

Online Appendix: Thar “SHE” blows? Gender, Competition, and Bubbles in Experimental Asset Markets, by Catherine C. Eckel and Sascha C. Füllbrunn

A1. META-ANALYSIS

TABLE A1. BUBBLE MEASURES FOR META-ANALYSIS

Treatment	Session	Fraction Women	Average Bias	Positive Deviation	Boom Duration	Bust Duration
Füllbrunn/Neugebauer 2012	Equity MD 1	0.67	19.27	745	11	4
Füllbrunn/Neugebauer 2012	Equity MD 2	0.33	-2.30	396	10	5
Füllbrunn/Neugebauer 2012	Equity MD 3	0.56	6.77	338	9	2
Füllbrunn/Neugebauer 2012	Equity BN 1	0.33	104.80	1685	13	1
Füllbrunn/Neugebauer 2012	Equity BN 2	0.33	4.93	267	7	3
Füllbrunn/Neugebauer 2012	Equity BN 3	0.33	82.97	1345	12	2
Füllbrunn/Neugebauer 2012	Equity BN 4	0.22	92.50	1508	11	3
Füllbrunn/Neugebauer/Nicklisch 2014	Pilot SSW 1	0.44	34.40	1176	8	6
Füllbrunn/Neugebauer/Nicklisch 2014	Pilot SSW 2	0.00	142.00	2130	15	0
Füllbrunn/Neugebauer/Nicklisch 2014	Pilot SSW 3	0.44	67.77	1087	13	2
Cheung/Palan 2012	1 - Individuals	0.33	105.00	2316	11	4
Cheung/Palan 2012	5 - Individuals	0.44	47.27	967	12	3
Cheung/Palan 2012	6 - Individuals	0.78	-41.20	900	8	7
Cheung/Palan 2012	7 - Individuals	0.22	29.87	608	12	3
Cheung/Hedegaard/Palan 2014	36-USB	0.70	-59.50	0	0	15
Cheung/Hedegaard/Palan 2014	37-USB	0.70	78.77	1384	11	4
Cheung/Hedegaard/Palan 2014	38-USB	0.70	-12.53	128	9	6
Cheung/Hedegaard/Palan 2014	39-USB	0.70	18.30	522	9	4
Cheung/Hedegaard/Palan 2014	40-USB	0.60	-100.80	225	4	11
Cheung/Hedegaard/Palan 2014	41-USB	0.40	-21.03	117	4	5
Haruvy/Noussair/Powell 2014	57	0.38	153.13	3263	11	4
Haruvy/Noussair/Powell 2014	58	0.56	-125.23	13	2	13
Haruvy/Noussair/Powell 2014	62	0.56	33.80	886	11	4
Haruvy/Noussair/Powell 2014	63	0.56	19.57	1426	6	6
Haruvy/Noussair/Powell 2014	64	0.44	57.50	1087	11	4
Haruvy/Noussair/Powell 2014	56	0.63	-60.47	8	1	10
Powell 2011	1	0.56	-12.30	79	6	5
Powell 2011	2	0.56	-3.17	751	11	4
Powell 2011	3	0.25	175.73	2636	15	0
Powell 2011	4	0.22	4.63	156	4	3
Powell 2011	5	0.89	26.60	606	10	3
Powell 2011	6	0.29	-87.40	0	0	15
Powell 2011	7	0.33	69.67	1108	11	2
Powell 2011	8	0.67	-29.50	9	2	7
Powell 2011	9	0.33	29.17	557	10	2

*Notes:* This table reports the observed values of various measures of the magnitude of bubbles for each market along with the fraction of females. Average Bias =  $\sum (P_t - FV_t)/15$  where  $P_t$  and  $FV_t$  equal median price and fundamental value in period  $t$ , respectively. The boom and bust durations are the greatest number of consecutive periods that median transaction prices are above and below fundamental values, respectively. The data is taken from the respective article or we received the data from the authors.

