Thar She Bursts – Reducing Confusion Reduces Bubbles.

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Web Appendix

WEB APPENDIX A: TREATMENT DETAILS

Table A1—: Details of the treatments with declining FVs. "Div" is the expected dividend payment, "FV" denotes fundamental value, "Asset Value" is the number of stocks multiplied with the expected fundamental value (FV), and "C/A" stands for the C/A-ratio.

Period	No. assets	Div	FV	Asset Value	Cash	C/A
Treatments with declining FVs						
T1($\searrow$+), T5($\searrow$+$_G$), and T6($\searrow$+$_{G\_re}$), R1						
1	400	5	50	20000	20000	1.0
2	400	5	45	18000	22000	1.2
3	400	5	40	16000	24000	1.5
4	400	5	35	14000	26000	1.9
5	400	5	30	12000	28000	2.3
6	400	5	25	10000	30000	3.0
7	400	5	20	8000	32000	4.0
8	400	5	15	6000	34000	5.7
9	400	5	10	4000	36000	9.0
10	400	5	5	2000	38000	19.0
T3($\searrow$=)						
1	400	5	50	20000	20000	1.0
2	400	5	45	18000	18000	1.0
3	400	5	40	16000	16000	1.0
4	400	5	35	14000	14000	1.0
5	400	5	30	12000	12000	1.0
6	400	5	25	10000	10000	1.0
7	400	5	20	8000	8000	1.0
8	400	5	15	6000	6000	1.0
9	400	5	10	4000	4000	1.0
10	400	5	5	2000	2000	1.0
T6($\searrow$+$_{G\_re}$), R2						
1	200	6	60	12000	40000	3.33
2	200	6	54	10800	41200	3.81
3	200	6	48	9600	42400	4.42
4	200	6	42	8400	43600	5.19
5	200	6	36	7200	44800	6.22
6	200	6	30	6000	46000	7.67
7	200	6	24	4800	47200	9.83
8	200	6	18	3600	48400	13.44
9	200	6	12	2400	49600	20.67
10	200	6	6	1200	50800	42.33

Table A2—: Details of the treatments with constant FVs. "Div" is the expected dividend payment, "FV" denotes fundamental value, "Asset Value" is the number of stocks multiplied with the expected fundamental value (FV), and "C/A" stands for the C/A-ratio.

Treatments with constant FVs						
T2(—+)						
Period	No. assets	Div	FV	Asset Value	Cash	C/A
1	400	0	50	20000	20000	1.0
2	400	0	50	20000	24444	1.2
3	400	0	50	20000	30000	1.5
4	400	0	50	20000	37143	1.9
5	400	0	50	20000	46667	2.3
6	400	0	50	20000	60000	3.0
7	400	0	50	20000	80000	4.0
8	400	0	50	20000	113333	5.7
9	400	0	50	20000	180000	9.0
10	400	0	50	20000	380000	19.0
T4(— =)						
Period	No. assets	Div	FV	Asset Value	Cash	C/A
1	400	0	50	20000	20000	1.0
2	400	0	50	20000	20000	1.0
3	400	0	50	20000	20000	1.0
4	400	0	50	20000	20000	1.0
5	400	0	50	20000	20000	1.0
6	400	0	50	20000	20000	1.0
7	400	0	50	20000	20000	1.0
8	400	0	50	20000	20000	1.0
9	400	0	50	20000	20000	1.0
10	400	0	50	20000	20000	1.0

Dear Participant! We welcome you to this experimental session and kindly ask you to refrain from talking to each other for the duration of the experiment. If you face any difficulties, contact one of the supervisors.

General Information
This experiment is concerned with replicating an asset market where traders can trade the stocks of a fictitious company (*stocks of a depletable gold mine*) for 10 consecutive periods.

Market Description
The market consists of ten subjects. Five of the ten traders get an initial endowment of 20 assets and a working capital of 3000 Taler, another five are endowed with 60 assets and 1000 Taler at the outset. At the beginning of the experiment the asset has a fundamental value (FV) of 50. Evaluating the asset at its initial FV yields that each subjects' wealth adds up to 4000 Taler. In every period you can sell and/or buy assets, and your asset and Taler inventories are transferred to the next trading period, respectively. Each trading period automatically terminates after two minutes.

