ONLINE APPENDIX- INSTRUCTIONS

CALL MARKET

Instructions for experiment

1. General Instructions

This is an experiment in the economics of market decision-making. The instructions are simple and if you follow them carefully 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 *fifteen* trading periods in which you will have the opportunity to buy and sell in a market. The currency used in the market is francs. All trading and earnings will be in terms of francs.

700 francs = 1 dollar

Your francs will be converted to dollars at this rate, and you will be paid in dollars when you leave the lab today. The more francs you earn, the more dollars you earn.

In each period, you may buy and sell units of a good called X in a market. X can be considered an asset with a life of 15 periods, and your inventory of X carries over from one trading period to the next. Each unit of X in your inventory at the end of *each* trading period pays a dividend to you. The dividend paid on each unit is the same for every participant.

You will not know the exact value of the dividend per unit until the end of each trading period. The dividend is determined by chance at the end of each period by a random number generator. The dividend in each period has an equally likely chance of being 0, 8, 28, or 60. The information is provided in the table below.

Dividend	→	0	8	28	60
Likelihood	→	25%	25%	25%	25%

The average dividend per period for each unit of X is 24 francs.

The dividend draws in each period are independent. That means that the likelihood of a particular dividend in a period is not affected by the dividend in previous periods.

2. Your Earnings

At the beginning of the experiment, you will be given 10,000 francs in your Cash inventory. Your earnings for the entire experiment are equal to your Cash inventory at the end of period 15.

All dividends you receive are added to your Cash inventory.

All money spent on purchases is subtracted from your Cash inventory.

All money received from sales is added to your Cash inventory.

Example of earnings from dividends: if you have 6 units of X at the end of period 3 and the dividend draw is 8 francs (which has a 25% chance of occurring), then your dividend earnings for period 3 are equal to 6 units x 8 francs = 48 francs.

3. Average Value Holding Table

You can use your **AVERAGE HOLDING VALUE TABLE** (attached at the end of this document) to help you make decisions. It calculates the average amount of dividends you will receive if you keep a unit of X until the end of the experiment. It also describes how to calculate how much in future dividends you give up on average when you sell a share at any time. The following describes each of the columns in the table.

1. *Ending Period*: period 15 is the last trading period within the experiment, and thus the last period for which to receive a dividend payment. After the final dividend payment in period 15, each unit of X is worthless.

2. *Current Period*: the period during which the average holding value is being calculated. For example, in period 1, the numbers in the row corresponding to "Current Period 1" are in effect.

3. *Number of Remaining Dividend Payments*: the number of times that a dividend can be received from the current period until the final period (period 15). That is, it indicates the number of random asset payment draws remaining in the lifetime of the asset. It is calculated by taking the total number of periods, 15, subtracting the current period number, and adding 1, because the dividend is also paid in the current period.

4. *Average Dividend Value per Period*: the average amount of each dividend. As we indicated earlier, the average dividend in each period is 24 francs per unit of X.

5. *Average Holding Value per Unit of Inventory*: the average value of holding a unit of X for the remainder of the experiment. That is, for each unit of X you hold in your inventory for the remainder of the experiment, you receive on average the amount listed in column 5. The number in Average Holding Value is calculated by multiplying the Number of Remaining Dividend Payments with the Average Dividend Payment per Period.

Please have a look at the table now and make sure you understand it. The following example may help in your understanding.

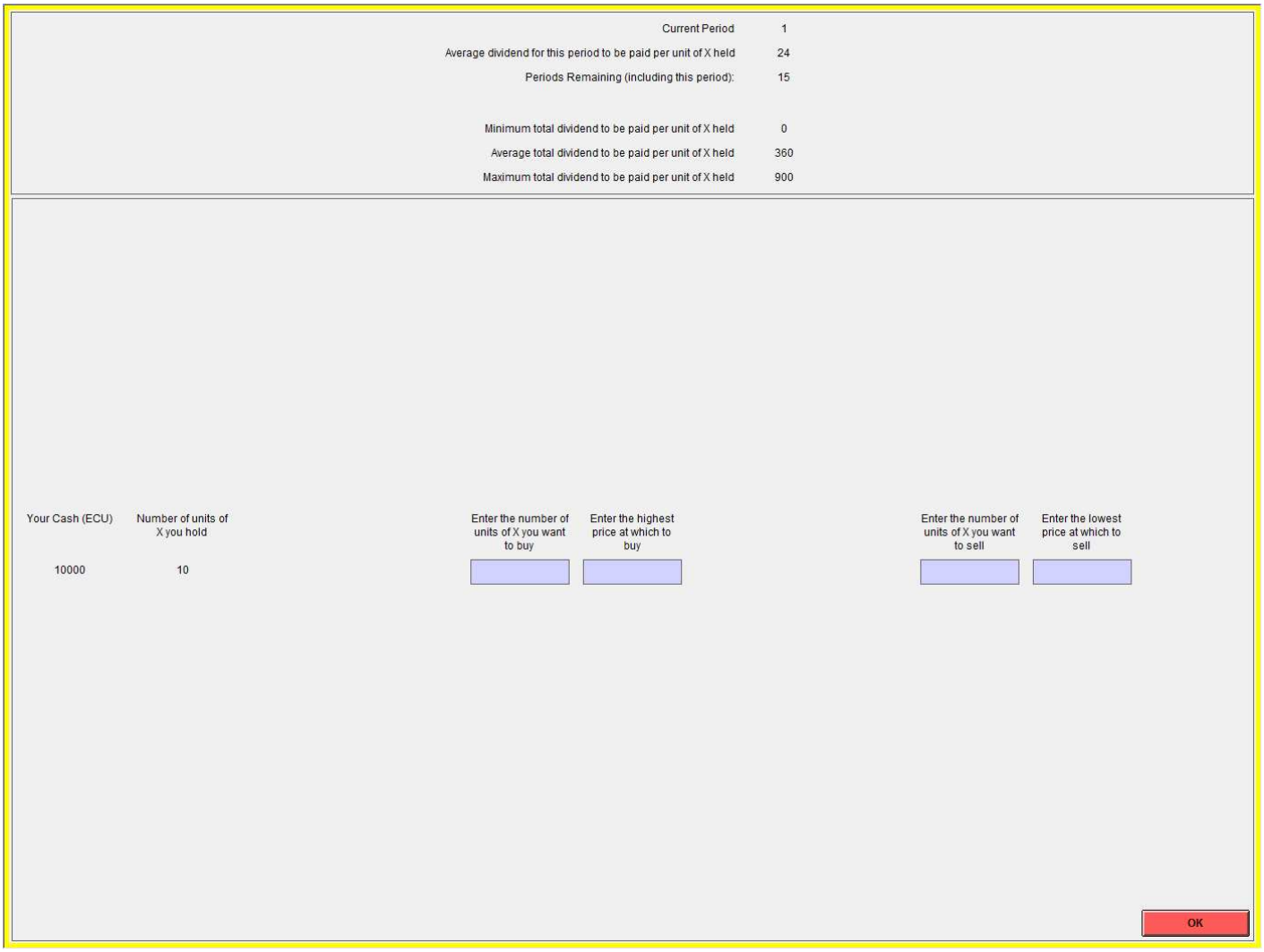
Suppose for example that there are 7 periods remaining. Since the dividend paid on a unit of X has a 25% chance of being 0, a 25% chance of being 8, a 25% chance of being

28, and a 25% chance of being 60 in any period, the dividend is on average 24 per period for each unit of X. If you hold a unit of X for 7 periods, the total dividend paid on the unit over the 7 periods is on average 7*24 = 168.