TABLE A2. OLS REGRESSION WITH AND WITHOUT STUDY DUMMIES<sup>A</sup>

	Average Bias		Positive Deviation		Boom		Bust	
Fraction Females	-171.8*** (53.84)	-127.4* (69.28)	-1,662** (661.1)	-1,291 (818.0)	-7.218** (3.480)	-3.697 (4.236)	7.410** (3.084)	3.963 (3.794)
D_FN_MD		-3.144 (44.14)		-79.56 (521.1)		2.572 (2.699)		-1.144 (2.417)
D_FN_BN		32.53 (40.98)		347.8 (483.8)		2.517 (2.506)		-1.699 (2.244)
D_FNN		41.45 (45.33)		599.1 (535.2)		3.734 (2.772)		-1.246 (2.482)
D_CP		14.30 (39.59)		525.1 (467.5)		3.035 (2.421)		-0.254 (2.168)
D_CHP		-12.75 (36.84)		-30.22 (434.9)		-0.843 (2.252)		2.240 (2.017)
D_HNP		2.205 (35.02)		543.4 (413.4)		-0.422 (2.141)		2.016 (1.917)
Constant	105.0*** (27.35)	77.32* (38.45)	1,651*** (335.8)	1,244** (453.9)	11.96*** (1.768)	9.351*** (2.351)	1.431 (1.566)	2.750 (2.105)
Observations	35	35	35	35	35	35	35	35
R-squared	0.236	0.279	0.161	0.268	0.115	0.253	0.149	0.266

Notes. This table reports OLS regression results from the meta study. Fraction females and dependent variables are given by table A1. All "D" variables are study dummies taken from table A1: FN\_MD = Füllbrunn/Neugebauer Magdeburg, FN\_MD = Füllbrunn/Neugebauer Bonn, FNN = Füllbrunn/Neugebauer/Nicklisch, CP = Cheung/Palan, <sup>a</sup> D\_ indicates a dummy variable; CHP= Cheung/Hedegaard/Palan 2014, HNP= Haruvy/Noussair/Powell 2014, Baseline is Powell.

## A2. ASSET MARKET INSTRUCTIONS

### 1. General Instructions

This is an experiment in the economics of market decision making. If you follow the instructions and make good decisions, you might earn a considerable amount of money, which will be paid to you in cash at the end of the experiment. The experiment will consist of a sequence of trading periods in which you will have the opportunity to buy and sell shares. Money in this experiment is expressed in tokens (100 tokens = 1 Dollar).

### 2. How To Use The Computerized Market.

The goods that can be bought and sold in the market are called *Shares*. On the top panel of your computer screen you can see the *Money* you have available to buy shares and the number of shares you currently have.

If you would like to **offer to sell a share**, use the text area entitled “Enter Ask price”. In that text area you can enter the price at which you are offering to sell a share, and then select “Submit Ask Price”. Please do so now. You will notice that 9 numbers, one submitted by each participant, now appear in the column entitled “Ask Price”. The lowest ask price will always be on the top of that list and will be highlighted. If you press “BUY”, you will buy one share for the lowest current ask price. You can also highlight one of the other prices if you wish to buy at a price other than the lowest.

Please purchase a share now by highlighting a price and selecting “BUY”. Since each of you had put a share for sale and attempted to buy a share, if all were successful, you all have the same number of shares you started out with. This is because you bought one share and sold one share.

When you buy a share, your *Money* decreases by the price of the purchase, but your shares increase by one. When you sell a share, your *Money* increases by the price of the sale, but your shares decrease by one. Purchase prices are displayed in a table and in the graph on the top right part of the screen.

If you would like to **offer to buy a share**, use the text area entitled “Enter Bid price”. In that text area you can enter the price at which you are offering to buy a share, and then select “Submit Bid Price”. Please do so now. You will notice that 9 numbers, one submitted by each participant, now appear in the column entitled “Bid Price”. The highest price will always be on the top of that list and will be highlighted. If you press “SELL”, you will sell one share for the highest current bid price. You can also highlight one of the other prices if you wish to sell at a price other than the highest.

Please sell a share now by highlighting a price and selecting “SELL”. Since each of you had put a share for purchase and attempted to sell a share, if all were successful, you all have the same number of shares you started out with. This is because you sold one share and bought one share.

You will now have a practice period. Your actions in the practice period do not count toward your earnings and do not influence your position later in the experiment. The goal of the practice period is only to master the use of the interface. Please be sure that you have successfully submitted bid prices and ask prices. Also be sure that you have accepted both bid and ask prices. You are free to ask questions, by raising your hand, during the practice period.

