Japan decreased from 1,571 trillion yen at the end of June, 2007 to 1,409 trillion yen at the end of March, 2009, according to Bank of Japan. (Fig. 1)
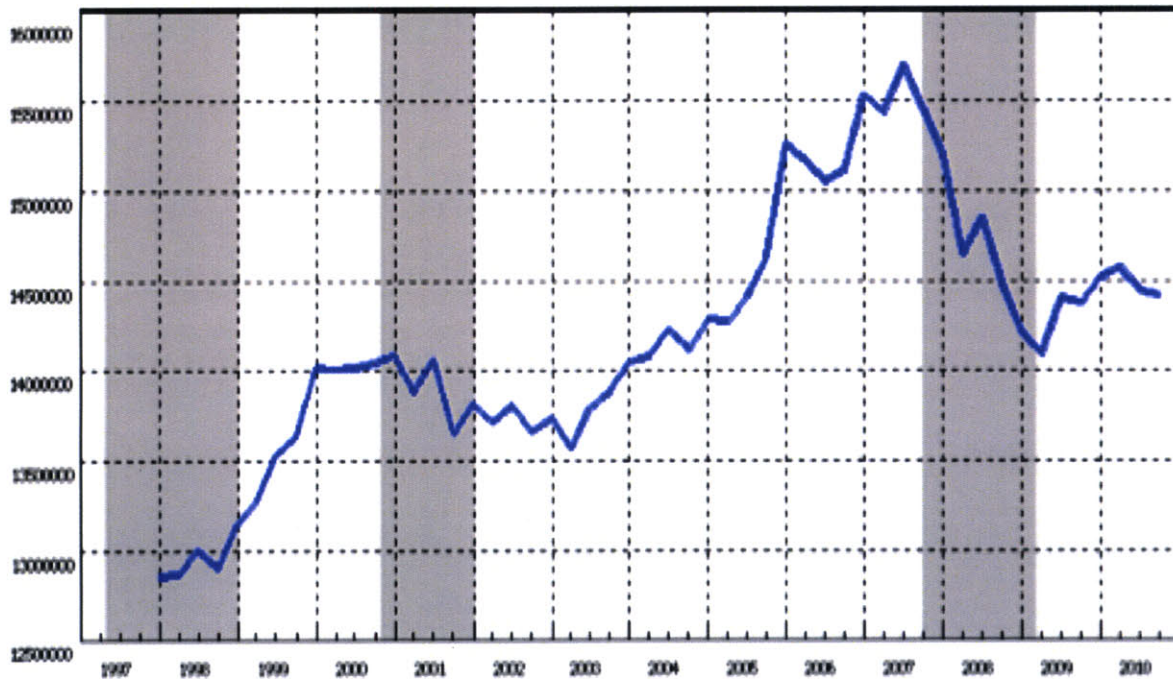
Fig. 1 Transition of individual financial asset balance of Japan 1997-2010

This crisis also had a big influence on the percentage of individual financial assets as well. Although the ratio of cash and deposits of individual financial assets was falling to 50.2% by the end of June 2007 under the mood of "investment from savings", it changed to 55.2% and rose by December 2008 and 55.8% at the end of June 2010, according to Bank of Japan. (Fig. 2)
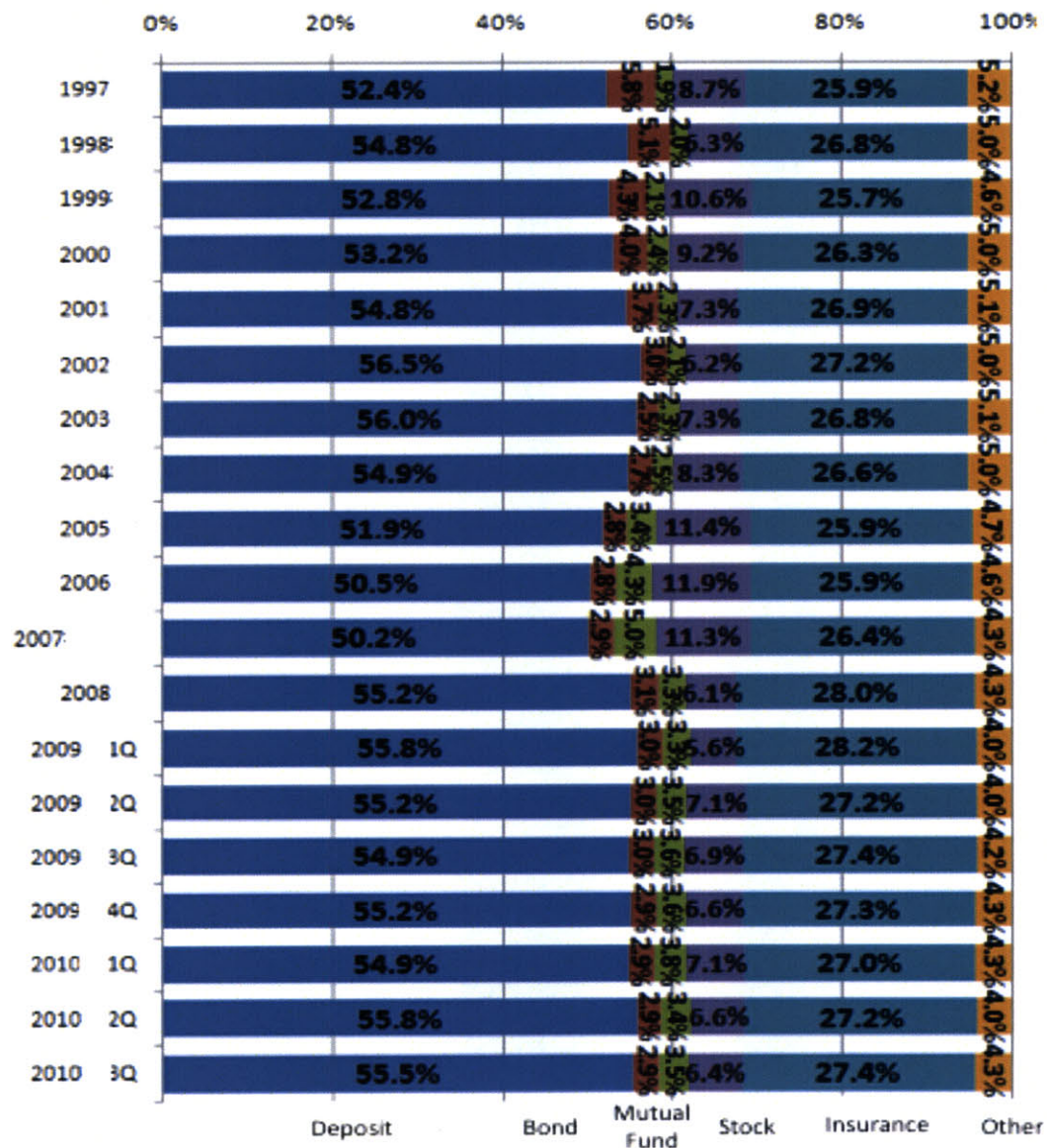
Fig. 2 Japanese Household Financial Asset Portfolio 1997-2010

The influence of financial crisis brought not only the reduction in customer's financial assets but also the conscious action for an individual's asset management style. In short, when people invested, they tended not to invest in high risk products, but rather focused on deposits in risk-averse savings-oriented products. Moreover, even when they took greater, there was a tendency to use simple and intelligible investments.

As a result of this monetary crisis, people recognized that they were unprepared for an unexpected event that actually happened, and the crisis became the impetus to look back upon personal financial management style. The situation cannot be explained by economic theory, rather it is based on human's rationality.

In general, people tend to believe that they can explain events by normal distribution. However, this financial crisis could not be explained by any normal distribution. Nevertheless people tend to believe these events can never happen by nature. As Zweig (2007) wrote in his book "Your money & Your Brain", this nature comes from human's distorted brain mechanism. As humans are faced with a loss avoidance bias, they try to avoid loss rather than pursue profit - especially for financial loss – and they tend to be overreacted to it. Moreover, when human are faced with such a situation, they react based on intuition instead of deep consideration. This distorted brain mechanism in humans is particularly problematic when dealing with financial uncertainty.

1.2 Importance of trust building for banks

The facts: (1) the market does not always work as we expect and (2) humans do not make rational decisions in financial crisis, based on those facts, financial institutions should advocate for customers to make more rational financial decisions. Needless to say, nowadays the importance of financial transaction is growing, especially, individual level financial transaction which are heavily based on individual financial literacy. Thus, financial institutions need to build and sustain trust between customers in order to educate and advocate for them.

While many Japanese financial institutions have been building trust with between their customers as a general strategy, the mechanisms of the trust building may not be as effective any more, and even more importantly, will be very difficult to accomplish after the crisis. Thus, banks need to develop a new strategy to re-build customer trust in various ways. In addition, they should also consider that the trust with customers must be sustained in the long run.

In terms of bank's marketing strategy, as customer desires and needs are becoming more diverse, banks should move from a product based approach to a customer centric approach. In the past, the bank's main marketing strategy was largely based on product selling, however, it is becoming more clear that a needs based approach, using a helpful "Nudge" to customers may yield better results and greater trust. (Richard H. Thaler and Cass R. Sunstein, 2008)

Therefore, banks need to understand a customer more deeply and needs to set forth the strategy to advocate for the customer to make better financial decisions, based more clearly on trust. The approach could be beyond an individual attribute, economic conditions, dealings experience, etc.

1.3 Suruga Bank

Suruga Bank Ltd. is a Japan-based regional bank engaged in the financial services, as well as the provisioning of other financial products and services such as leasing. The Bank operates in two business segments. The Banking segment is engaged in the provision of deposit services, loan services, and domestic and foreign exchange transactions services, as well as the counter sale of securities, investment trust and insurance. The Leasing segment is engaged in the provision of leasing services, credit guarantee services and credit cards services.

Compared to other commercial banks in Japan, Suruga Bank has been focusing on retail banking such as mortgages, personal lending, and credit card businesses for more than 25 years. Under the "Concierge" vision, Suruga Bank aims to meet the individual financial needs of every customer through a "One to One" service. In the early 2000s, by building a robust CRM system, Suruga Bank built its customer-centric business model in retail banking business.

Along with the expansion of the Internet use, Suruga Bank was the first to build virtual branches in Japan. Now there are eight virtual branches including business service alliances so far (Fig. 3). In these branches, Suruga Bank is providing not only deposit products, but also loan products so that new customers would apply for them. Building virtual branches gave Suruga Bank another profit sources as well.

As the virtual banks/branches business model came into practice, almost of all Japanese banks built similar ones. As a result, the competition shifted from "fast mover advantage"

to a so-called "price-war". Therefore, to accomplish the next level of retail banking service model, Suruga Bank is interested in improvement of trust building with customer especially through online banking. This next stage of marketing methodology is the basis of Suruga's sponsored this research project at MIT Sloan.