4. Market and Trading Rules

At the beginning of the experiment, you will have an initial inventory of 10 units of X and 10,000 francs. The experiment will consist of 15 periods. In each period, you will see a computer screen like the one shown below. You can use the interface to buy and sell units of X. On your computer screen, you can see the Cash and Number of units of X you have available.

At the beginning of each trading period, if you wish to purchase units of X you can send in a **buy order**. Your buy order indicates the number of units of X you would like to buy and the highest price that you are willing to pay. Similarly, if you wish to sell units of X, you can send in a **sell order**. Your sell order indicates the number of units of X you are offering to sell and the lowest price that you are willing to accept. The price at which you offer to buy must be less than the price at which you offer to sell. The price you specify in your order is a per-unit price, at which you are offering to buy or sell *each* unit of X.



Your offer to sell is limited by your inventory of X, and your offer to buy is limited by (1) a maximum of 10 units each periods, and (2) your cash holdings and the maximum price of X you are willing to pay. The computer totals all the offers to buy and all the offers to sell. An example of the bidding screen is provided above.

The computer program will organize the buy and sell orders and uses them to determine the **trading price** at which units of X are bought and sold. All transactions in a given period will occur at the same trading price. This will generally be a price where the number of units of X with sell order prices at or below this clearing price is equal to the number of units of X with buy order prices at or above this clearing price. The people who submit buy orders at prices above the trading price make purchases, and those who submit sell orders at prices below the trading price make sales.

Examples of how the market works.

Example 1. Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 60

- Trader 2 submits an offer to buy at 20
- Trader 3 submits an offer to sell at 10
- Trader 4 submits an offer to sell at 40

At any price above 40, there are more units offered for sale than for purchase. At any price below 20 there are more units offered for purchase than for sale. At any price between 21 and 39 there is an equal number of units offered for purchase and for sale. The trading price is the lowest price at which there is an equal number of units offered for purchase and for sale. In this example that price is 21. Trader 1 makes a purchase from trader 3 at a price of 21.

Example 2. Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 360
- Trader 2 submits an offer to buy at 320
- Trader 3 submits an offer to sell at 310
- Trader 4 submits an offer to sell at 300

The trading price is the lowest price at which there is an equal number of units offered for purchase and for sale. In this example that price is 310. Traders 1 and 2 make a purchase from traders 3 and 4 at a price of 310.

5. Transaction Price Forecast

At the beginning of each period, you will be asked to submit a price that forecasts the actual transaction price for each unit of X in that period. You will be paid for the accuracy of your forecasts.

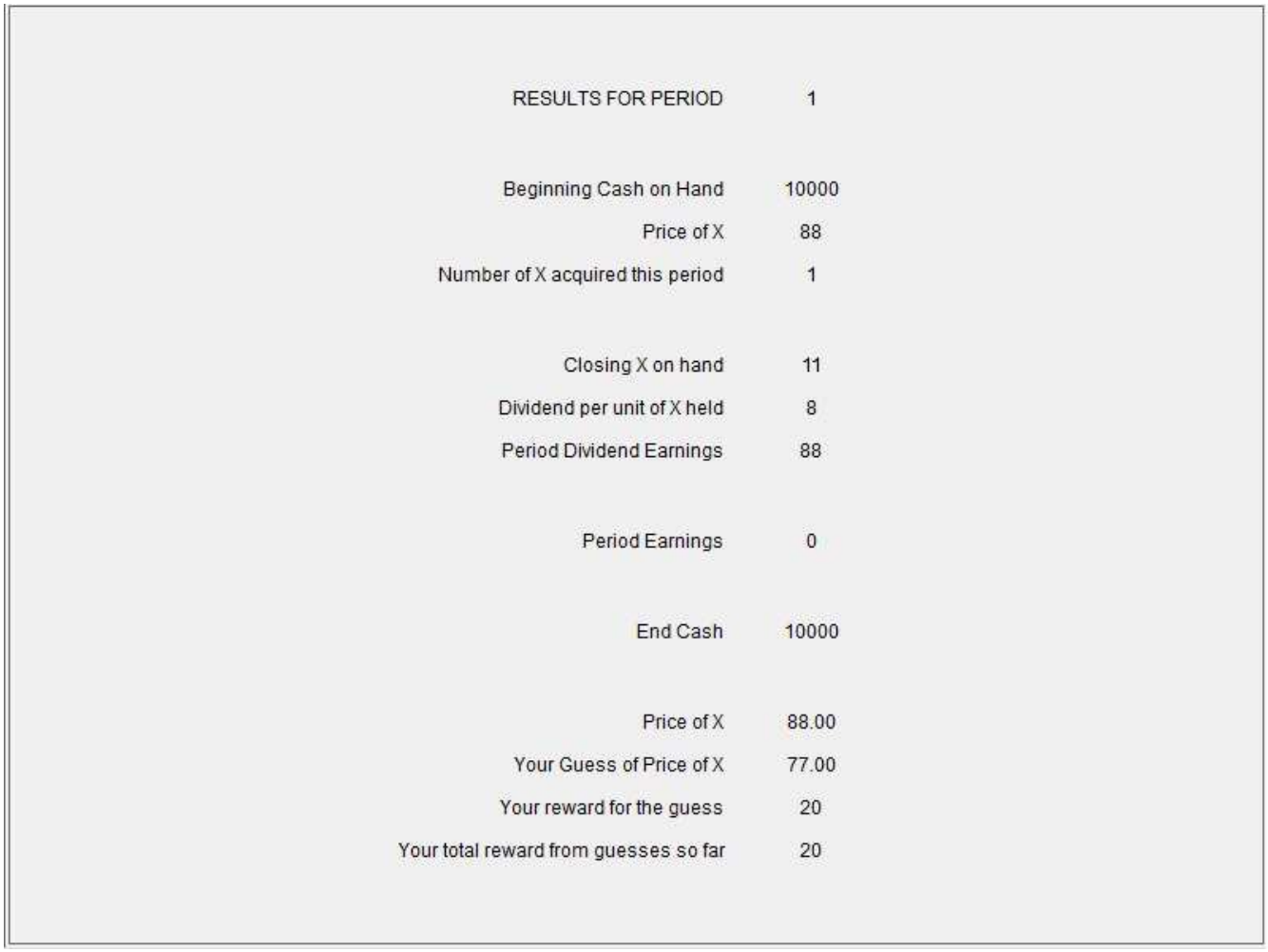
The money you receive from your forecast will be calculated in the following manner

Accuracy	*Your earnings*
Within 10% of actual price	50 francs
Within 25% of actual price	20 francs
Within 50% of actual price	10 francs

The money earned from each period's forecast will not be added to your Cash on Hand, but rather added up each period and paid to your separately at the end of the experiment.

6. Recording your earnings

At the end of each period, a summary screen will be provided to you (an example of the summary screen is illustrated below).



On your **PERIOD EARNINGS SHEET** please record the following information from the summary screen. At the beginning of period 1, record your cash on hand at the beginning of the period in column 2 in the row marked period 1. In column 3, record your sales or purchases for the period. Record your inventory of units at the end of the period in column 4 in the row marked period 1. Fill in the dividend of each unit in column 5. Record your dividend earnings for the period in column 6. In column 7, record your cash on hand at the end of the period. Record your cash on hand at the beginning of the period in column 8. Your earnings in each period equal the difference in your cash on hand at the end of the period minus the cash on hand at the beginning of the period. Record your period earnings in column 9. Repeat this procedure to obtain the period earnings of all periods.