On the right hand side you have one price diagram showing this period’s recent purchase prices (the same in the “*Purchase Price*” list). On the horizontal axis will be the number of shares traded, and on the vertical axis is the price paid for that particular share. You will also see a graph on the historical performance of the experiment, where the blue dots indicate the maximum price a share was traded in that period, the black dots indicate the average price, and the red dots indicate the minimum price

### 3. Specific Instructions for this experiment

The experiment will consist of 15 trading periods. In each period, there will be a market open for 240 seconds, in which you may buy and sell shares. Shares are assets with a life of 15 periods, and your inventory of shares carries over from one trading period to the next. You may receive dividends for each share in your inventory at the end of each of the 15 trading periods.

At the end of each trading period, including period 15 the computer randomly draws a dividend for the period. Each period, each share you hold at the end of the period:

- earns you a dividend of 0 tokens with a probability of 25%
- earns you a dividend of 8 tokens with a probability of 25%

- earns you a dividend of 28 tokens with a probability of 25%
- earns you a dividend of 60 tokens with a probability of 25%

Each of the four numbers is equally likely. The average dividend in each period is 24. The dividend is added to your cash balance automatically. After the dividend is paid at the end of period 15, there will be no further earnings possible from shares.

#### 4. Average Holding Value Table

You can use the following table to help you make decisions.

Ending Period	Current Period	Number of Holding Periods	×	Average Dividend per Period	=	Average Holding Value per Share in Inventory
15	1	15	×	24	=	360
15	2	14	×	24	=	336
15	3	13	×	24	=	312
15	4	12	×	24	=	288
15	5	11	×	24	=	264
15	6	10	×	24	=	240
15	7	9	×	24	=	216
15	8	8	×	24	=	192
15	9	7	×	24	=	168
15	10	6	×	24	=	144
15	11	5	×	24	=	120
15	12	4	×	24	=	96
15	13	3	×	24	=	72
15	14	2	×	24	=	48
15	15	1	×	24	=	24

There are 5 columns in the table. The first column, labeled Ending Period, indicates the last trading period of the experiment. The second column, labeled Current Period, indicates the period during which the average holding value is being calculated. The third column gives the number of holding periods from the period in the second column until the end of the experiment. The fourth column, labeled Average Dividend per Period, gives the average amount that the dividend will be in each period for each unit held in your inventory. The fifth column, labeled Average Holding Value Per Unit of Inventory, gives the average value for each unit held in your inventory from now until the end of the experiment. That is, for each unit you hold in your inventory for the remainder of the experiment, you will earn on average the amount listed in column 5.

Suppose for example that there are 7 periods remaining. Since the dividend on a Share has a 25% chance of being 0, a 25% chance of being 8, a 25% chance of being 28 and a 25% chance of being 60 in any period, the dividend is on average 24 per period for each Share. If you hold a Share for 7 periods, the total dividend for the Share over the 7 periods is on average  $7 \times 24 = 168$ . Therefore, the total value of holding a Share over the 7 periods is on average 168.

#### 6. Making Predictions

In addition to the money you earn from dividends and trading, you can make money by accurately forecasting the trading prices of all future periods. You will indicate your forecasts before each period begins on the computer screen.

The cells correspond to the periods for which you have to make a forecast. Each input box is labeled with a period number representing a period for which you need to make a forecast. The money you receive from your forecasts will be calculated in the following manner

Accuracy	Your Earnings
Within 10% of actual price	5 tokens
Within 25% of actual price	2 tokens