Fig. 3 Example of Suruga Bank's virtual branches

2. Previous Study and Motivation

2.1 Previous study

Suruga bank has been exploring the power of trust, especially in online transaction, through recent research projects at the MIT Center for Digital Business, one of research centers of MIT Sloan School of management. To acquire and retain customers, as well as to build strong customer relationship, Suruga Bank has been challenging the notion of how to build and maintain trust between customers. Suruga Bank considers trust as a core component of its effective marketing strategy.

Professor Urban and Suruga Bank have explored the power of "Customer advocacy". As Urban (2004) describes, firms built on a foundation of total quality and customer satisfaction would build trust and more transparent relationship with customers. This idea is based on the proposition of "if I advocate you, you will advocate for me". In other words, as the customer has power, the firm must try to satisfy customers needs providing them with the best products information honestly - even though these products are from a competitor - then customers will tell others about the firm, and help the firm to design better products.

In the project on this concept, Yoshio Tokoro, who was a Visiting Scholar of the Center, built a practical "Card Loan" web site that used a financial advisor to improve customer experience through web site. (Fig. 4) For this site, he focused on two ideas: Urban's "Customer Advocacy" idea, and the concept of "Morphing the web site" which enables a

matching of information to a specific customer's cognitive and cultural decision style.

This research confirmed that customer advocacy theory and morphing theory resulted in

greater trust, site rate, and purchase probabilities significantly increased. (Tokoro, 2008)

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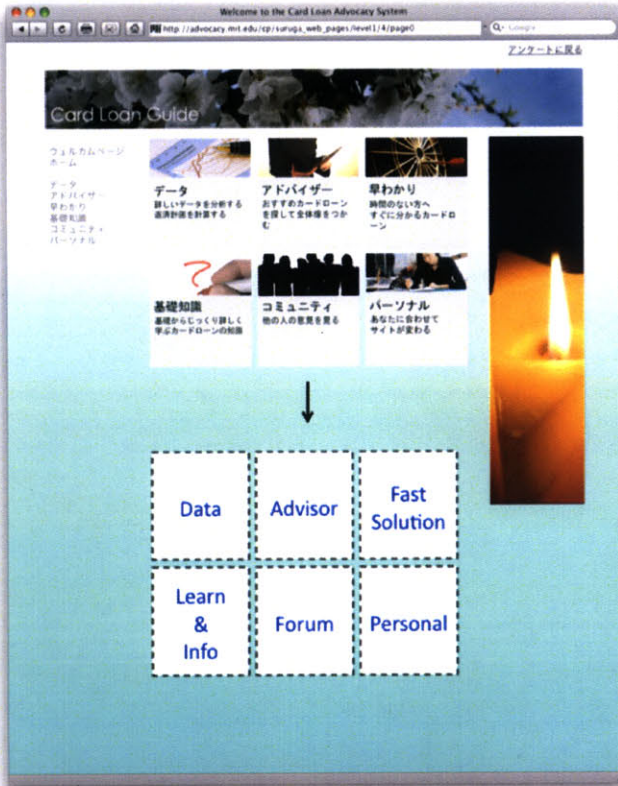
2nd page- Advisor
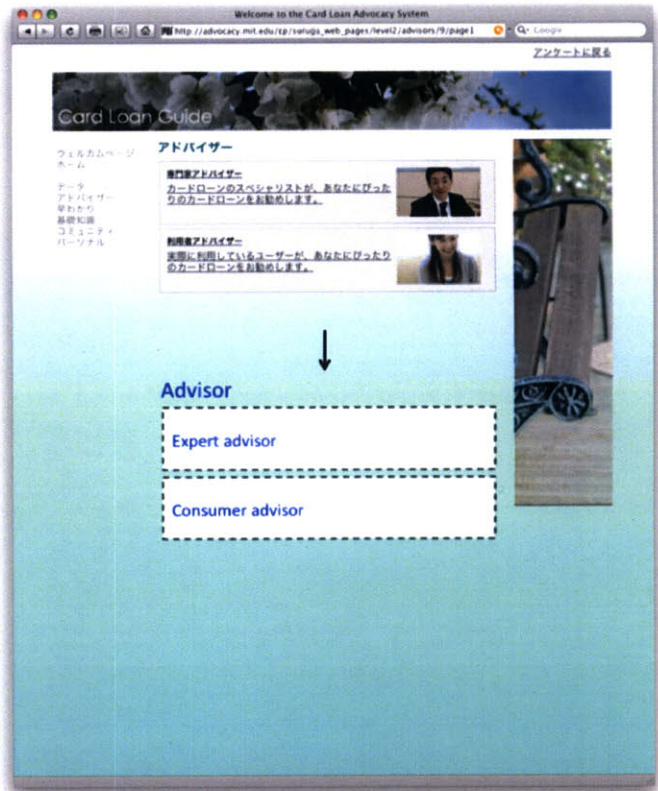
Full information including comparison with competitors (Advocacy)
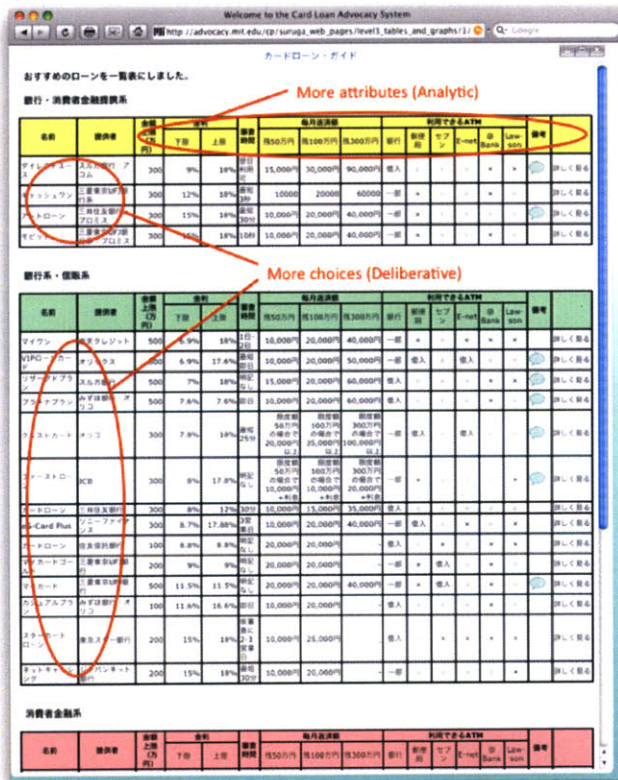
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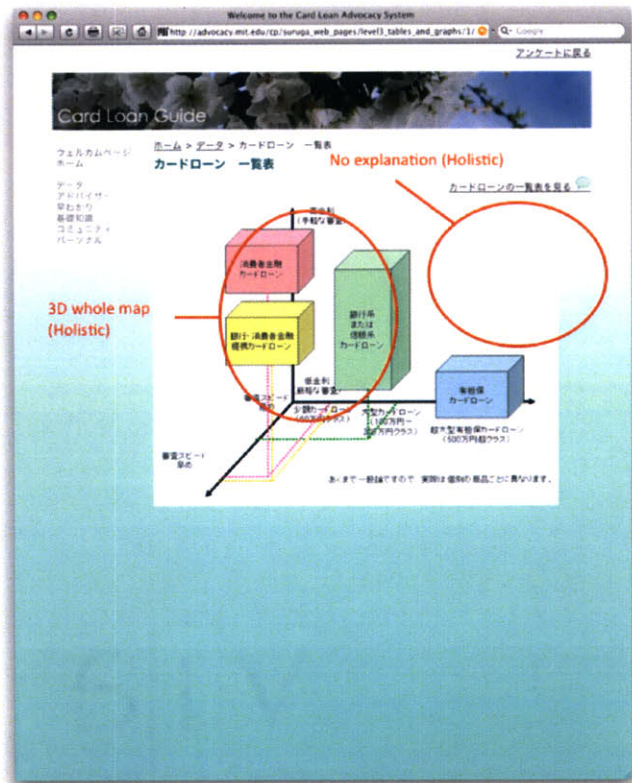
Fig. 4 Screen Shots of Card Loan site

2.2 Motivation for this research

My motivation for this research comes from the following facts that even though "Customer Advocacy" theory and applying "Morphing web site" technique would work for building trust, there are still unresolved issues regarding trust building in online banking. Specifically, compared with "face-to-face" transactions, customer trust in online banking may still be weaker due to distant, digital environment and implicit uncertainly. Furthermore, as mentioned in 1.1, people tend to make more irrational decisions in extreme circumstances. Specifically, in uncertain circumstances most people would take actions of risk avoidance, and thereby avoid online transactions. Still certain kind of framework in order for help customer to make rational decision is needed.

Thus, I am interested in developing a new innovative attribute with having "advisor's face" for investigating the impact of the facial resembles and the behavioral correlates of such website and trust building through online banking.

Determining if the advisor's face could help understand finding the best personas of advisor and behavioral reactions will give us a chance to explore the mechanism of decision making and trust formations, and see their drivers for online banking.

If we could find the best persona for each customer, as Suruga bank have been providing "One to One" communication through CRM, it would have high synergy effect. In the end, such understanding of customers' trust formation will provide Suruga Bank a unique position with a new marketing strategy.

Before addressing these goals, this paper clarifies a few definitional ambiguities and briefly reviews the literature about online trust.

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3. Literature

The new Suruga Trust paradigm is grounded in three lines of research, including: online trust, E-commerce, and psychological science.

3.1 Online Trust

Online trust is growing in importance as research area as trust has been recognized as a key driver of web–based business. It also has important influence on Internet marketing strategies. (Urban, 2009) As the popularity and technology development of the Internet progresses, the issues have moved beyond from the security and privacy to trust. A website with lack of trust can easily lose customer's attentions. Thus, marketers have huge interest in learning about online trust.

According to Urban, Sultan, and Qualls (2000), the formation of trust is multi-dimensional and there are other things that affect trust. They recommended the use of: (1) virtual-advisors to gain customer confidence, (2) advocacy features to provide unbiased and complete information, and (3) competitive information to increase transparency.

McKnight, Choudhury, and Kacmar (2000) conceptualized a trust-building model as they demonstrated that consumer trust resulted in a willingness to follow advice, share information, and make a purchase.

Bart et al. (2005) found that trust is a mediating construct between antecedents such as website and consumer characteristics and consequences such as behavioral intent.

Recent work by Buttner and Goritz (2008) on pharmaceutical products reinforces previous research to show that trust mediates perceived risk and intent to buy.