END OF PERIOD CASH= BEGINNING OF PERIOD CASH + DIVIDEND PER UNIT * NUMBER OF UNITS IN INVENTORY AT THE END OF PERIOD+SALES - PURCHASES

PERIOD EARNINGS = END OF PERIOD CASH – BEGINNING OF PERIOD CASH

Subsequent periods should be recorded similarly. Your earnings for this experiment are given by the cash on hand at the end of period 15.

Example of period earnings. Suppose that in period 10 your BEGINNING OF PERIOD CASH is 3,000 francs and your INVENTORY at the beginning of period 10 is 7 units of X. If in period 10 you sell 2 units of X at a price of 200 francs and the dividend draw is 8 francs, then in period 10:

SALES= 2*200=400

INVENTORY (at the end of period 10) = 7- 2 = 5

PERIOD DIVIDEND EARNINGS = DIVIDEND PER UNIT * NUMBER OF UNITS IN INVENTORY = 8 * 5 = 40.

END OF PERIOD CASH = 3,000 +40+ 2*200 = 3,440

PERIOD EARNINGS = END OF PERIOD CASH – BEGINNING OF PERIOD CASH = 3,440 – 3,000 = 440.

6. Quiz

Question 1: Suppose that you purchase a unit of X in period 5.

a. What is the average dividend payment on the unit of X for period 5? _____
b. If you hold that unit of X till the end of the experiment (11 periods including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____

Question 2: Suppose that you purchase a unit of X in period 15.

a. What is the average dividend payment on the unit of X for period 15? _____
b. If you hold that unit of X till the end of the experiment (1 period including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____

Question 3: Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 400
- Trader 2 submits an offer to buy at 120
- Trader 3 submits an offer to sell at 310
- Trader 4 submits an offer to sell at 300

a. The trading price is the lowest price at which there is an equal number of units offered for purchase and for sale. In this example that price is _____.

b. At this price trader(s) _____ make a purchase from trader(s) _____.

Question 4: What is the value of the asset after the final dividend payment in period 15? _____

AVERAGE HOLDING VALUE TABLE

Ending Period	Current period	Number of Remaining Dividend Payments	*	Average Dividend Value Per Period	=	Average Holding Value Per Unit of 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

PERIOD EARNINGS SHEET

(1) PERIOD	(2) BEGINNING CASH	(3) +SALES -PURCHASES	(4) INVENTORY AT THE END OF PERIOD	(5) DIVIDEND PER UNIT	(6) PERIOD DIVIDEND EARNINGS	(7) END CASH	(8) BEGINNING CASH	(9) PERIOD EARNINGS
1	10,000						10,000	
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14								
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Instructions Summary

- The experiment will consist of 15 trading periods in which you will have the opportunity to buy and sell in a market.

- The currency used in the market is francs. All trading and earnings will be in terms of francs. Your francs will be converted into dollars at the rate

  700 francs = 1 dollar.

  The more francs you earn, the more dollars you earn.

- In each period, you may buy and sell units of a good called X in a market. Each unit of X in your inventory at the end of each trading period pays a dividend to you. The dividend paid on each unit is the same for every participant.

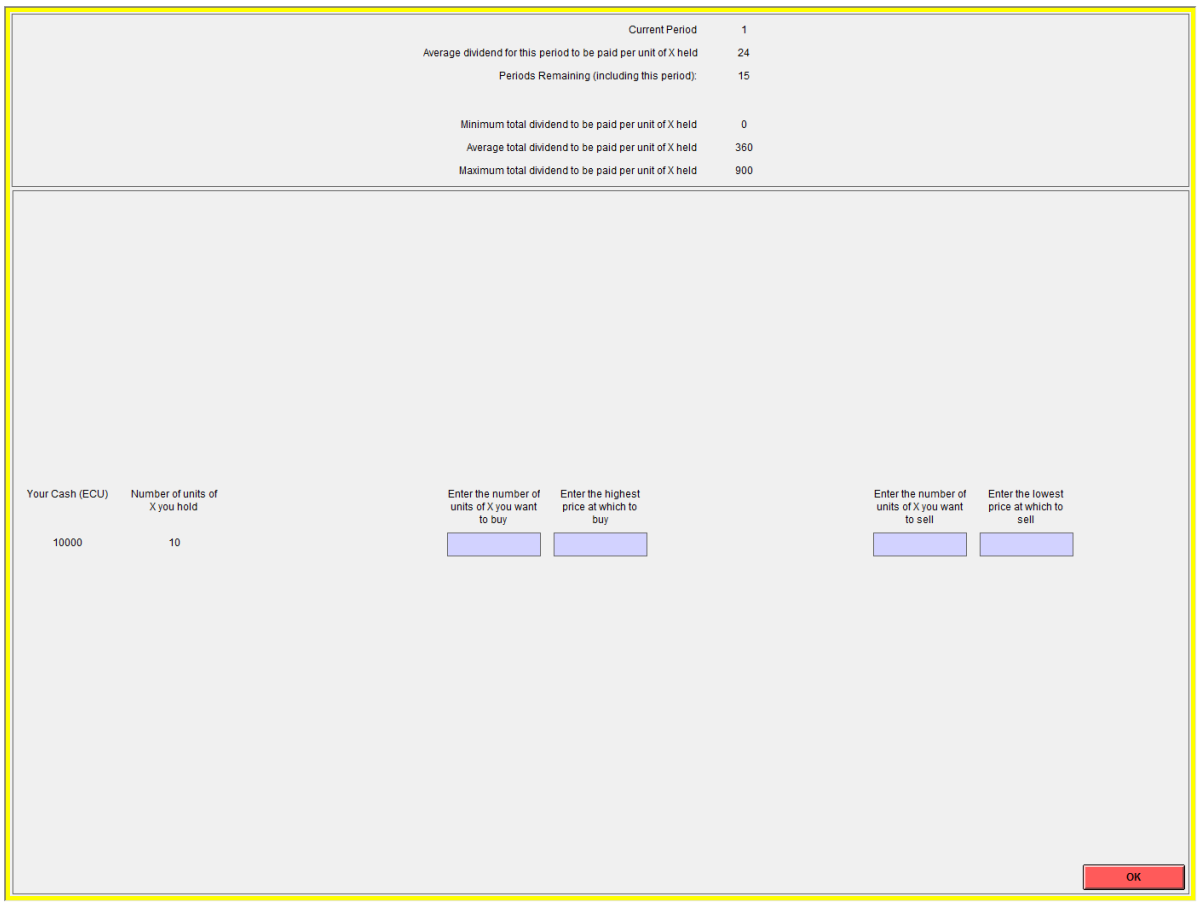
- The dividend in each period has an equally likely chance of being 0, 8, 28, or 60. The average dividend per period for each unit of X is 24 francs. The dividend draws in each period are independent. That means that the likelihood of a particular dividend in a period is not affected by the dividend in previous periods.

- At the beginning of the experiment, you will be given 10,000 francs in your Cash inventory and 10 units of X. Your earnings for the entire experiment are equal to your Cash inventory at the end of period 15.
  All dividends you receive are added to your Cash inventory. All money spent on purchases is subtracted from your Cash inventory. All money received from sales is added to your Cash inventory.