Trade is accomplished in form of a double auction, i.e., each trader can appear as buyer and seller at the same time. You can submit any quote of assets with prices ranging from 0 to a maximum of 999 Taler (with at most two decimal places). For every bid you make, you have to enter the number of assets you intend to trade as well. Note that your Taler and asset inventory cannot drop below zero. At the end of each trading period, every asset pays a dividend (profit) which gets summed up to your Taler holding. The dividend (for one asset) amounts either 0 or 10 Taler, given equal probability. Thus, an asset's average dividend amounts 5 Taler for every period. Assets feature a life-span of 10 trading periods, i.e., after dividends are paid out at the end of period 10, assets are worthless. *(The stocks are for a depletable gold mine, in which gold is mined for 10 periods. In each period the probability of finding (not finding) gold is 50%. If gold is found in period p a dividend (profit) of 10 Taler for each unit of the stock will be paid. If no gold is found, the dividend will be zero. After 10 periods the gold mine is depleted and the fundamental value of the stocks is zero.)*

You do not get any information about the dividend realization of the current period, i.e. you do not know the dividend payment for the current or the coming periods. The only thing you know is that the dividend either takes the value of 10 or 0 (per asset) in each period. At the end of a period you will be informed about the dividend realization of the expired period.

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[1]To mimic closely already existing SSW markets, we use almost identical instructions as Martin Dufwenberg, Tobias Lindqvist and Evan Moore (2005). Instructions and sceenshots are for T1($\searrow$+), text changes in T3($\searrow$ =) are in (**bold**), text changes in T5($\searrow$+$_G$) and in T6($\searrow$+$_{G\_re}$), R1 are in (*italic*).

Fundamental Value (FV)

The subsequent table might help you to make your decisions. The first column, labeled "Ending Period", indicates the last trading period of the market. The second column, labeled "Current Period", indicates the period during which the FV is being calculated. The third column gives the number of holding periods from the period in the second column until the end of the market. The fourth column, labeled "Average Dividend Value 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 "Fundamental Value Per Unit of Inventory", gives the expected total dividend earnings (per asset) for the remainder of the experiment. That is, for each unit you hold in your inventory for the remainder of the market, you receive in expectation the amount listed in column 5, which is defined as the FV of the current period. The number in column 5 is calculated by multiplying the numbers in column 3 and 4.

Suppose for example that there are 4 periods remaining in a market. Since the dividend on a unit of asset has a 50% chance of being 0 and a 50% chance of being 10, the dividend is in expectation 5 Taler (per period for each asset). If you hold one asset for 4 periods, the total dividend paid on the unit over 4 periods is in expectation 4 * 5 = 20.

Ending period	Current period	Number of Holding Periods	x	Average Dividend Value per Period	=	Fundamental Value per Unit of Inventory
10	1	10		5		50
10	2	9		5		45
10	3	8		5		40
10	4	7		5		35
10	5	6		5		30
10	6	5		5		25
10	7	4		5		20
10	8	3		5		15
10	9	2		5		10
10	10	1		5		5

(Saving account

In addition to your Taler account you possess a saving account. Your dividend earnings during the course of the experiment are directly transferred to this account. In each period an amount of 200 Taler are added to the account to increase your savings. This procedure may result in a negative Taler account. As long as your Taler holding are below zero you are not allowed to post bids or to buy shares. At the end of the experiment your savings are added to your TOTAL EARN-INGS.)

Asset trading

If you buy assets, your Taler holding is diminished by the respective expenditures (price * volume). Inversely, if you sell assets, your Taler holding will be increased by the respective revenues (price * volume).

Calculate Your Earnings

At the end of the market (after 10 periods), assets have a value of zero. Solely your Taler holdings (**and your balance on the saving account (dividend payments and savings)**) serve for the determination of your total earnings.

Your TOTAL EARNINGS at the end of the experiment =
Taler holdings (**+ balance on the saving account**).

Your total earnings in this experiment are converted into Euro at a rate of

$$400 \text{ Taler} = 1 \text{ Euro}$$

Important information

- No interest is payed for Taler holdings.
- **(Savings of 200 Taler each period.)**
- Each trading period lasts for 120 seconds.
- The experiment ends after 10 periods.
- Use the full stop (.) as decimal place.

Trading screen: By means of the following figure, the procedure of trading (buying and selling) will be illustrated.
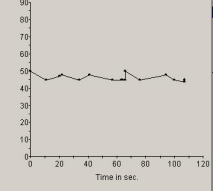
Information about current Stock and Money.

Summary of Own Sales and Purchases in the running Period (including corresponding Quantities and Prices).

BID: you have to enter Quantity and Price. Trade does not take place until another participant accepts your offer!!!