3.2 E-commerce

Ulrike Steinbrück, Heike Schaumburg (2002) examined virtual re-embedding and suggested this as a possible strategy to increase consumer trust. Even though many companies have tried to do this strategy, still little is known about the effectiveness of virtual embedding. They found the effectiveness of photograph in e-bank website and found significant positive effect on trustworthiness. For the design of e-commerce websites it can be concluded that embedding a photograph of a company's representative may be a simple, yet powerful way to increase the trustworthiness of an online-vendor.

As a result, displaying a portrait photograph helps to create social presence and brings the impersonal process of electronic commerce closer to the familiar situation of a face-to-face sales conversation. The customer develops a quasi-social relationship to the person shown in the picture. Thus, it creates an entry point for the consumer to the anonymous company and facilitates the establishment of customer trust.

3.3 Psychological Science

Deciding whether an unfamiliar person is trustworthy is one of the most important decisions in social environments. Such decisions often depend on appraisal of others from their facial appearance and can be automatic (implicit/unconscious). Studies have shown that information from faces is processed rapidly, with inferences about trustworthiness made in only 100 milliseconds (Willis and Todorov, 2006).

Another study shows that facial dynamics significantly influenced peoples' choice and decision of whom to cope with. Facial dynamics have the capacity to serve as a behavioral 'fingerprint' of someone's trustworthiness in a given situation. Fleeting facial movements convey temporal information that has an impact on whether we will trust others and cooperate with them or refrain from doing so.

(Krumhuber, E., Manstead, A., Cosker, D., Rosin, P. L. and Marshall, A. D., 2007)

4 Research Methodology

Based on this literature, we used a variant of a standard economic trust exercise, cast into a game involving online loan and investment decision.

Briefly, we have created an investment game, involving pictures of bank representatives who make financial offers with varying degree of risk and uncertainty. Participants were given a 'loan' to invest in a series of banks, and they would receive earnings based on their investment performance. For each trial, the participant saw an image of a 'bank representative' and the name of the current bank. Each offer consisted of a principal, and either a fixed or variable interest rate. The bank representatives are depicted as either digitally generated trust-manipulated faces, or as morphed faces, some of which had been morphed with the subject's own photograph. Participants were also notified of a small chance that a bank might 'fail' and not return their principal.

4.1 Building "personalized" website

Our research team created a website for this investment game with basic experimental design, exposing pictures of "advisors" (bank representatives) and making financial offers with varying degree of risk and uncertainty. (Fig. 5)

Participants were presented with two offers (A and B). They could choose offer A or offer B, or reject both offers and request a new bank. They can see how many banks are remained and how much loan they have. They can also see a bank's fake name and logos in the center.

Fig. 5 Website design

4.2 Face Morphing

The bank representatives faces are depicted as either digitally generated trust-manipulated faces, or as morphed faces, some of which had been morphed with the subject's own photograph. We used the face-morphing software "PsychoMorph" (Bernard Tiddeman, Perception Lab, University of St Andrews, St Andrews, UK) specifically adapted for this research. (Appendix. 3) Fig. 6 shows the morphing process. This generated image is used for standard face of the "advisors" with the face of the actual experimental participant.

Subject   40%   60%   **Frame**
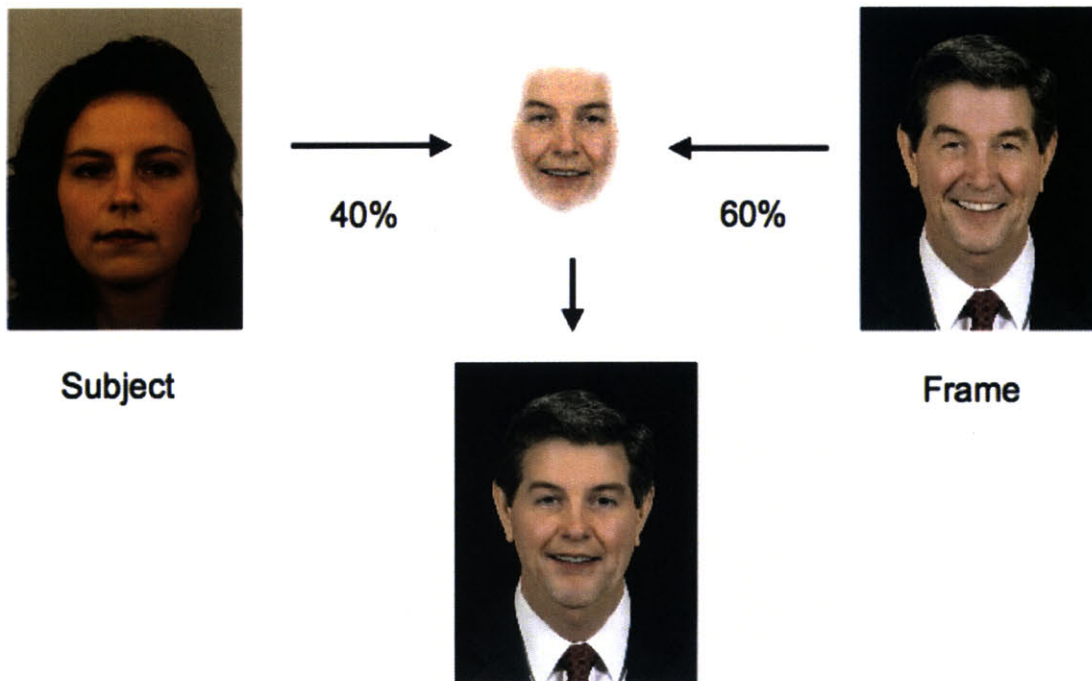
Fig 6. The morphing process

4.3 Investment Game

Participants played a series of investment games with what they believe were real bank representatives. None of the participants recognized that the faces of bank representatives were digitally morphed, neither with other faces nor with their own.

At first, participants were given an $8000 'loan' to invest in a series of 96 banks. For each trial, the participants were presented with two offers (A and B). Then, participants saw an image of a 'bank representative' and the name of the current bank, which is not real bank name. They could choose offer A or offer B, or reject both offers and request a new bank. Each offer consisted of a principal, and either a fixed or variable interest rate (Table 1) in the following sequence. (Table 2)

Participants were also notified of a small chance that 2 banks might 'fail' and not return their principal, thereby deducting all or some of the amount of the invested principal from the participant's total earnings. As these 2 banks are determined after the investment game, it will affect participant's investment strategy.

Offer

Offer A			Offer B		
Amount	Base rate	Risk	Amount	Base rate	Risk
25	0.01	none	25	0.01	none
50	0.015	moderate	50	0.015	moderate
100	0.02	high	100	0.02	high

Risk

Base rate	none	min moderate	max moderate	min high	max high
1.0%	1.0%	-0.5%	3.5%	-2.0%	6.0%
1.5%	1.5%	0.0%	4.0%	-1.5%	6.5%
2.0%	2.0%	0.5%	4.5%	-1.0%	7.0%

Table 1. The Combination of offers

trial	principal_A	base_interest_A	risk_A	principal_B	base_interest_B	risk_B
1	25	0.02	2	25	0.015	2
2	25	0.02	1	25	0.01	1
3	25	0.01	2	25	0.01	1
4	50	0.01	2	100	0.015	1
5	25	0.02	1	100	0.015	1
6	50	0.01	3	25	0.01	3
7	50	0.02	2	25	0.02	3
8	50	0.01	2	100	0.01	3
9	25	0.01	1	50	0.015	1
10	50	0.02	1	100	0.02	3
11	25	0.01	2	50	0.01	2
12	50	0.015	1	50	0.01	1
13	100	0.01	3	50	0.02	2
14	25	0.01	3	100	0.02	2
15	100	0.01	3	25	0.015	1
16	100	0.02	2	50	0.02	1
17	50	0.02	2	50	0.015	2
18	25	0.01	1	25	0.01	2
19	50	0.02	1	50	0.01	3
20	50	0.02	3	100	0.01	3
21	50	0.01	3	100	0.015	1
22	50	0.015	3	50	0.015	1
23	25	0.01	3	50	0.02	2
24	25	0.015	3	25	0.02	3
25	25	0.01	3	50	0.02	3
26	50	0.01	2	100	0.02	3
27	25	0.01	1	50	0.015	1
28	100	0.02	3	100	0.015	3
29	50	0.015	2	50	0.015	3
30	100	0.015	2	50	0.01	1
31	25	0.02	2	50	0.02	2
32	100	0.015	3	50	0.01	3
33	50	0.01	1	100	0.02	1
34	100	0.01	2	100	0.015	2
35	100	0.015	1	100	0.015	2
36	100	0.015	3	50	0.02	1
37	100	0.02	1	50	0.02	3
38	50	0.015	3	50	0.01	2
39	25	0.02	3	25	0.02	1
40	25	0.015	3	100	0.02	1
41	50	0.015	2	100	0.02	2
42	100	0.015	2	25	0.02	1
43	100	0.02	2	50	0.01	1
44	25	0.01	2	25	0.015	2
45	25	0.015	1	25	0.015	1
46	25	0.02	1	25	0.015	3
47	50	0.01	2	25	0.015	2
48	50	0.01	1	50	0.015	2
49	100	0.01	1	25	0.02	2
50	25	0.02	3	25	0.01	2
51	50	0.015	2	100	0.015	2
52	25	0.02	3	100	0.01	2
53	100	0.015	2	100	0.01	3
54	100	0.02	3	50	0.015	1
55	100	0.01	1	50	0.02	3
56	25	0.01	1	100	0.01	1
57	100	0.01	2	100	0.01	1
58	25	0.02	2	50	0.02	2
59	100	0.01	2	100	0.015	3
60	25	0.015	1	25	0.01	3
61	50	0.015	2	25	0.02	2
62	100	0.02	3	25	0.015	3
63	100	0.015	2	25	0.02	3
64	25	0.015	3	50	0.02	1
65	25	0.02	2	50	0.015	3
66	50	0.02	1	50	0.01	2
67	50	0.02	1	25	0.02	1
68	100	0.015	2	100	0.01	3
69	100	0.015	1	25	0.015	2
70	100	0.02	3	25	0.01	2
71	25	0.015	1	100	0.015	2
72	100	0.02	3	50	0.015	3
73	100	0.02	1	100	0.01	1
74	50	0.02	3	50	0.015	1
75	100	0.015	3	100	0.01	2
76	50	0.015	3	25	0.02	3
77	100	0.02	3	100	0.01	2
78	25	0.02	1	100	0.01	3
79	25	0.01	2	50	0.01	3
80	100	0.02	1	100	0.02	2
81	25	0.01	2	100	0.015	1
82	25	0.015	1	50	0.01	3
83	50	0.01	3	25	0.015	3
84	50	0.01	3	25	0.01	1
85	50	0.015	3	50	0.02	2
86	50	0.01	1	50	0.01	2
87	50	0.015	1	100	0.02	1
88	25	0.015	2	25	0.01	1
89	25	0.02	3	100	0.015	2
90	25	0.015	3	100	0.015	3
91	50	0.02	2	25	0.01	2
92	100	0.015	1	25	0.015	2
93	100	0.01	1	50	0.02	3
94	50	0.02	2	100	0.01	1
95	100	0.02	2	25	0.015	1
96	100	0.01	1	25	0.01	1