- Example on how to read Average Holding Value Table.

Suppose for example that there are 7 periods remaining. Since the dividend paid on a unit of X 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 unit of X. If you hold a unit of X for 7 periods, the total dividend paid on the unit over the 7 periods is on average 7*24 = 168.

- Market and Trading Rules



- Your offers to sell are limited by your inventory of X, and your offers to buy are limited by (1) a maximum of 10 units each periods, and (2) your cash holdings and the maximum price of X you are willing to pay.

- At the beginning of each period, you will be asked to submit a price that forecasts the average of all transaction prices of X in that period. You will be paid for the accuracy of your forecasts as described in the Table in Section 5.

- At the end of each period, a summary screen will be provided to you. You should record this information on your period earnings sheet

7. Quiz

Question 1: Suppose that you purchase a unit of X in period 5.

a. What is the average dividend payment on the unit of X for period 5? _____
b. If you hold that unit of X till the end of the experiment (11 periods including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____

Question 2: Suppose that you purchase a unit of X in period 15.

a. What is the average dividend payment on the unit of X for period 15? _____
b. If you hold that unit of X till the end of the experiment (1 period including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____

Question 3: Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 400
- Trader 2 submits an offer to buy at 120
- Trader 3 submits an offer to sell at 310
- Trader 4 submits an offer to sell at 300

a. The trading price is the lowest price at which there is an equal number of units offered for purchase and for sale. In this example that price is _____.

b. At this price, trader(s) _____ make a purchase from trader(s) _____ .

Question 4: What is the value of the asset after the final dividend payment in period 15? _____

AVERAGE HOLDING VALUE TABLE

Ending Period	Current period	Number of Remaining Dividend Payments	*	Average Dividend Value Per Period	=	Average Holding Value Per Unit of Inventory
15	1	15	*	24	=	360
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15	3	13	*	24	=	312
15	4	12	*	24	=	288
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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

PERIOD EARNINGS SHEET

(1) PERIOD	(2) BEGINNING CASH	(3) SALES/ PURCHASES	(4) CLOSING X ON HAND	(5) DIVIDEND PER UNIT	(6) PERIOD DIVIDEND EARNINGS	(7) END CASH	(8) BEGINNING CASH	(9) PERIOD EARNINGS
1	10,000						10,000	
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DOUBLE AUCTION

Instructions for experiment

1. General Instructions

This is an experiment in the economics of market decision-making. The instructions are simple and if you follow them carefully 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 *fifteen* trading periods in which you will have the opportunity to buy and sell in a market. The currency used in the market is francs. All trading and earnings will be in terms of francs.

600 francs = 1 dollar

Your francs will be converted to dollars at this rate, and you will be paid in dollars when you leave the lab today. The more francs you earn, the more dollars you earn.

In each period, you may buy and sell units of a good called X in a market. X can be considered an asset with a life of 15 periods, and your inventory of X carries over from one trading period to the next. Each unit of X in your inventory at the end of *each* trading period pays a dividend to you. The dividend paid on each unit is the same for every participant.

You will not know the exact value of the dividend per unit until the end of each trading period. The dividend is determined by chance at the end of each period by a random number generator. The dividend in each period has an equally likely chance of being 0, 8, 28, or 60. The information is provided in the table below.

Dividend	→	0	8	28	60
Likelihood	→	25%	25%	25%	25%

The average dividend per period for each unit of X is 24 francs.

The dividend draws in each period are independent. That means that the likelihood of a particular dividend in a period is not affected by the dividend in previous periods.

2. Your Earnings

At the beginning of the experiment, you will be given 10,000 francs in your Cash inventory. Your earnings for the entire experiment are equal to your Cash inventory at the end of period 15.

All dividends you receive are added to your Cash inventory.

All money spent on purchases is subtracted from your Cash inventory.

All money received from sales is added to your Cash inventory.

Example of earnings from dividends: if you have 6 units of X at the end of period 3 and the dividend draw is 8 francs (which has a 25% chance of occurring), then your dividend earnings for period 3 are equal to 6 units x 8 francs = 48 francs.

3. Average Value Holding Table

You can use your **AVERAGE HOLDING VALUE TABLE** (attached at the end of this document) to help you make decisions. It calculates the average amount of dividends you will receive if you keep a unit of X until the end of the experiment. It also describes how to calculate how much in future dividends you give up on average when you sell a share at any time. The following describes each of the columns in the table.

1. *Ending Period*: period 15 is the last trading period within the experiment, and thus the last period for which to receive a dividend payment. After the final dividend payment in period 15, each unit of X is worthless.

2. *Current Period*: the period during which the average holding value is being calculated. For example, in period 1, the numbers in the row corresponding to "Current Period 1" are in effect.

3. *Number of Remaining Dividend Payments*: the number of times that a dividend can be received from the current period until the final period (period 15). That is, it indicates the number of random asset payment draws remaining in the lifetime of the asset. It is calculated by taking the total number of periods, 15, subtracting the current period number, and adding 1, because the dividend is also paid in the current period.

4. *Average Dividend Value per Period*: the average amount of each dividend. As we indicated earlier, the average dividend in each period is 24 francs per unit of X.

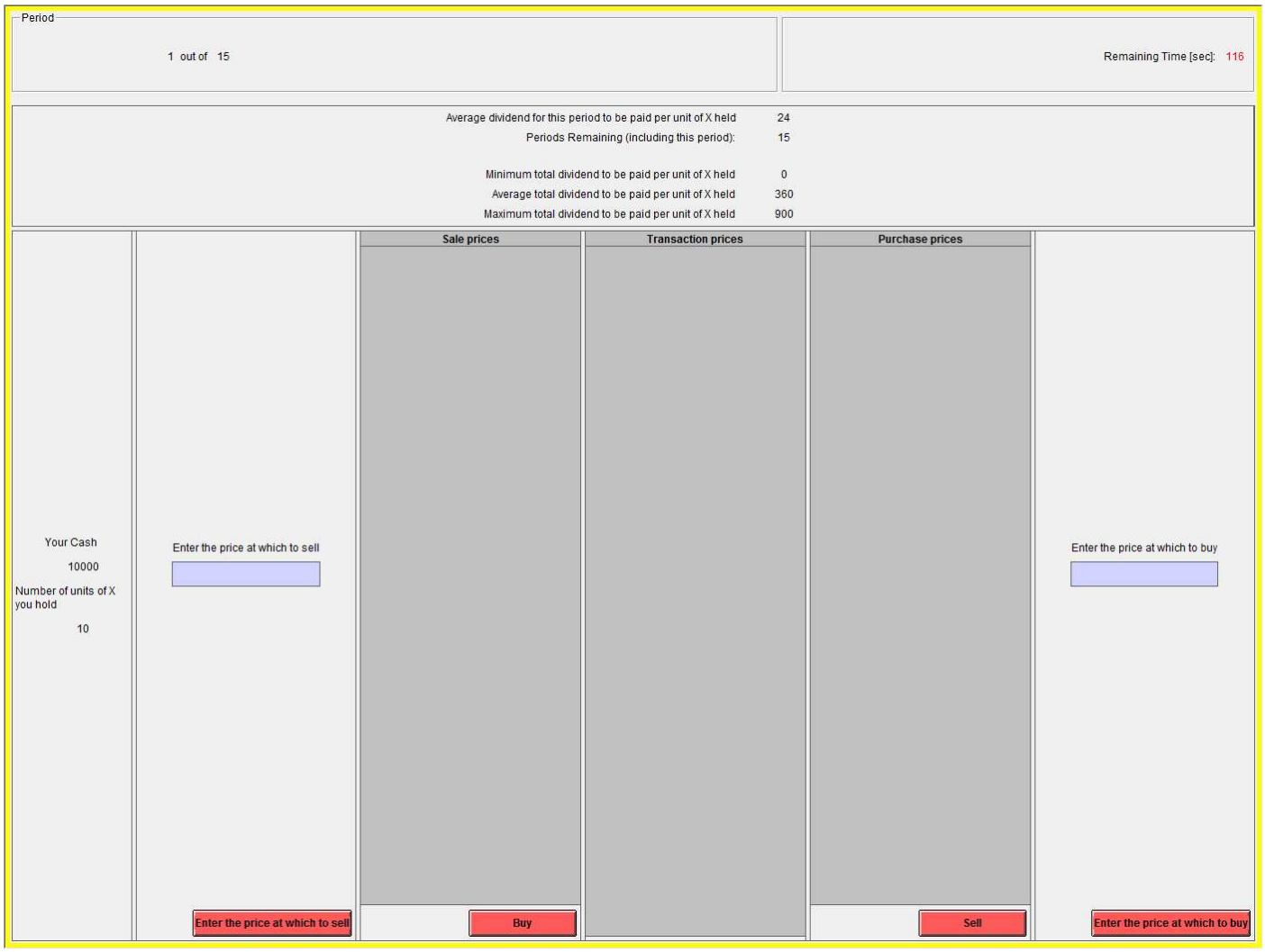
5. *Average Holding Value per Unit of Inventory*: the average value of holding a unit of X for the remainder of the experiment. That is, for each unit of X you hold in your inventory for the remainder of the experiment, you receive on average the amount listed in column 5. The number in Average Holding Value is calculated by multiplying the Number of Remaining Dividend Payments with the Average Dividend Payment per Period.