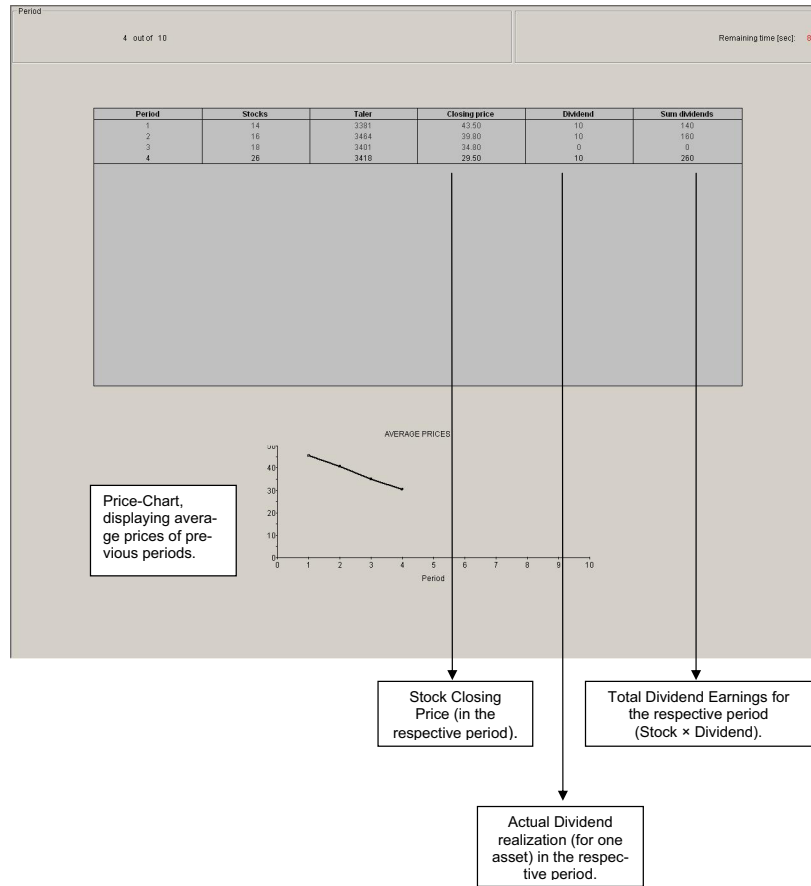**ASK**: analogue to Purchase BID - see above.

List of all BIDS: from all traders - your own Bids are written in blue. The offer with blue background is always the best, i.e., it yields the highest revenues for the seller.

List of all ASKS: from all traders - your own Asks are written in blue. The offer with blue background is always the best, i.e., it is the cheapest one for the buyer.

Current Market Price (of Stock)

Price-Chart of current period

Period

1 out of 10

Remaining time [sec]: 13

Stocks 21

Taler 2952

Price 43.50

Own Sales	Quantity	Own buys	Quantity
44.50	2	43.50	3
44.50	2	47.60	2

Bid	Quantity	Ask	Quantity

BID   ASK

All bids	Quantity	All asks	Quantity
44.20	2	47.60	1
43.30	7	48.00	2
43.00	2	48.20	3
42.80	6	48.30	5
42.50	6	49.00	12
41.00	7	49.40	6

Quantity   Quantity

SELL   BUY

Time in sec.

SELL: You sell the entered Quantity, given the Price with the blue background. If you enter a higher amount than offered in the blue box, you sell the offered Quantity at most.

BUY: You buy the entered Quantity, given the Price with the blue background. If you enter a higher amount than offered in the blue box, you buy the offered Quantity at most.

History screen: appears after each trading period (for 10 seconds), providing you with information of past periods:

Period	Stocks	Taler	Closing price	Dividend	Sum dividends
1	14	3381	43.50	10	140
2	16	3464	39.80	10	160
3	18	3401	34.80	0	0
4	26	3418	29.50	10	260

Price-Chart, displaying average prices of previous periods.

Stock Closing Price (in the respective period).

Actual Dividend realization (for one asset) in the respective period.

Total Dividend Earnings for the respective period (Stock × Dividend).

WEB APPENDIX C: EXPERIMENTAL INSTRUCTIONS FOR TREATMENTS FEATURING A CONSTANT FV[2]

Dear Participant! We welcome you to this experimental session and kindly ask you to refrain from talking to each other for the duration of the experiment. If you face any difficulties, contact one of the supervisors.

General Information
This experiment is concerned with replicating an asset market where traders can trade the stocks of a fictitious company for 10 consecutive periods.

Market Description
The market consists of ten subjects. Five of the ten traders get an initial endowment of 20 assets and a working capital of 3000 Taler, another five are endowed with 60 assets and 1000 Taler at the outset. At the beginning of the experiment the asset has a fundamental value (FV) of 50. Evaluating the asset at its initial FV yields that each subjects' wealth adds up to 4000 Taler. In every period you can sell and/or buy assets, and your asset and Taler inventories are transferred to the next trading period, respectively. Each trading period automatically terminates after two minutes.
Trade is accomplished in form of a double auction, i.e., each trader can appear as buyer and seller at the same time. You can submit any quote of assets with prices ranging from 0 to a maximum of 999 Taler (with at most two decimal places). For every bid you make, you have to enter the number of assets you intend to trade as well. Note that your Taler and asset inventory cannot drop below zero. At the end of each trading period, every asset pays a dividend (profit) of 5 Taler or causes holding costs of -5 Taler with equal probability. Thus, an asset's average payout amounts 0 Taler at the end of each period. Dividends and holding costs are collected in a separate account. Assets feature a life-span of 10 trading periods. At the end of period 10 assets are bought back by the experimenter at a price of 50.
For the current period you do not get any information wether a dividend will be paid out or holding cost will accrue. The only thing you know is that the dividend payment and the holding cost either takes the value of +5 or –5 (per asset) in each period. At the end of a period you will be informed wether a dividend is paid out or holding costs accrued for the expired period.