Table 2. The sequence of offer

4.4 Trustworthiness rating on Advisor's Photo

After completing the investment game, participants saw digitally generated trust-manipulated faces and were asked to rate on the degree to which they would be willing to be represented by each digitally created bank representative. Participants who saw bank representatives with morphed faces evaluated on each image for trustworthiness on a Likert scale of 1-6. Fig. 7 shows its process.
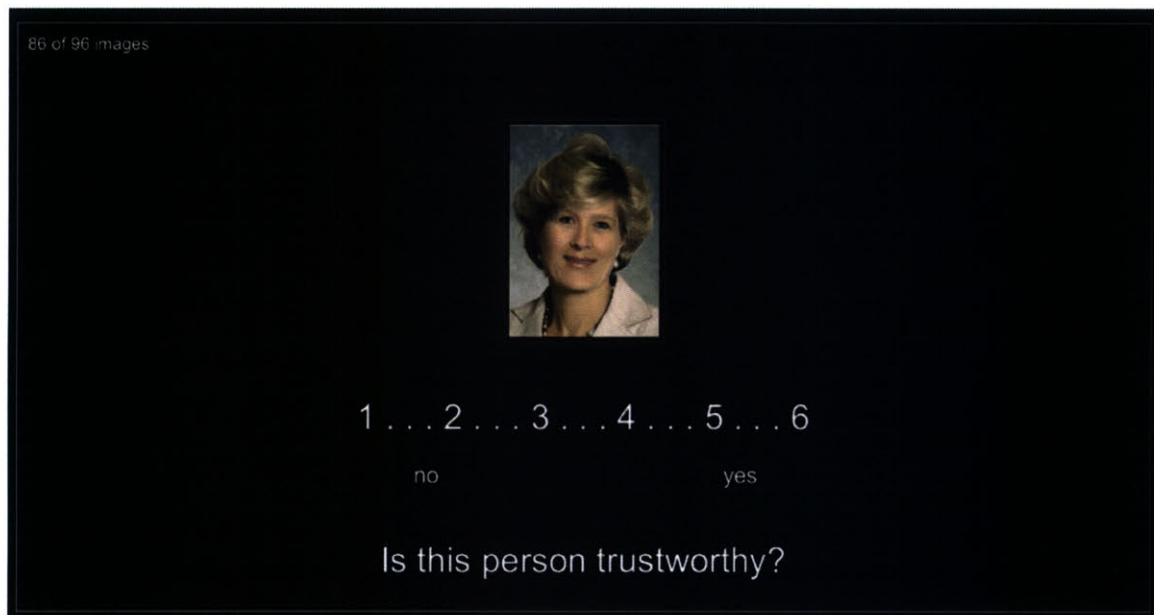
Fig. 7 The photo rating process

4.5 Personality and Demographic Questionnaires

Finally, participants took personality and demographic questionnaires. The questionnaires not only allowed us to create individual risk and trust profiles for each participant and to correlate them with their investment performance, but also gave us an indication of their personal investment strategy. One of questionnaires was the Suruga Bank's official use for customer profile sheet. (Appendix. 4) In this questionnaire, we especially focused on gender, financial asset, risk preference, and investment style in order for segmentation.

By following the experiment participants were asked to respond to an exit interview designed to probe their understanding of instructions and the objectives of the experiment.

4.6 Participants

Twenty-nine Japanese people who are living around Boston participated in the experiment. The people were recruited via an Internet community site and word of mouth. The participants ranged in age from 24 to 43; 17 were female and 12 were male. Their occupation is one third related MIT, researcher or student, one third is related to business, and the rest is housewife so far. They were familiar with using computer, but most of them were not familiar with investment.

5 Research Analysis

5.1 Hypothesis

One of the decision points in online environment is whether an unfamiliar person is trustworthy or not. Such decisions often depend on appraisal of others from their facial appearance and can be unconscious. Another point is the trade off between attractiveness of product offers and fear for choosing a "failed bank". This decision could depend on the subject's personal risk preference and investment style.

If a subject felt more trust or loyalty, they would likely to accept offers continuously. Continuous acceptance or rejection should be one of indicators of how a subject feels relative to the exposures. Also, the subject's decision should be rational.

In this experiment, as subjects are asked to choose investment products which have different expected value and some offers might be defaulted, the decision might come from multiple sources.

I consider these aspects and made the following hypothesis:

- Subjects accept more offers from advisors with facial similarity

- There are some trends among subjects identified by risk preference, personality, or demographics

- Subject's decision factor may differ when he/she accept or reject

- Advisor's trustworthiness has strong correlation to subject's decision making

- Advisor's facial similarity generate trust, loyalty, and promote rational decision

5.2 Result of Investment game and Photo trustworthiness rating

Fig. 8 shows the result of relative rejection, which is calculated by the mean of rejection over acceptance, among the type of face morphing from investment game. I observed overall relative rejection for the offer with self-morphed face, which is morphed with subjects' face, is the lowest (.289) (morph=1) compare to other types of face morphing types, constant other (.315) (morph=2) and mixed with others (.340) (morph=3). However, the difference is small.

Then I broke into different aspects including demographic profile, which are gender, asset subject have, risk preference, and investment style that come from survey questionnaire (Appendix 4), which levels are the following:

Asset ($): Low (-50k) / L-middle (50k-300k) / H-Middle (300k-1000k) / High (more)

Risk Profile (preference): Positive (Profitability) / Neutral (Balance) / Passive (Safety)

Investment Style (in game): Positive (Profitability) / Neutral (Balance) / Passive (Safety)

Morph	all	Gender	rate	Asset	rate	Risk profile	rate	Inv style	rate
self =1	0.28982	Female	0.319	Low	0.181	Positive	0.350	Positive	0.210
		Male	0.260	L-Middle	0.371	Neutral	0.288	Neutral	0.278
				H-middle	0.306	Passive	0.356	Passive	0.542
				High	0.259				
other =2	0.31593	Female	0.357	Low	0.171	Positive	0.200	Positive	0.190
		Male	0.276	L-Middle	0.399	Neutral	0.323	Neutral	0.289
				H-middle	0.364	Passive	0.350	Passive	0.711
				High	0.259				
mixed =3	0.34074	Female	0.331	Low	0.158	Positive	0.333	Positive	0.222
		Male	0.348	L-Middle	0.421	Neutral	0.337	Neutral	0.333
				H-middle	0.463	Passive	0.455	Passive	0.648
				High	0.277				

Fig. 8 Relative rejection by morph type, gander, Asset, Risk Profile, and Investment Style

I observed some key findings that are highlighted below:

- Male is more sensitive to advisor's facial similarity

- Risk sensitive people in preference and investment style may prefer advisor's facial similarity

- Relative rejection seems to depend on risk matter, not demographic profile

The result also gave us some possible customer segmentation which the persona would work better for, such as, for male whose risk sensitively is lower, advisor who has facial similarity may get lower relative rejection in offers.

Fig. 9 shows the average rate of trustworthiness among each morph type. Subjects rated higher on other (morph type=2) than self-morphed photos. It implies that facial similarity is not always equal to trustworthiness.

Morph	self =1	other =2	mixed =3
rate (0-1)	0.5931	0.647032	0.578672

Fig. 9 Photo Trustworthiness Average Rate

Fig. 10 shows the result of interview after experiment. Participants were asked three questions. For the first question "What was your investment strategy", many of the participants calculated an offer's expected value and choose the better one. Others judged the offer by the advisor's face. As for advisor's face, some of them felt strange feeling, which may comes from face morphing.

However, as a whole, participants seemed to care for advisor's face in some way.

Question	Reply	# of Reply
What was your investment Strategy?		
	Calclated Expected Value	10
	No strategy	7
	Judged from the advisor's face	5
	Accept fixed rate offer only	4
	Less investment to big investment	3
How did you manage to avoid fail bank?		
	Avoid high amount and risk	14
	Judged from face	10
	Never mind	5
How did you feel about Advisors apperance?		
	Unfamiier	15
	Looked strange	8
	Looked formal	6

Fig. 10 The Interview Result

Finally, Fig. 11 shows that those who say they do judge face, they are more significantly to reject (response=0) mixed-morph (morph type=3).
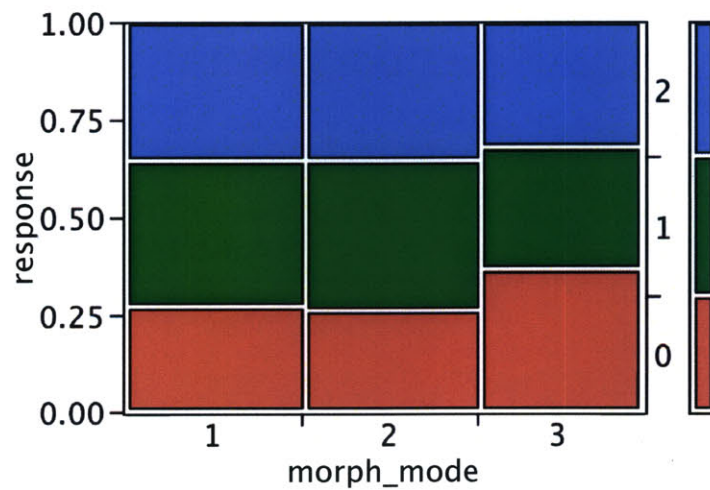
Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	10.475	0.0331*
Pearson	10.645	0.0309*

Fig. 11 Conversion by morph mode and whether they judge face

The primary contribution of this research is its attempt to explore the impact of facial similarity on a subject's decision making through cause and effect approach. These results suggest that facial similarity may not generate trustworthiness but may affect a customer's decision making in some way.

5.3 Acceptance / Rejection factor analysis

The second analysis is about the factor which affected subject's decision making. I combined the transaction data from the investment game and each subject's demographic profile questionnaire. Then I analyzed the correlation between decision (acceptance or rejection) and each factor. Fig. 12 shows the correlations between each factor which affected acceptance.