Please have a look at the table now and make sure you understand it. The following example may help in your understanding.

Suppose for example that there are 7 periods remaining. Since the dividend paid on a unit of X 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 unit of X. If you hold a unit of X for 7 periods, the total dividend paid on the unit over the 7 periods is on average 7*24 = 168.

4. Market and Trading Rules

At the beginning of the experiment, you will have an initial inventory of 10 units of X and 10,000 francs. The experiment will consist of 15 periods. Each period will last 180 seconds. In each period, you will see a computer screen like the one shown below. You can use the interface to buy and sell units of X. On your computer screen, you can see the Cash and Number of units of X you have available.



At the beginning of each trading period, if you wish to purchase a unit of X you can send in a **buy order** by typing the amount you are willing to pay for a unit of good X in the box marked "Enter the price at which to buy" and by pressing the corresponding button. Similarly, if you wish to sell units of X, you can send in a **sell order** by typing the amount you are willing to sell a unit of X for in the box marked "Enter the price at which to sell" and by pressing the corresponding button. The "Purchase prices" column shows all the available "Purchase prices" in descending order so that the highest price is at the top.

Press the “Sell” button if you would like to sell a unit of good X for the highlighted amount in the “Purchase prices” column. The “Sale prices” column shows all the available “Sale prices” in ascending order so that the lowest price is at the top.
Press the “Buy” button if you would like to buy a unit of good X for the highlighted amount in the “Sale prices” column. Note that you cannot accept your own buy or sell orders.
The “Transaction prices” column shows all the prices at which a unit of X has been bought or sold in the current period.

Your offers to sell are limited by your inventory of X, and your offers to buy are limited by (1) your cash on hand and price, and (2) a maximum of 10 units each period.

Examples of how the market works.

The numbers used in the examples are for illustrative purposes.

Example 1. Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 60
- Trader 2 submits an offer to buy at 20
- Trader 3 submits an offer to sell at 10
- Trader 4 submits an offer to sell at 40

The sale prices will be ordered in ascending order in the “Sale prices” column so that the lowest price is at the top. The first participant who presses the button “Buy” will buy the unit at the price of 10, if this price is highlighted in the “Sale prices” column. The purchase prices will be ordered in descending order in the “Purchase prices” so that the highest price is at the top. The first participant who presses the button “Sell” will sell at the price of 60, if this price is highlighted in the “Purchase prices” column.

Example 2. Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 410
- Trader 2 submits an offer to buy at 400
- Trader 3 submits an offer to sell at 300
- Trader 4 submits an offer to sell at 320

The sale prices will be ordered in ascending order in the “Sale prices” column so that the lowest price is at the top. The first participant who presses the button “Buy” will buy the unit at the price of 300, if this price is highlighted in the “Sale prices” column. The purchase prices will be ordered in descending order in the “Purchase prices” so that the highest price is at the top. The first participant who presses the button “Sell” will sell at the price of 410, if this price is highlighted in the “Purchase prices” column.

5. Transaction Price Forecast

At the beginning of each period, you will be asked to submit a price that forecasts the average of all transaction prices of X in that period. You will be paid for the accuracy of your forecasts.

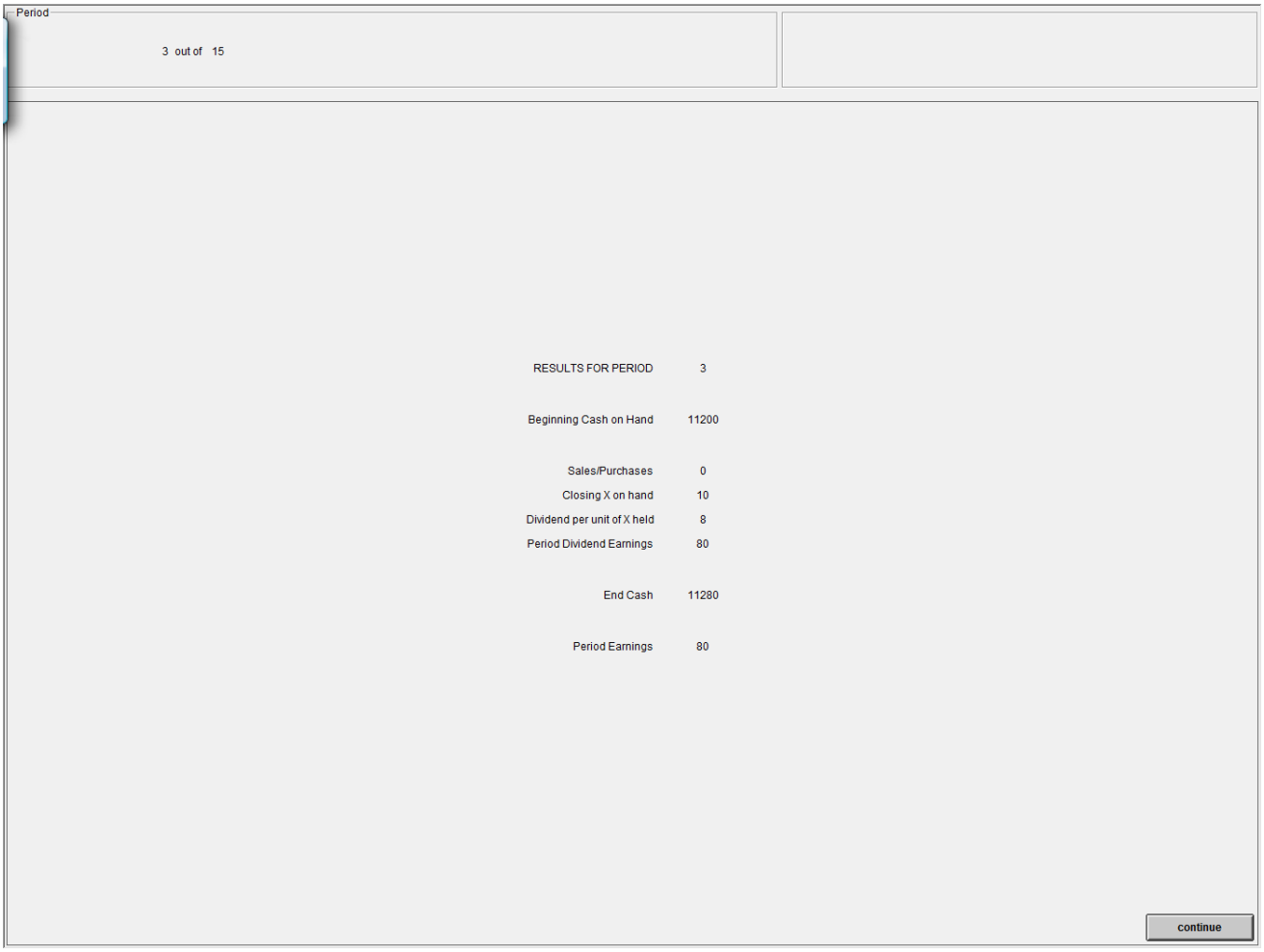
The money you receive from your forecast will be calculated in the following manner