Fundamental Value (FV)
The subsequent table might help you to make your decisions. The first column, labeled "Current Period", indicates the period during which the FV is being calculated. The second column, labeled "Average Payment Per Period", gives the

average amount that the dividend/holding cost will be in each period for each unit held in your inventory. The third column, labeled "Fundamental 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 3.

Current period	Average Payment per Period (−5 or +5 with equal prob.)	Fundamental Value per Unit of Inventory
1	0	50
2	0	50
3	0	50
4	0	50
5	0	50
6	0	50
7	0	50
8	0	50
9	0	50
10	0	50

Saving account

Your dividend earnings (positive) and holding costs (negative) during the course of the experiment are directly transferred to a saving account. At the end of the experiment your cumulated earnings/losses are added to/substracted from your TOTAL EARNINGS.

Asset trading

If you buy assets, your Taler holding is diminished by the respective expenditures (price * volume). Inversely, if you sell assets, your Taler holding will be increased by the respective revenues (price * volume).

Calculate Your Earnings
At the end of each period earnings of external investments are added to your Taler holdings.

End of period	1	2	3	4	5	6	7	8	9	10
Earnings	444	556	714	953	1333	2000	3333	6667	20000	0

Your total earnings at the end of the market (after 10 periods) are your Taler holdings plus your balance on the saving account (dividend payments minus holding costs) plus the value of your asset holdings (number of assets * 50).

Your TOTAL EARNINGS at the end of the experiment =
Taler holdings + balance on the saving account + (# of assets * 50).

Your total earnings in this experiment are converted into Euro at a rate of

$$400 \ \mathbf{(4000)} \ \text{Taler} = 1 \ \text{Euro}$$

Important information

- No interest is payed for Taler holdings.
- Each trading period lasts for 120 seconds.
- The experiment ends after 10 periods.
- Use the full stop (.) as decimal place.

Trading and history screen are identical to treatments with declining FV *and therefore omitted.*

Web Appendix D: Experimental instructions for round 2 of Treatment T6($\diagdown$+$_{\text{G\_re}}$)

Market Description
The market consists of ten subjects, which are randomly reassigned to the market. Five of the ten traders get an initial endowment of 10 assets and a working capital of 4600 Taler, another five are endowed with 30 assets and 3400 Taler at the outset. At the beginning of the experiment the asset has a fundamental value (FV) of 60. Evaluating the asset at its initial FV yields that each subjects' wealth adds up to 5200 Taler.

The stocks are for a depletable gold mine, in which gold is mined for 10 periods. In each period there is an equal probability of finding plenty of gold, little gold or no gold. If plenty of gold is found in period p a dividend (profit) of 17 Taler for each unit of the stock is paid. If little gold is found, the dividend is 1. If no gold is found, the dividend is zero. After 10 periods the gold mine is depleted and the fundamental value of the stocks is zero.

Fundamental Value
Since the dividend on a unit of asset has a 33.33% chance of being 17, 1 or 0, the dividend is on average 6 Taler (per period for each asset). If you hold one asset for 4 periods, the total dividend paid on the unit over 4 periods is on average 4 * 6 = 24.

Ending period	Current period	Number of Holding Periods	x	Average Dividend Value per Period	=	Fundamental Value per Unit of Inventory
10	1	10		6		60
10	2	9		6		54
10	3	8		6		48
10	4	7		6		42
10	5	6		6		36
10	6	5		6		30
10	7	4		6		24
10	8	3		6		18
10	9	2		6		12
10	10	1		6		6

Calculate Your Earnings
At the end of the market (after 10 periods), assets have a value of zero. Solely your Taler holdings serve the determination of your total earnings.

Your TOTAL EARNINGS in this experiment are converted into Euro at a rate of

$$520 \text{ Taler} = 1 \text{ Euro}$$

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REFERENCES

Dufwenberg, Martin, Tobias Lindqvist, and Evan Moore. 2005. "Bubbles and Experience: An Experiment." *The American Economic Review*, 95(5): 1731–1737.

Noussair, Charles N., Stephane Robin, and Bernard Ruffieux. 2001. "Price Bubbles in Laboratory Asset Markets with Constant Fundamental Values." *Experimental Economics*, 4: 87–105.