Factor	Acceptance			
	Corelation	F Ratio	Prob > F	judge
Principal A (25, 50, 100)	-0.2649	6.8671	0.0103	significant
Interest rate A (1%, 2%, 3%)	-0.4421	22.1063	<.0001	significant
Risk A (1=0, 2=-1% to 3%, 3=3% to 5%)	0.1525	2.1676	0.1444	
Principal B (25, 50, 100)	0.193	3.5202	0.0638	
Interest rate B (1%, 2%, 3%)	0.5209	33.8905	<.0001	significant
Risk B (1=0, 2=-1% to 3%, 3=3% to 5%)	-0.2811	7.8093	0.0063	significant
Gender (0: felmale, 1: male)	0.3114	5.5845	0.0219	significant
Asset (1=Low, 2=Medium Low, 3=Medium High, 4=High)	-0.0544	0.1546	0.6958	
Risk preference (1=Positive, 2=Netral, 3=Passive)	-0.2437	3.2842	0.0757	
Investment Style (1=Positive, 2=Netral, 3=Passive)	-0.0025	0.0003	0.9855	
Average Photo rating on Morph 1 (0.5931)	0.1068	0.6005	0.4419	
Average Photo rating on Morph 2 (0.6470)	0.2124	2.456	0.1231	
Average Photo rating on Morph 3 (0.5786)	0.2868	4.661	0.0355	significant

Fig. 12 Correlation between acceptance and its factors

As for subject's acceptance, product factors such as principal and interest rate seem to have significant correlations. In addition, gender and the lowest trustworthiness on photo rating also have significant correlation. These results imply that when subjects accept the offer, the decision making mechanism is based on the offer's attractiveness and not based on how much they feel trustworthiness toward the advisor.

On the other hand, Fig. 13 shows the correlations between each factor and rejection.

Factor	Rejection			
	Corelation	F Ratio	Prob > F	judge
Principal A (25, 50, 100)	0.0722	0.4817	0.4894	
Interest rate A (1%, 2%, 3%)	-0.1217	1.3821	0.2428	
Risk A (1=0, 2=-1% to 3%, 3=3% to 5%)	0.3104	9.8082	0.0023	significant
Principal B (25, 50, 100)	0.1474	2.0428	0.1563	
Interest rate B (1%, 2%, 3%)	-0.146	2.0044	0.1602	
Risk B (1=0, 2=-1% to 3%, 3=3% to 5%)	0.2089	4.1987	0.0433	significant
Gender (0: felmale, 1: male)	0.1054	0.5839	0.4482	
Asset (1=Low, 2=Medium Low, 3=Medium High, 4=High)	-0.0825	0.3562	0.5532	
Risk preference (1=Positive, 2=Netral, 3=Passive)	-0.1552	1.2836	0.2624	
Investment Style (1=Positive, 2=Netral, 3=Passive)	0.3767	8.5986	0.005	significant
Average Photo rating on Morph 1 (0.5931)	0.0238	0.0295	0.8644	
Average Photo rating on Morph 2 (0.6470)	0.0564	0.1662	0.6852	
Average Photo rating on Morph 3 (0.5786)	0.3161	5.7719	0.0199	significant

Fig. 13 Correlation between rejection and its factors

As for subject's rejection, risk factors and subject's investment style seem to have significant correlations. In addition, the subject's profile for the lowest trustworthiness on photo rating has significant correlation, too. These results imply that when subjects reject the offer, its decision making mechanism is based on the subject's risk preference and advisor's trustworthiness, rather than product's attractiveness.

Along with analyzing acceptance result, I found that some acceptance decisions were looked irrational, which means that subject sometimes choose the offer with lower expected value, which is calculated from principal, base interest, and risk. For example, when the offer A comes with $25, 1%, no risk, and offer B comes with $100, 3%, risk 3 (=3% to 5%), then their expected values are $2.5 and $7, but subject still accept offer A. In same way, Fig. 14 shows the correlations between each factor which affected irrational decisions.

Factor	Irrational			
	Corelation	F Ratio	Prob > F	judge
Principal A (25, 50, 100)	-0.1521	1.0663	0.3073	
Interest rate A (1%, 2%, 3%)	-0.4867	13.9682	0.0005	significant
Risk A (1=0, 2=-1% to 3%, 3=3% to 5%)	0.3321	5.579	0.0226	significant
Principal B (25, 50, 100)	-0.2366	2.6691	0.1093	
Interest rate B (1%, 2%, 3%)	0.4316	10.3008	0.0025	significant
Risk B (1=0, 2=-1% to 3%, 3=3% to 5%)	-0.296	4.3212	0.0434	significant
Gender (0: felmale, 1: male)	0.0443	0.0315	0.8614	
Asset (1=Low, 2=Medium Low, 3=Medium High, 4=High)	-0.1154	0.2161	0.6483	
Risk preference (1=Positive, 2=Netral, 3=Passive)	-0.2515	1.0802	0.3141	
Investment Style (1=Positive, 2=Netral, 3=Passive)	0.1293	0.272	0.6091	
Average Photo rating on Morph 1 (0.5931)	0.0922	0.137	0.7159	
Average Photo rating on Morph 2 (0.6470)	0.1911	0.6065	0.4475	
Average Photo rating on Morph 3 (0.5786)	0.3761	2.6368	0.124	

Fig. 14 Correlation between irrational decision and its factors

As for subject's irrational decision mechanism, risk factors seem to have significant correlations. This result imply irrational decision making is based on the offer's risk factors, not based subject's risk preference, nor an advisor's trustworthiness. In other words, subjects might take action of risk avoidance in certain circumstances.

Finally, in order to find factors that affected the probability of acceptance / rejection, I conducted ANOVA (Analysis of Variance) with a stepwise regression. Fig. 15 is the result of ANOVA, which implies that investment style affected the probability of acceptance the most. Its step history shows that risk amount, trustworthiness, and interest rate affected the probability of acceptance - in order.

Stepwise Fit

Response:
res

Stepwise Regression Control

Prob to Enter	0.050
Prob to Leave	0.100

Direction:

Current Estimates

SSE	DFE	MSE	RSquare	RSquare Adj	Cp	AICc
474.13569	2679	0.1769823	0.0489	0.0457	16.317592	2986.576

Lock	Entered	Parameter	Estimate	nDF	SS	"F Ratio"	"Prob>F"
X	X	Intercept	0.97132329	1	0	0.000	1
		morph_mode	0	1	0.355219	2.008	0.1566
		principal_A	0	1	0.266147	1.504	0.22015
	X	base_interest_A	6.55864906	1	1.96986	11.130	0.00086
	X	risk_A	-0.0571239	1	5.696296	32.186	1.55e-8
	X	principal_B	-0.0006411	1	1.05453	5.958	0.01471
	X	base_interest_B	6.00467701	1	1.571764	8.881	0.00291
	X	risk_B	-0.0394553	1	2.718131	15.358	9.12e-5
	X	gender	0.03756095	1	0.808501	4.568	0.03266
		financial_asset	0	1	0.320229	1.810	0.17863
	X	risk_preference	-0.0508581	1	1.166005	6.588	0.01032
	X	investment_style	-0.0983127	1	5.887479	33.266	8.96e-9
		rating_morph_1	0	1	0.192247	1.086	0.29739
	X	rating_morph_2	0.173185	1	1.887202	10.663	0.00111
		rating_morph_3	0	1	0.444899	2.515	0.11287

Step History

Step		Parameter	Action	"Sig Prob"	Seq SS	RSquare	Cp	p
1		investment_style	Entered	0.0000	8.323486	0.0167	91.254	2
2		risk_A	Entered	0.0000	5.458873	0.0276	62.337	3
3		risk_B	Entered	0.0002	2.455346	0.0326	50.431	4
4		rating_morph_2	Entered	0.0010	1.933402	0.0365	41.481	5
5		base_interest_A	Entered	0.0012	1.882033	0.0402	32.822	6
6		base_interest_B	Entered	0.0020	1.707383	0.0437	25.152	7
7		principal_B	Entered	0.0151	1.049487	0.0458	21.208	8
8		risk_preference	Entered	0.0383	0.761232	0.0473	18.897	9
9		gender	Entered	0.0327	0.808501	0.0489	16.318	10

Fig. 15 Result of ANOVA and stepwise regression

5.4 Combination of Advisor's facial similarity and Managing communication

The final analysis is about how many times subjects continue to accept offer(s) with rational decision from advisors during the game. In this research, we asked subjects to decide whether he/she wants to accept offer A or B, or reject in 96 times per subject. The continuous acceptance/rejection should be some indication of loyalty / trust from subjects to advisors. The decision also should be done rationally, in other words, the decision should be done as they choose the offer which is higher expected value. Fig. 16 shows average acceptance rate with rational / irrational decision by morph type (facial similarity) during the 96 offers investment game.
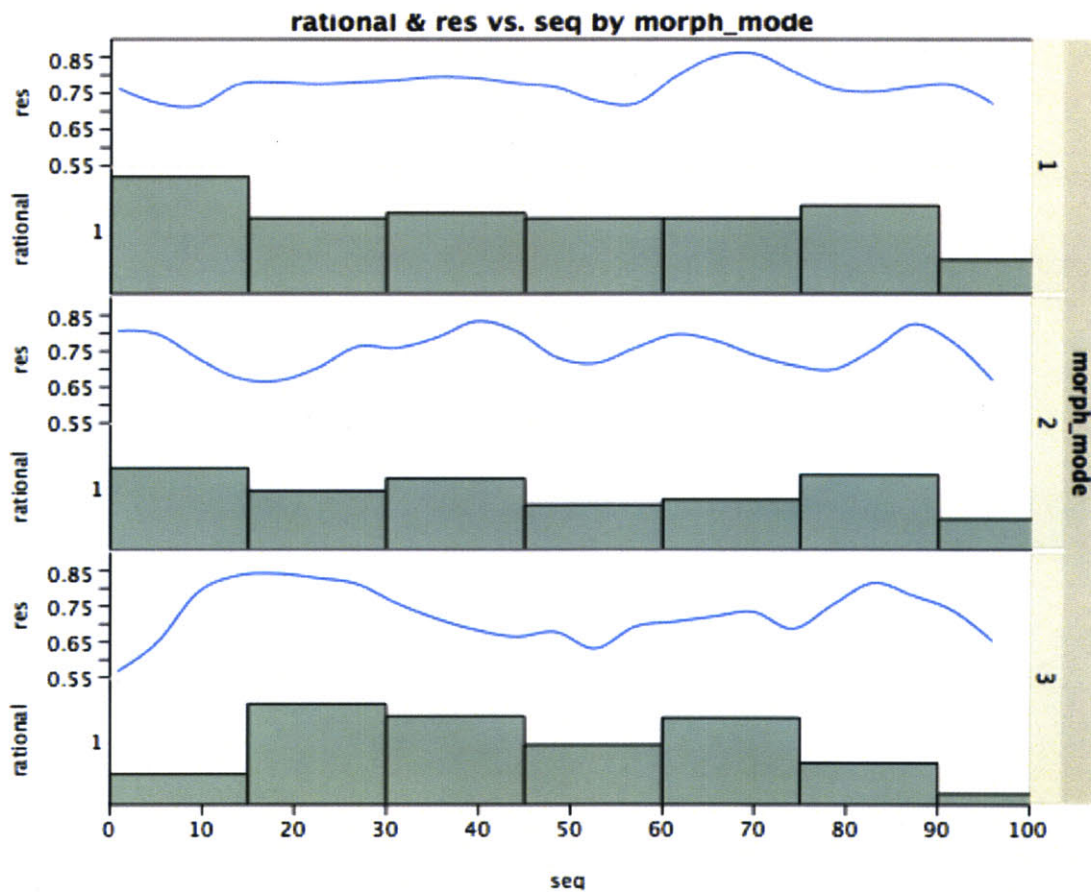
Fig. 16 Acceptance with rational decision during game