Accuracy	*Your earnings*
Within 10% of actual price	50 francs
Within 25% of actual price	20 francs
Within 50% of actual price	10 francs

The money earned from each period's forecast will not be added to your Cash on Hand, but rather added up each period and paid to you separately at the end of the experiment.

6. Recording your earnings

At the end of each period, a summary screen will be provided to you (an example of the summary screen is illustrated below).



On your **PERIOD EARNINGS SHEET** please record the following information from the summary screen. At the beginning of period 1, record your cash on hand at the beginning of the period in column 2 in the row marked period 1. In column 3, record your earnings from sales or purchases for the period. Record your inventory of units at the end of the period in column 4 in the row marked period 1. Fill in the dividend of each unit in column 5. Record your dividend earnings for the period in column 6. In column 7, record your cash on hand at the end of the period. Record your cash on hand at the beginning of the period in column 8. Your earnings in each period equal the difference in your cash on hand at the end of the period minus the cash on hand at the beginning of the period. Record your period earnings in column 9. Repeat this procedure to obtain the period earnings of all periods.

END OF PERIOD CASH= BEGINNING OF PERIOD CASH + DIVIDEND PER UNIT * NUMBER OF UNITS IN INVENTORY AT THE END OF PERIOD+SALES - PURCHASES

PERIOD EARNINGS = END OF PERIOD CASH – BEGINNING OF PERIOD CASH

Subsequent periods should be recorded similarly. Your earnings for this experiment are given by the cash on hand at the end of period 15.

Example of period earnings. Suppose that in period 10 your BEGINNING OF PERIOD CASH is 3,000 francs and your INVENTORY at the beginning of period 10 is 7 units of X. If in period 10 you sell 2 units of X at a price of 200 francs and the dividend draw is 8 francs, then in period 10:

SALES= 2*200=400

INVENTORY (at the end of period 10) = 7- 2 = 5

PERIOD DIVIDEND EARNINGS = DIVIDEND PER UNIT * NUMBER OF UNITS IN INVENTORY = 8 * 5 = 40.

END OF PERIOD CASH = 3,000 +40+ 2*200 = 3,440

PERIOD EARNINGS = END OF PERIOD CASH – BEGINNING OF PERIOD CASH = 3,440 – 3,000 = 440.

7. Quiz

Question 1: Suppose that you purchase a unit of X in period 5.

a. What is the average dividend payment on the unit of X for period 5? _____
b. If you hold that unit of X till the end of the experiment (11 periods including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____

Question 2: Suppose that you purchase a unit of X in period 15.

a. What is the average dividend payment on the unit of X for period 15? _____
b. If you hold that unit of X till the end of the experiment (1 period including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____

Question 3: Suppose that in period 7 four traders participate in the market and:

- Trader 1 submits an offer to buy at 310
- Trader 2 submits an offer to buy at 300
- Trader 3 submits an offer to sell at 200
- Trader 4 submits an offer to sell at 220

a. What is the transaction price if only trader 1 presses the "Buy" button? _____
b. What is the transaction price if only trader 3 presses the "Sell" button? _____
c. What are the transaction prices if traders 1 and 2 press the "Buy" button? _____
d. What are the transaction prices if traders 3 and 4 press the "Sell" button? _____

Question 4: What is the value of the asset after the final dividend payment in period 15? _____

AVERAGE HOLDING VALUE TABLE

Ending Period	Current period	Number of Remaining Dividend Payments	*	Average Dividend Value Per Period	=	Average Holding Value Per Unit of Inventory
15	1	15	*	24	=	360
15	2	14	*	24	=	336
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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

PERIOD EARNINGS SHEET

(1) PERIOD	(2) BEGINNING CASH	(3) SALES/ PURCHASES	(4) CLOSING X ON HAND	(5) DIVIDEND PER UNIT	(6) PERIOD DIVIDEND EARNINGS	(7) END CASH	(8) BEGINNING CASH	(9) PERIOD EARNINGS
1	10,000						10,000	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Instructions Summary

- The experiment will consist of 15 trading periods in which you will have the opportunity to buy and sell in a market.

- The currency used in the market is francs. All trading and earnings will be in terms of francs. Your francs will be converted into dollars at the rate

  600 francs = 1 dollar.

  The more francs you earn, the more dollars you earn.

- In each period, you may buy and sell units of a good called X in a market. Each unit of X in your inventory at the end of each trading period pays a dividend to you. The dividend paid on each unit is the same for every participant.