Within 50% of actual price

1 token

---

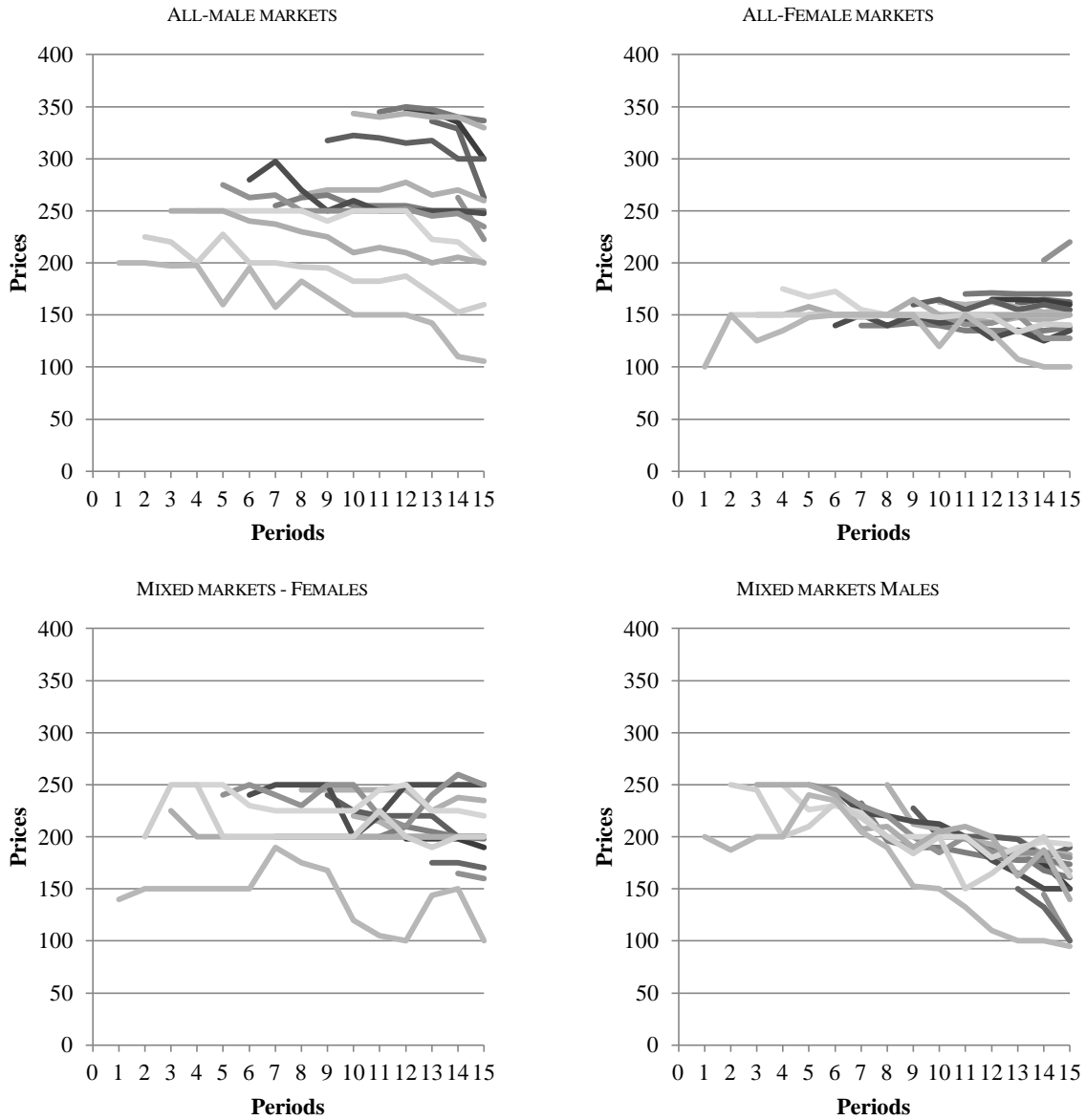
You may earn money on each and every forecast. The accuracy of each forecast will be evaluated separately. For example, for period 2, your forecast of the period 2 trading price that you made prior to period 1 and your forecast of period 2 trading price that you made prior to period 2 will be evaluated separately from each other. For example, if both fall within 10% of the actual price in period 2, you will earn  $2 \times 5$  tokens = 10 tokens. If exactly one of the two predictions falls within 10% of the actual price and the other falls within 25% but not 10% you will earn 5 tokens + 2 tokens = 7 tokens.

#### 7. Your Earnings

Your earnings for the entire experiment will equal the amount of cash that you have at the end of period 15, after the last dividend has been paid, plus the \$5 you receive for participating. The amount of cash you will have is equal to:

*Money you have at the beginning of the experiment*  
*+Dividends you receive*  
*+Money received from sales of shares*  
*-Money spent on purchases of shares*  
*+Earnings from all forecasts*

### A3. FORECASTING



**FIGURE A1. TIME SERIES OF MEDIAN FORECAST PRICES**

*Notes:* Each line represents the median of predicted prices for each of the remaining periods. E.g., in the all-male markets the longest line shows the median forecast price in each periods for all remaining 15 periods, the shortest line for one remaining period.

The figure depicts the time series of median forecast prices in the all-female market and the all-male markets, as well as for the mixed markets separated by gender. The all-male market figure shows a clear increase in forecast levels right from the start. Thus, males adapt to the observed bubble pattern. As prices in female markets in general show no increase, their forecasts do not rise. In the mixed market some reaction to price changes can be found for both males and females, i.e., prices increase given an increase in recent market prices. The results are qualitatively in line with Haruvy, Lahav, and Noussair (2007).