This graph's definition is described in the following.

$$f = (p_i * q_i) / (n * i)$$

p_i = probability of acceptance , q_i = probability of rational decision

i = offer (1-96) , n = subject (1-29)

Fig. 16 implies that if we continue to expose advisers with facial similarity (morph mode=1), subject would accept offer with rational decision. Compared to other morph types, if we continue to expose offers with advisors with having facial similarity, subjects would accept offers with rational decision, got higher expected value, in higher probability through the game. Especially, the self-morphing impact is the strongest from first offer to 15th and from 15th to 45th offer, the average is highly constant, which implies that exposing advisor having facial similarity to subject would promote the subject to make 'right' financial decision and generate trust.

Similarly, Fig. 17 shows # of average acceptance with rational decision by morph type during the 96 offers investment game. This graph's definition is described as the following.

$$f = \sum^{96}_{i=1} \{ (p_i * q_i) / (n * i) \}$$

p_i = probability of acceptance , q_i = probability of rational decision
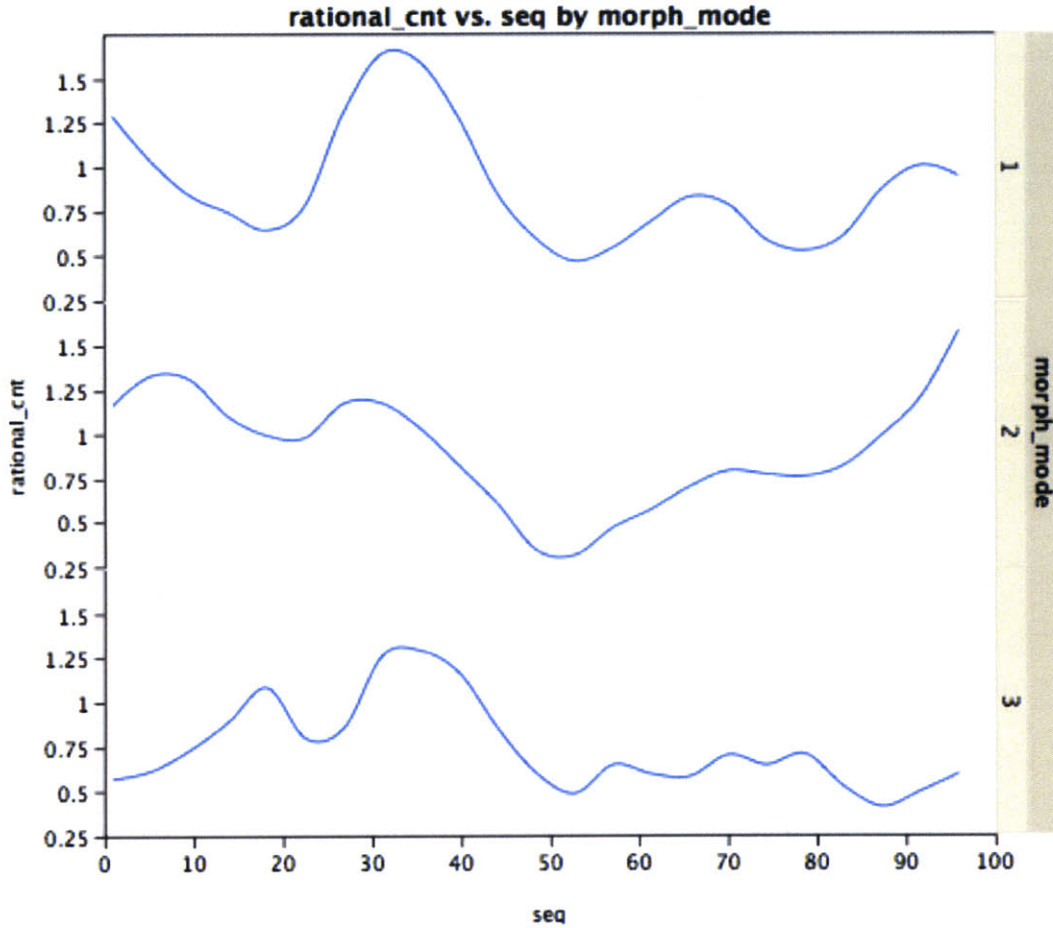
i = offer (1-96) , n = subject (1-29)

Fig. 17 # of Average Continuous Acceptance during game

Fig. 17 also implies that if we continue to expose advisers with facial similarity (morph type=1), the subject would continue to accept offer with rational decision. Compare to other morph types, if we continue to expose offers with advisors with having facial similarity (morph type=1), subjects would accept offers with rational decision continuously through the game. Especially, from 15th to 45th offer, the average is high. In other words, this result also implies that exposing of advisor with facial similarity to the

subject would generate loyalty and trust in the long run.

From the previous analysis, the main factors for a subject's financial decision was seemed to be based on the subject' investment style, the riskiness of the offer, and the trustworthiness of an advisor's photo. However, as long as bank seeks to get loyalty and trust in the long run, they need to take into account not only these factors but also the factor of facial similarity in some way.

Managing effective communication with understanding of subject's financial decision making mechanism would result in promoting subject's rational decision and generating trust.

6. Conclusion

The primary goal of this research was to develop a deeper understanding of a subject's decision making mechanism and trust formation by experimenting investment game. Five hypothesis based on Suruga Bank's business needs (as shown in 5.1) were initially proposed. As a whole, this research confirmed the primary insights of introducing a "new context" and managing "communication" for the online trust building.

This research will also contribute to Suruga Bank's future business in multiple ways. One contribution is increasing the understanding for how customers make financial decisions and its underlying factors. The other is finding the new way for how to communicate with customer effectively with generating loyalty and trust in online environment.

6.1 Financial decision making mechanism

The results confirmed that subjects tended to accept an offer based on its attractiveness, such as principal and interest rate. In other words, subjects made strong interaction with product attractiveness according to their belief. On the other hand, subjects tended to reject offer based on its risk element, investment style they have, and advisor's trustworthiness. This is because subjects are sensitive to risk and fear of the potential for a failed bank. However, we could find that subjects still made irrational decisions that came from offer's risk factors, even though offers were easy to be compared.

One interesting finding is that some of subjects made their decision based on the advisor's face, according to the result of interview. The result also implies that new context on website worked well in some way.

6.2 Effectiveness of managing communication

As there were still irrational decisions in them, in order to prevent irrational decision, advisors facial similarity would help through the invest game. The result suggests that advisor having facial similarity has high potential for promoting subject to make rational decision and generating and building trust. As the sequence data during the game highlighted, there are many points where the advisors facial similarity would work well preventing irrational decision. It may also work for certain customer segments.

Thus, as long as a bank seeks to get higher acceptance with rational decision, they should manage communication effectively. The effective continuous communication would create reliability and dependability, and in the end it improved a customer's loyalty and trust.

6.3 For Suruga Bank's online banking strategy

To earn a higher level of trust, many steps can be taken in an online banking environment. From the above discussions, there is a fact that structural assurance and communication both had an impact on customer trust, suggesting Suruga Bank need to use it in their online banking strategy. Also, there are certain customer segments that this strategy might work well, such as males whose risk preference is neutral etc.

Misunderstanding of customer's financial decision making mechanism and lack of proper communication affect the overall level of trust toward the bank. An important contribution of this research concerns how trust is developed and sustained over varying investment situations. The future commitment of the customer to online banking depends on perceived trust. The issue of trust is recognized as critical success factors for Suruga Bank.

Therefore, Suruga Bank should try to develop customer-oriented products based on their personality and demographic profile, and sell them within a new context, such as financial advisor having facial similarity through online banking, which advocate customers to rational decision with generating trust.

7. Future Research

7.1 Practical setting

Some of the limitations in the designs of this research provide directions for future research opportunities.

In the investment game, we used the Caucasian photo as bank representatives, which were used for face morphing. In addition, subjects were asked relatively simple choice of financial product, which is only combination of amount and risk, but were not actually given an opportunity to do it practically. These factors might lead subject to certain kinds of limited interests.

Another potential limitation of the research was about subjects we recruited. Japanese subjects, who are living in Boston may not typical Japanese. Although these were strength of research, certain potential factors for Suruga Banks customer's trust are left uncontrolled.

Future research needs to consider the extent to which the prior experience with practical subjects and products in real environment. We can see if with experience and facts, the effectiveness of website having facial similarity attribute become more important than in the initial environment. Bank logos, and advertisement could be additional dimensions that may be important in development of customer's brand awareness of the bank, which were not included in this research.

7.2 Measurement of "Trust" in brain activity

Suruga Bank will develop a unique understanding of trust from a neuro-psychological viewpoint. The measurement of brain activities in fMRI is another direction of research. Subjects may show more sensitive reaction to, for example, facial trustworthiness of representatives or advisors, promotes trust subconsciously. Specifically, the direction will provide new and deep insights into the neural mechanisms of trust and financial choices.

The use of different methodologies and contexts may prove to be fruitful. Future research should provide other methods in order to find the best way to build trust between customers. Suruga Bank will be in a unique position of understanding how to optimize the design of advisor for bank products and services.

Appendix 1: Investment Game Procedure and Screen Shots

Introductions and three samples

Press SPACE to begin.

In this experiment you can make money by investing in
several
interest-bearing bank accounts.

You will be playing with our money -- we will give you a
$8000 starting loan. At the end of the experiment, you
must return the $8000, but any interest you make from your
investments is yours to keep.

Press the spacebar to proceed to the investment rules.