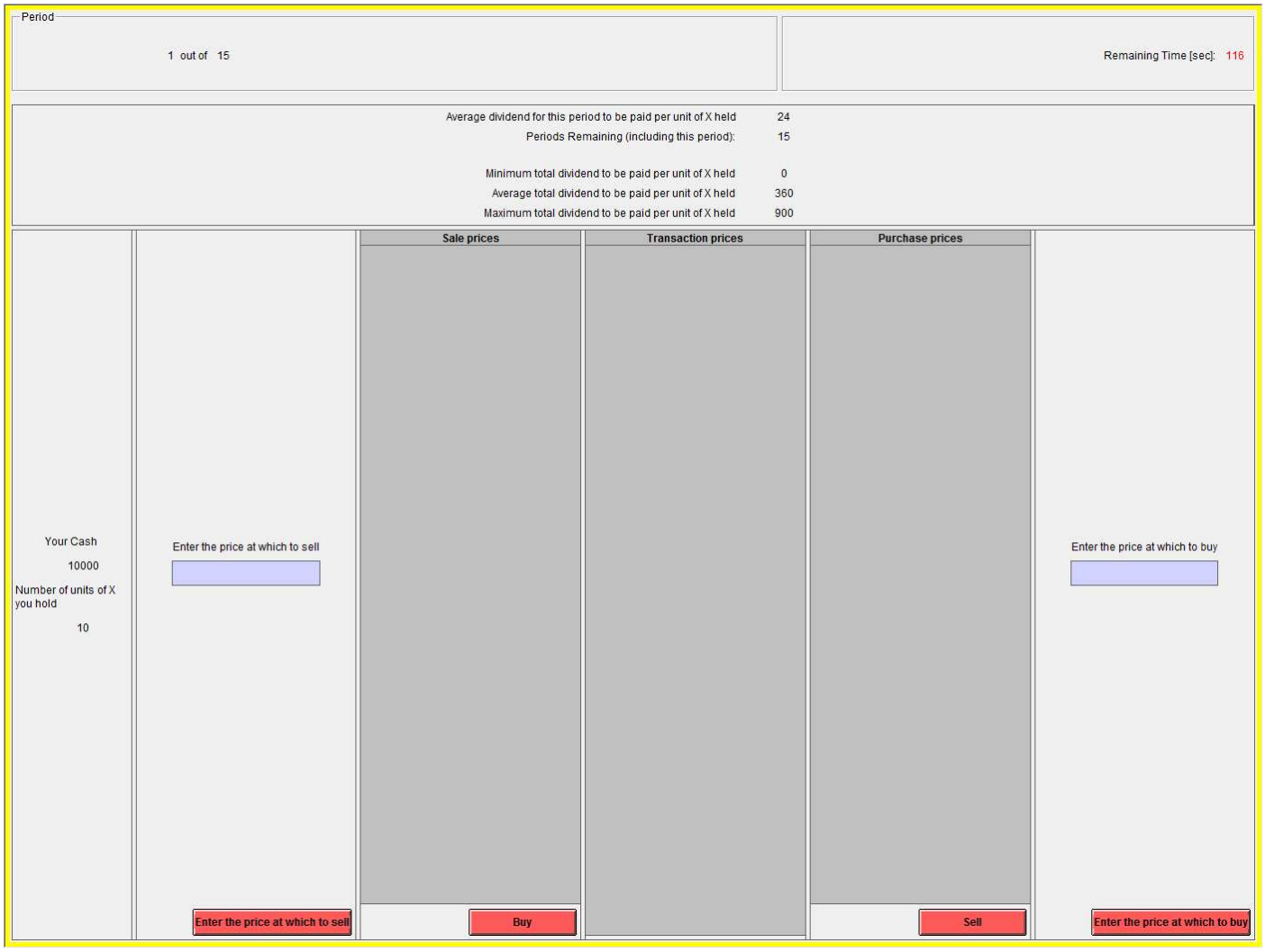
- The dividend in each period has an equally likely chance of being 0, 8, 28, or 60. The average dividend per period for each unit of X is 24 francs. The dividend draws in each period are independent. That means that the likelihood of a particular dividend in a period is not affected by the dividend in previous periods.

- At the beginning of the experiment, you will be given 10,000 francs in your Cash inventory and 10 units of X. Your earnings for the entire experiment are equal to your Cash inventory at the end of period 15.
  All dividends you receive are added to your Cash inventory. All money spent on purchases is subtracted from your Cash inventory. All money received from sales is added to your Cash inventory.

- Example on how to read Average Holding Value Table.

Suppose for example that there are 7 periods remaining. Since the dividend paid on a unit of X 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 unit of X. If you hold a unit of X for 7 periods, the total dividend paid on the unit over the 7 periods is on average 7*24 = 168.

- Market and Trading Rules



- Your offers to sell are limited by your inventory of X. Your offers to buy are limited by (1) a maximum of 10 units each period, and (2) your cash holdings and the maximum price of X you are willing to pay.

- At the beginning of each period, you will be asked to submit a price that forecasts the average of all transaction prices of X in that period. You will be paid for the accuracy of your forecasts as described in the Table in Section 5.

- At the end of each period, a summary screen will be provided to you. You should record this information on your period earnings sheet

7. Quiz

Question 1: Suppose that you purchase a unit of X in period 5.

a. What is the average dividend payment on the unit of X for period 5? _____
b. If you hold that unit of X till the end of the experiment (11 periods including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____

Question 2: Suppose that you purchase a unit of X in period 15.

a. What is the average dividend payment on the unit of X for period 15? _____
b. If you hold that unit of X till the end of the experiment (1 period including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____

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- Trader 1 submits an offer to buy at 310
- Trader 2 submits an offer to buy at 300
- Trader 3 submits an offer to sell at 200
- Trader 4 submits an offer to sell at 220

a. What is the transaction price if only trader 1 presses the "Buy" button? _____
b. What is the transaction price if only trader 3 presses the "Sell" button? _____
c. What are the transaction prices if traders 1 and 2 press the "Buy" button? _____
d. What are the transaction prices if traders 3 and 4 press the "Sell" button? _____

Question 4: What is the value of the asset after the final dividend payment in period 15? _____

AVERAGE HOLDING VALUE TABLE

Ending Period	Current period	Number of Remaining Dividend Payments	*	Average Dividend Value Per Period	=	Average Holding Value Per Unit of Inventory
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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

PERIOD EARNINGS SHEET

(1) PERIOD	(2) BEGINNING CASH	(3) SALES/ PURCHASES	(4) CLOSING X ON HAND	(5) DIVIDEND PER UNIT	(6) PERIOD DIVIDEND EARNINGS	(7) END CASH	(8) BEGINNING CASH	(9) PERIOD EARNINGS
1	10,000						10,000	
2								
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TATONNEMENT

General Instructions

This is an experiment in the economics of market decision-making. The instructions are simple and if you follow them carefully 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 *fifteen* trading periods in which you will have the opportunity to buy and sell in a market. The currency used in the market is francs. All trading and earnings will be in terms of francs.

360 francs = 1 NZ dollar

Your francs will be converted to dollars at this rate, and you will be paid in dollars when you leave the lab today. The more francs you earn, the more dollars you earn.

In each period, you may buy and sell units of a good called X in a market. X can be considered an asset with a life of 15 periods, and your inventory of X carries over from one trading period to the next. Each unit of X in your inventory at the end of *each* trading period pays a dividend to you. The dividend paid on each unit is the same for every participant.

You will not know the exact value of the dividend per unit until the end of each trading period. The dividend is determined by chance at the end of each period by a random number generator. The dividend in each period has an equally likely chance of being 0, 8, 28, or 60. The information is provided in the table below.

Dividend	→	0	8	28	60
Likelihood	→	25%	25%	25%	25%

The average dividend per period for each unit of X is 24 francs.

The dividend draws in each period are independent. That means that the likelihood of a particular dividend in a period is not affected by the dividend in previous periods.

2. Your Earnings

At the beginning of the experiment, you will be given 10000 francs in your Cash inventory and 10 units of X. Your earnings for the entire experiment are equal to your Cash inventory at the end of period 15.

All dividends you receive are added to your Cash inventory.

All money spent on purchases is subtracted from your Cash inventory.

All money received from sales is added to your Cash inventory.

Example of earnings from dividends: if you have 6 units of X at the end of period 3 and the dividend draw is 8 francs (which has a 25% chance of occurring), then your dividend earnings for period 3 are equal to 6 units x 8 francs = 48 francs.