## A4. GAMBLE CHOICE TASK INSTRUCTIONS AND ANALYSIS

### A4.1. General Instructions

**Directions:** In this game, you have a chance to earn money. Your earnings will depend on what you do, what others do, and chance, as explained below.<sup>1</sup> When this game is completed, you will be paid the amount you earn in this game. **Note: the dollar values in the experiment are measured in US dollars.**

In this game, you choose **One** from six possible options. Once you choose an option, a six-sided die will be rolled to determine whether you receive payment A or payment B. If a 1, 2, or 3 is rolled you receive payment A; if a 4, 5, or 6 is rolled you receive payment B. You only play the game once.

Option	Payment A	Payment B
1	\$12.00	\$12.00
2	\$8.00	\$20.00
3	\$4.00	\$28.00
4	\$0.00	\$36.00
5	-\$4.00	\$44.00
6	-\$8.00	\$48.00

### **Examples:**

If you choose option 1: If you roll 1, 2, or 3 you earn \$12.00; if you roll 4, 5, or 6, you earn \$12.00.

If you choose option 2: If you roll 1, 2, or 3 you earn \$8.00; if you roll 4, 5, or 6, you earn \$20.00.

If you choose option 3: If you roll 1, 2, or 3 you earn \$4.00; if you roll 4, 5, or 6, you earn \$28.00.

If you choose option 4: If you roll 1, 2, or 3 you earn \$0.00; if you roll 4, 5, or 6, you earn \$36.00.

If you choose option 5: If you roll 1, 2, or 3 you **lose** \$4.00 (taken from your show up fee); if you roll 4, 5, or 6, you earn \$44.00.

If you choose option 6: If you roll 1, 2, or 3 you **lose** \$8.00 (taken from your show up fee); if you roll 4, 5, or 6, you earn \$48.00.

### **Decision:**

When you are ready please circle the option (1, 2, 3, 4, 5, or 6) that you prefer. Remember, there are no right or wrong answers, you should just choose the option that you like best.

<sup>1</sup> The instructions contain a small error, "what others do." This does not appear to have caused any confusion among the subjects. No subject commented or asked a question about the phrase, and no subject showed any sign of being unsure of their earnings conditional on their choices, based on interviews with the experimenters and a review of the lab logs for the sessions.

#### A4.2. Discussion

Note that these lotteries range from a certain outcome of \$12, and increase in expected value and variance through option 5; option 6 consists of an increase in variance from option 5, with the same expected value. Thus choosing option 1 indicates extremely high risk aversion, and only subjects who are risk-lovers should prefer option 6. We code the decisions as the option number, 1 – 6, reflecting the lottery selected, and this provides an index of risk aversion. See Eckel and Grossman (2008b) for further details. Note the measure used in the present paper adds one additional gamble, Gamble 6, to the protocol used in Eckel and Grossman 2008b. On average our experimental results do not substantially vary from Eckel and Grossman (2008b), where the average of 138 males is 3.79 and the average of 120 females is 3.08.

#### A4.3. Spearman Rank Correlation

For neither variable we can reject the Null hypothesis *bubble measure and average option choice are independent* considering treatments separately. However, we can reject this hypothesis considering all sessions. Thus, risk aversion plays some role overall but it is difficult to disentangle it from the gender effect. Finally there is no effect within treatments.

Table A3. Spearman's rho (p): session average of options chosen<sup>a</sup>

	Females	Mixed	Males	Total
Average Bias	0.6377 (0.17)	0.0546 (0.91)	0.7590 (0.80)	0.7532 (<0.01)
Total Dispersion	0.4058 (0.42)	-0.2182 (0.64)	0.7590 (0.08)	0.2939 (0.22)
Boom Duration	0.7464 (0.09)	0.7464 (0.09)	0.4004 (0.43)	0.6165 (<0.01)
Bust Duration	-0.4697 (0.35)	-0.4697 (0.35)	-0.2732 (0.60)	-0.5229 (0.02)

<sup>a</sup> Average option, where option 1 = zero risk (highest risk aversion) and option 6 is highest risk (least risk aversion).