You will see a series of bank offers (about 100 altogether). For example, an offer could be something like this:
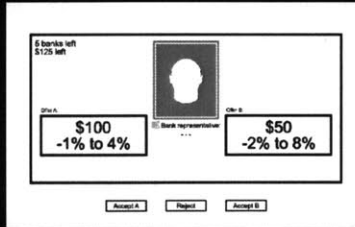
The person in the photo is the bank representative, who proposes the investment terms. Here, you have three choices:
You can choose to invest $100 in Offer A which has an interest rate somewhere between a loss of 1% and a gain of 4%.
Or, you can choose to invest $50 in Offer B which has an interest rate somewhere between a loss of 2% and a gain of 8%.
Or, if you don't want to invest in either, you can REJECT both offers.
We will cover these options in order.
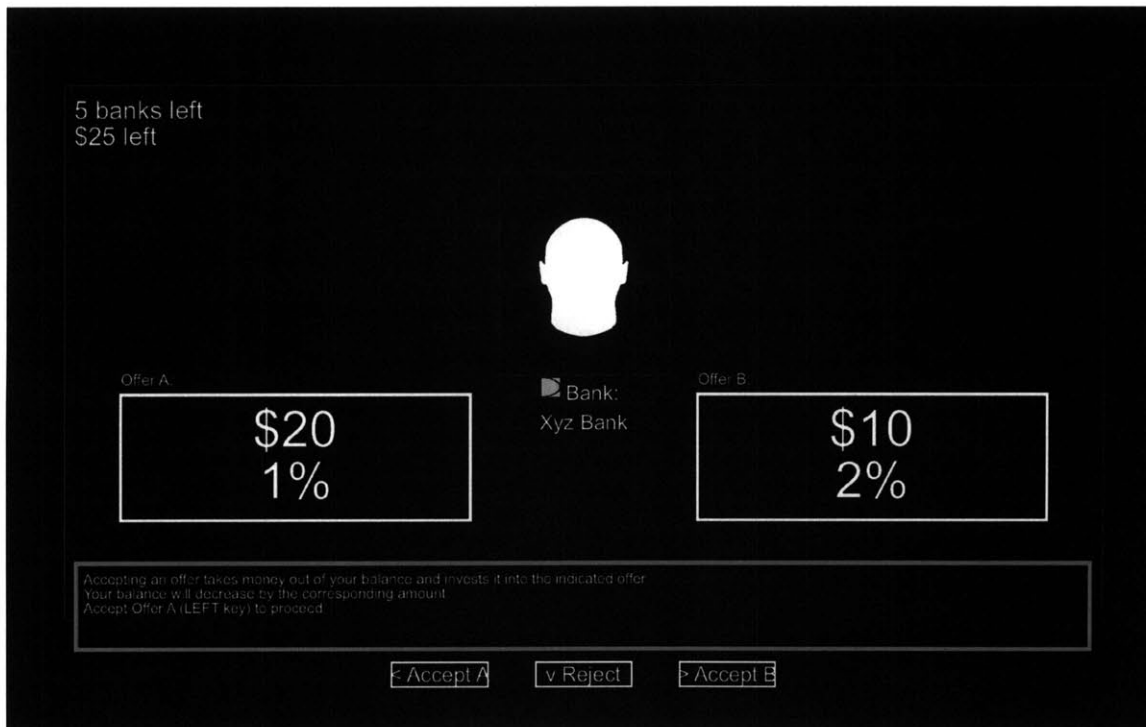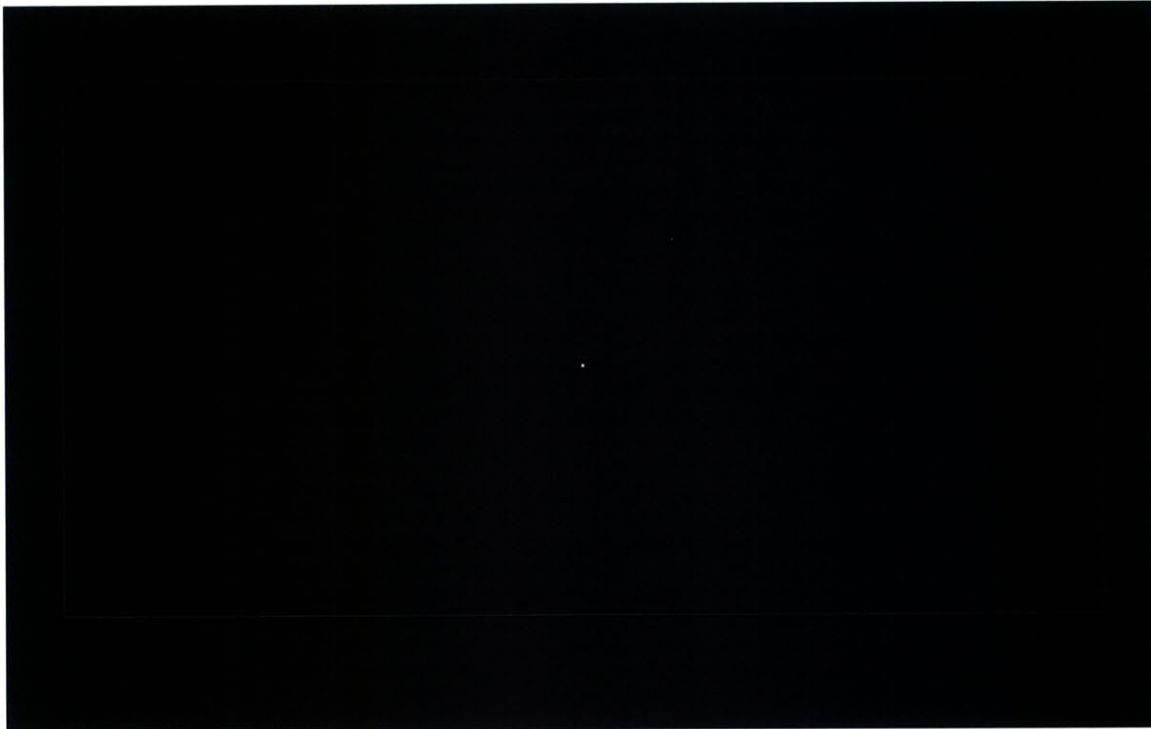
4 banks left
$5 left

Offer A:

Bank:
Abc Bank

Offer B:

$20
-0.5% to 3.5%

$10
3%

You now have two offerings from a new bank.
Since your balance fell below the price of both offers, you cannot invest now.
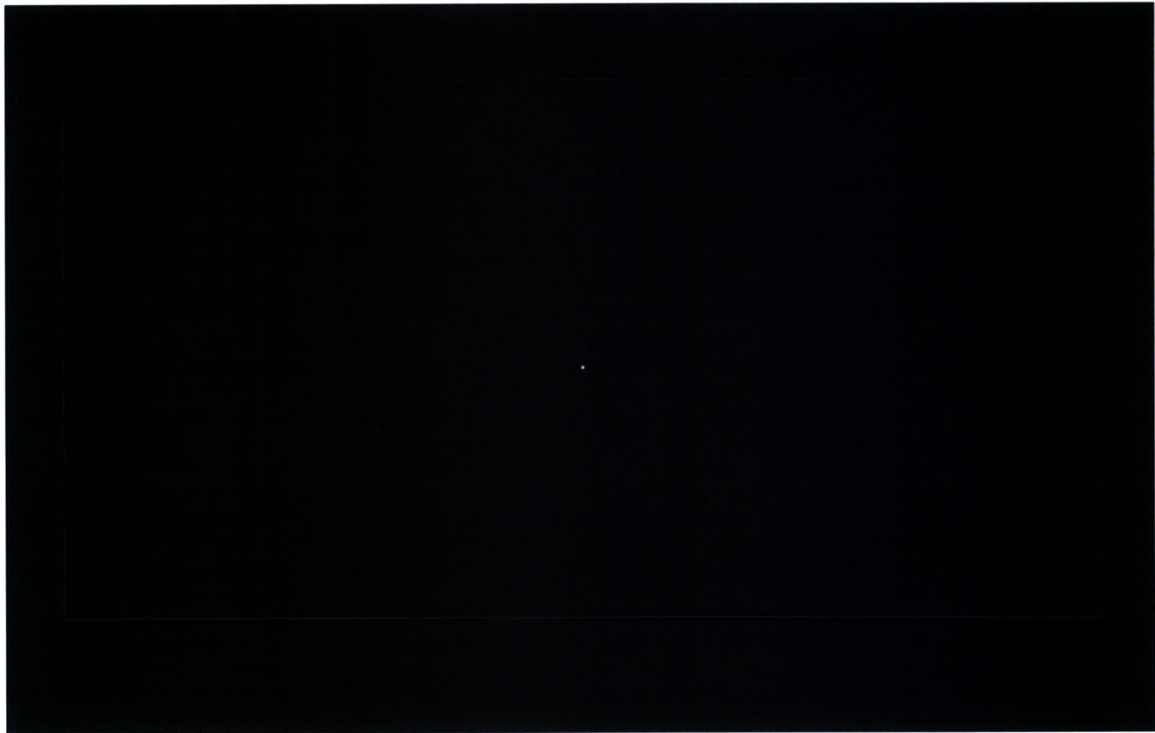Reject these offers (DOWN key) to proceed.

< Accept A   v Reject   > Accept B
you cannot afford this offer   you cannot afford this offer

50

3 banks left
$5 left

Offer A.

$20
-2% to 6%

Bank:
Pqr Bank

Offer B.

$5
0.5% to 4.5%

Note that each choice you make decreases the number of banks left.
This time, you can only afford Offer B.
You can either REJECT both, or ACCEPT Offer B.
Accept Offer B (RIGHT key) to complete the demo and proceed.

< Accept A   v Reject   > Accept B

you cannot afford this offer

IMPORTANT: While most of your investments are safe, there is a chance that a bank will "fail" and not return your original investment. So if you invest $50 into a "failed" bank, $50 will be deducted from your total earnings.

The chance of this happening is small -- among these banks there are only two failed banks.

The risk of failure is greater with banks that have not attracted a lot of investments from previous participants in this same experiment. Therefore, it is in your interest to invest in banks that you believe previous participants have also invested in.

And when you invest in a bank you are also making it less likely that that bank will fail in future, for other participants in the experiment.

Press the spacebar to proceed

Your participation fee for this study is calculated at $30/hr, in $15 increments to the nearest half hour. Usually the entire session lasts for 2 hours. You can earn a lot more from your investments but you may also lose all or part of it if you invest into the "failed" bank. If your investment balance is negative, we will set it to zero, and you will still leave with the participation fee.

The final payout you receive will be the sum of the participation fee and the final earnings from your investments. The maximum amount possible is $150, so if your payout exceeds $150, you will receive $150.

    Example 1: You earn $10 in interest and you don't invest in the
    "failed" bank. You leave the experiment with $10 + your participation fee.
    Example 2: You earn $20 in interest but you invest $50 in the
    "failed" bank. You will end up with minus $30 in interest but you will
    still be paid for your participation.
    Example 3: You earn $25 in interest and you don't invest in the
    "failed" bank, your total earnings will be $25 + your participation fee.
Please invest carefully. The session will be end when you run out of money.

Press the spacebar to proceed

It is important that you understand the instructions
before the start of the experiment. Please ask the
experimenter if anything is unclear.

You will now be presented with 15 preliminary trials for
practice.
Practice earnings do not count towards your final earnings.

The practice trials will show a hint (in red text),
telling you the
range of possible earnings you might receive from your
investments.
Note that this does not take the "failed" bank into account.

If you don't have any questions,
Press RETURN/ENTER to start the practice trials.
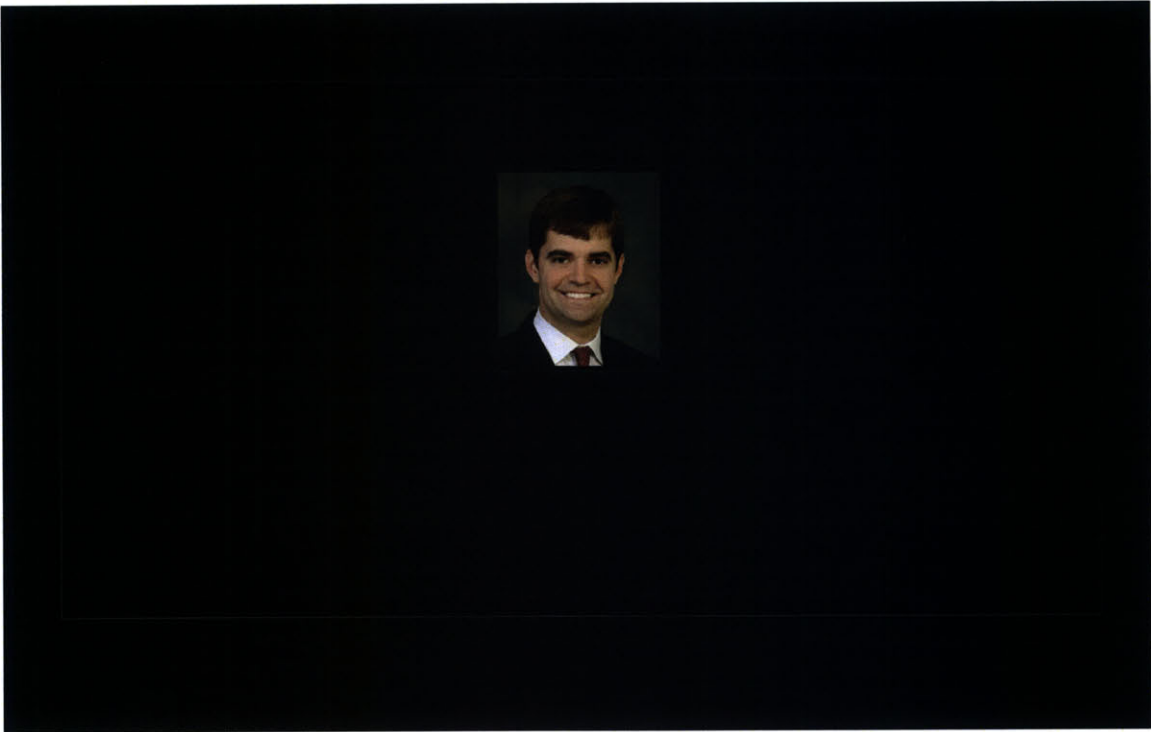
Offer A

$50
-1.5% to 6.5%

Offer B
$25
-1% to 7%

Offer A
$25
2%

Offer B
$25
-1% to 7%

13 banks left
$1000 left

Offer A

Bank:
Republic Bank

Offer B

$25
2%

$25
-1% to 7%

< Accept A   v Reject   > Accept B

58

This concludes the practice section.

Please let us know you are done, and we will discuss the results.

That ends the practice session.

you earnings totaled $0.00
at an average interest rate of 0.00%

Your budget will now be reset to $8000 for the actual session.
Note that the red hints will no longer appear.

Please make sure you understand the task, and don't hesitate to ask us any questions.

If everything is clear, get ready for the actual section and let us know when you are ready to begin.

This concludes the actual session.

Please pause for a moment and request a survey from your experimenter.
Complete the first page (top sheet) of this survey.
When you are done. press the spacebar to proceed to the next section.

Appendix 2: Photo Rating Procedure and Screen Shots

Introduction and three samples

Now, please help us choose the best images for our online
investment study.

You will be shown a series of faces like the ones that you
have already seen. Imagine that you are yourself a bank
representative. Your task is to rate these bankers
according to the attributes presented (trustworthiness and
attractiveness).

For each face, enter a number from 1 to 6, 1 as the least.
6 as the most.
Press the ENTER key to begin this section

1 . . . 2 . . . 3 . . . 4 . . . 5 . . . 6

no   yes

Is this person trustworthy?

1 . . . 2 . . . 3 . . . 4 . . . 5 . . . 6

no   yes

Is this person trustworthy?
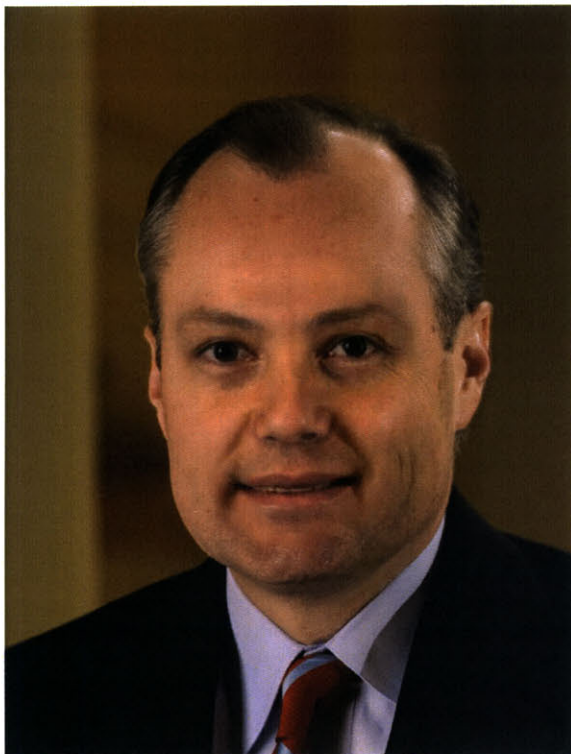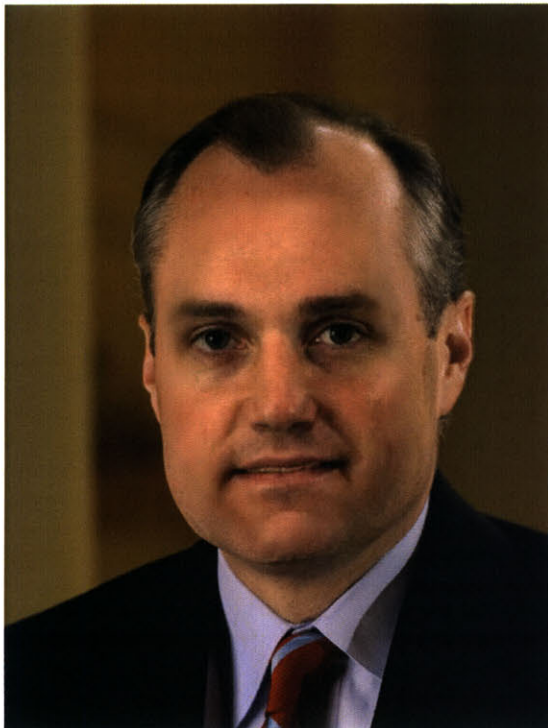
1...2...3...4...5...6

no   yes

Is this person trustworthy?

Appendix 3: Advisor's Picture Samples

Self-Morphing (with Japanese subjects)

Self-Morphing (with Caucasian subjects)

Appendix 4: Survey Questionnaires

A few follow-up questions that will help us improve the experiment:

1. Did you have difficulty following instructions, or entering your responses (Accept A, Rej B)? If so, please explain what was not clear.

2. Are you familiar with banking investment? _____ YES _____ NO

3. Were the practice trials helpful? _____ YES _____ NO

4. Did you find the choices difficult to make? Please use the scale below:

   Easy   Difficult
   1   2   3   4   5   6   7

5. Do you have the feeling that your choices become more confident over the course of t
   _____ More _____ Less

6. Please estimate how likely it is that you yourself hit the "bad bank"(circle one):

   Not likely   Most likely
   1   2   3   4   5   6   7

7. Please estimate how likely it is that other subjects hit the "bad bank"(circle one):

   Not likely   Most likely
   1   2   3   4   5   6   7

8. If you had to choose between these three offers which one would you choose?

   (a) $100 with interest rate between -1% and +4%
   (b) $100 with interest rate of exactly +1
   (c) $100 with interest rate between 0% and +2.5%

9. What do you think might be the final objective of this experiment?

10. Are you interested in participating in our future studies?
    _____ YES _____ NO

THANK YOU!

Date of Birth (month/day/year): _____ □ male □ female

Marital status
□ Single □ Partnered □ Married □ Separated □ Divorced □ Widowed

Number of children _____

Your Primary Occupation _____

Current family income (yearly $)
□ less than 50,000 □ 50,000-100,000 □ 100,000-300,000
□ 300,000-500,000 □ 500,000-1,000,000 □ more

Income by source (check all that are applicable)
□ Wages □ Retirement plan □ Social Security □ Income from savings
□ Government Benefit □ Income from relatives □ Alimony or child support
□ Student grant or scholarship □ Student Loan

What is your current work status (check all that apply)?
□ working now □ unemployed and looking for work
□ In between jobs, on sick or other leave □ Disabled □ Retired □ Homemaker
□ Student □ Volunteer □ Other (please specify: _____)

In which type of housing do you live?
□ Residence hall/College dormitory □ House/Apartment/Condominium
□ Senior housing □ Assisted living □ Nursing home □ Relative's home
□ Other (please specify: _____)

Current financial asset ($)
□ less than 50,000 □ 50,000-100,000 □ 100,000-300,000
□ 300,000-500,000 □ 500,000-1,000,000 □ more

What is your purpose of investment?
□ easy to cash in □ mid-term plan □ retirement or long-term plan

How long do you usually invest for?
□ less than 1 year □ over 1 year

What is the main consideration you have when deciding on an investment?
□ profitability □ balance between profit and safety □ safety
□ Other (please specify: _____)

What was your investment style during this activity?
□ profitability □ balance between profit and safety □ safety

If you were given $10,000, how would you allocate this money?
_____ % in equity (stocks) _____ % in fixed income (bonds) _____ % in cash

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