## A5. MATH ABILITY TASK

### A5.1 MATH ABILITY INSTRUCTIONS

We also considered a Math Ability Test without monetary incentives in which students had to answer the following questions

- 1) Phone plan A costs \$30 per month and 10 cents per minute. Phone plan B costs \$20 per month and 15 cents per minute. How many minutes makes plan A cost the same as plan B?;
- 2) Multiply 43 and 29;
- 3) Solve the equation for a:  $X6/X2 = Xa$ ;
- 4) Complete the following statement: As X gets larger and larger, the expression  $3-(1/X)$  gets closer and closer to...;
- 5) Suppose 20,000 people live in a city. If six percent of them are sick, how many people are sick?
- 6) 80 is 20 percent of...

### A5.2 MATH ABILITY DISCUSSION

The question was whether average math ability is correlated with mispricing. Using a spearman rank correlation we cannot reject the null that *TotalDispersion* and session score of math ability ( $\frac{1}{9} \sum_{i=1}^9 \frac{\# \text{right}}{6}$ ) are independent when taking all session measures into account (n=19). The average frequency of correct answers in all-female markets was 73% and in all-male market was 84% (significantly different using a Mann-Whitney U test with 82 males and 89 females in each treatment,  $p < 0.001$ ).

A6. ADDITIONAL MEASURES

TABLE A4. SESSION MEASURES NOT REPORTED IN THE PAPER

Session	All-Female Markets						All-Male Markets					
	1	2	3	4	5	6	1	2	3	4	5	6
Anxiety	22.44	20.22	14.33	11.00	13.00	16.33	18.11	18.33	20.11	13.44	15.78	22.67
Fun Seeking	6.33	9.33	12.67	13.00	12.67	5.78	11.22	11.00	9.56	7.67	9.78	9.00
Drive	5.56	9.44	9.56	8.67	10.67	5.44	8.33	6.67	8.11	5.78	9.89	5.78
Reward	2.33	1.78	2.44	3.78	3.11	1.33	3.89	2.56	3.89	2.89	3.56	2.67
TypeA	0.13	0.14	0.15	0.20	0.19	0.14	0.16	0.18	0.09	0.21	0.24	0.15
Math_Score	0.76	0.78	0.72	0.76	0.65	0.78	0.89	0.93	0.91	0.80	0.85	0.74
Option	3.22	3.44	2.78	3.00	3.00	2.89	3.67	4.11	3.67	3.78	4.78	3.67
Age	25.44	20.11	19.56	21.33	18.78	21.33	20.78	20.67	22.67	19.89	25.33	21.00
Africa American	0	0	0	1	0	0	0	0	0	0	0	0
Asian	3	2	4	1	2	3	1	2	0	3	1	2
Hispanic	1	2	1	1	0	1	2	0	0	0	3	1
MiddleEastern	0	0	0	0	1	0	0	0	0	0	0	1
PacificIslander	0	0	0	1	0	0	0	0	0	0	0	0
SouthAsia	3	3	2	1	3	2	5	3	7	3	2	4
White	3	3	2	4	3	3	3	4	1	2	4	1
Other	0	0	0	0	0	0	0	0	0	2	0	0

Session	Mixed Markets						
	1	2	3	4	5	6	7
Anxiety	11.44	21.22	15.89	14.33	17.22	16.89	17.44
Fun Seeking	15.89	12.11	9.22	10.67	8.78	0.56	7.78
Drive	11.00	3.67	10.89	8.56	8.56	3.56	7.11
Reward	3.22	4.78	2.67	2.89	4.22	1.44	2.89
TypeA	0.13	0.15	0.17	0.23	0.21	0.23	0.15
Math_Score	0.72	0.74	0.80	0.78	0.76	0.72	0.76
Option	3.11	3.67	3.22	2.67	3.22	3.11	3.33
Age	21.44	21.78	21.44	19.56	20.67	20.11	20.56
Black	0	1	0	0	0	0	0
Asian	0	0	0	0	1	2	0
Hispanic	2	4	0	4	4	2	1
MiddleEastern	0	0	1	0	0	0	0
PacificIslander	0	0	0	0	0	0	0
SouthAsia	0	0	0	0	0	0	1
White	9	6	8	5	6	5	6
Other	0	0	0	0	0	1	0

Notes: The tables report session averages over certain aspects of the subjects population, i.e. personality scores (Anxiety – TypeA), the score from the math questionnaire (Math\_Score), risk attitude (Option), age, and ethnic groups. More information on the measures can be found in the data.zip folder.