3. Average Value Holding Table

You can use your **AVERAGE HOLDING VALUE TABLE** (attached at the end of this document) to help you make decisions. It calculates the average amount of dividends you will receive if you keep a unit of X until the end of the experiment. It also describes how to calculate how much in future dividends you give up on average when you sell a share at any time. The following describes each of the columns in the table.

1. *Ending Period*: period 15 is the last trading period within the experiment, and thus the last period for which to receive a dividend payment. After the final dividend payment in period 15, each unit of X is worthless.

2. *Current Period*: the period during which the average holding value is being calculated. For example, in period 1, the numbers in the row corresponding to "Current Period 1" are in effect.

3. *Number of Remaining Dividend Payments*: the number of times that a dividend can be received from the current period until the final period (period 15). That is, it indicates the number of random asset payment draws remaining in the lifetime of the asset. It is calculated by taking the total number of periods, 15, subtracting the current period number, and adding 1, because the dividend is also paid in the current period.

4. *Average Dividend Value per Period*: the average amount of each dividend. As we indicated earlier, the average dividend in each period is 24 francs per unit of X.

5. *Average Holding Value per Unit of Inventory*: the average value of holding a unit of X for the remainder of the experiment. That is, for each unit of X you hold in your inventory for the remainder of the experiment, you receive on average the amount listed in column 5. The number in Average Holding Value is calculated by multiplying the Number of Remaining Dividend Payments with the Average Dividend Payment per Period.

Please have a look at the table now and make sure you understand it. The following example may help in your understanding.

Suppose for example that there are 7 periods remaining. Since the dividend paid on a unit of X 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 unit of X. If you hold a unit of X for 7 periods, the total dividend paid on the unit over the 7 periods is on average 7*24 = 168.

4. Market and Trading Rules

At the beginning of the experiment, you will have an initial inventory of 10 units of X and 10000 francs. The experiment will consist of 15 periods. In each period, each participant will have an opportunity to place offers to sell OR buy units of X.

At the beginning of each period, you will be asked to forecast the final trading price for a unit of X in that period. The median of all the participants' forecasted prices will be used to determine the initial price for that period. You will be paid for the accuracy of your forecasts as discussed in section 5.

To place an offer to buy or sell units of X at this announced price level, enter how many units of X you would like to buy or sell at this announced price level and select the OK button on your screen. Your offer to sell is limited by your inventory of X, and your offer to buy is limited by (1) a maximum of 10 units each periods, and (2) your cash holdings and the maximum price of X you are willing to pay. An example of the bidding screen is provided below.

If the total number of units that participants offer to buy is greater than the total number of units that participants offer to sell, then the program increases the announced price level and each participant may then make offers to buy or sell at this higher price level.

If the total number of units that participants offer to buy is less than the total number of units that participants offer to sell, then the program decreases the announced price level and each participant may then make offers to buy or sell at this lower price level.

If the total number of units that participants offer to buy equals the total number of units that participants offer to sell, then the period is over and the offers placed by each participant at this price level are transacted.

Manual Conclusion of Period:

If the total number of units that participants offer to buy is not equal to the total number of units that participants offer to sell, and *1* or *2* below are satisfied, we will conclude the period manually.

1. The difference between the total number of units the participants offer to sell and to buy is less than or equal to 2.

2. The price remains strictly in a region of three francs for three price iterations in a row (for example, if the price went from 100, to 101, to 100 then back to 102).

The Manual Conclusion of Period process is as follows: the computer will show a screen announcing the manual conclusion of a period.

You will have the opportunity to change your current bids to buy or sell at the current market price. More specifically, you may amend the quantity that you are willing to buy or sell by one unit at a time until EITHER (1) the amount people are willing to buy equals the amount traders are willing to sell OR (2) 20 seconds has expired. If the total amount offered to sell does not equal the total amount offered to buy at the end of 20 seconds, then the difference will be randomly allocated.

5. Transaction Price Forecast:

In addition to the money you earn from dividends and trading, you can make money by accurately forecasting the trading price for that period. At the beginning of each period, you will be asked to submit a price that forecasts the actual transaction price for each unit of X in that period.

The money you receive from your forecast will be calculated in the following manner

Accuracy	*Your earnings*
Within 10% of actual price	50 francs
Within 25% of actual price	20 francs
Within 50% of actual price	10 francs

The money earned from each period's forecast will not be added to your Cash on Hand, but rather added up each period and paid to your separately at the end of the experiment.

6. Calculating your earnings

END OF PERIOD CASH = BEGINNING OF PERIOD CASH
+ DIVIDEND PER UNIT
x NUMBER OF UNITS HELD AT THE END OF PERIOD
+ SALES
- EXPENDITURES ON PURCHASES

PERIOD EARNINGS = END OF PERIOD CASH – BEGINNING OF PERIOD CASH

Subsequent periods should be recorded similarly. Your earnings for this experiment are given by the cash on hand at the end of period 15.

Example of period earnings. Suppose that in period 10 your BEGINNING OF PERIOD CASH is 3,000 francs and your INVENTORY at the beginning of period 10 is 7 units of X. If in period 10 you sell 2 units of X at a price of 200 francs and the dividend draw is 8 francs, then in period 10:

SALES= 2*200=400

INVENTORY (at the end of period 10) = 7- 2 = 5

PERIOD DIVIDEND EARNINGS = DIVIDEND PER UNIT * NUMBER OF UNITS IN INVENTORY = 8 * 5 = 40.

END OF PERIOD CASH = 3,000 +40+ 2*200 = 3,440

PERIOD EARNINGS = END OF PERIOD CASH – BEGINNING OF PERIOD CASH = 3,440 – 3,000 = 440.

7. Recording your earnings

On your **PERIOD EARNINGS SHEET** please record the following information from the summary screen. At the beginning of period 1, record your cash on hand at the beginning of the period in column 2 in the row marked period 1. In column 3, record your earnings from sales minus expenditures from purchases for the period. Record your closing X on hand at the end of the period in column 4 in the row marked period 1. Fill in the dividend of each unit in column 5. Record your dividend earnings for the period in column 6. In column 7, record your cash on hand at the end of the period. Record your cash on hand at the beginning of the period in column 8. Your earnings in each period equal the difference in your cash on hand at the end of the period minus the cash on hand at the beginning of the period. Record your period earnings in column 9. Repeat this procedure to obtain the period earnings of all periods.

8. Quiz

Question 1: Suppose that you purchase a unit of X in period 5.

a. What is the average dividend payment on the unit of X for period 5? _____
b. If you hold that unit of X till the end of the experiment (11 periods including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (11 periods including the current period)? _____

Question 2: Suppose that you purchase a unit of X in period 15.

a. What is the average dividend payment on the unit of X for period 15? _____
b. If you hold that unit of X till the end of the experiment (1 period including the current period), what is the average total dividend paid on the unit of X? _____
c. What is the maximum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____
d. What is the minimum possible dividend paid on the unit of X till the end of the experiment (1 period including the current period)? _____

Question 3: At the beginning of each period, the initial price will be the median of all participants' submitted prices.

a. If, at the announced price, the total number of units that participants offer to buy is greater than the total number of units that participants offer to sell, then will the program increase or decrease the announced price level? _____

b. If, at the announced price, the total number of units that participants offer to buy is less than the total number of units that participants offer to sell, then will the program increase or decrease the announced price level? _____

Question 4: What is the value of the asset after the final dividend payment in period 15? _____

Question 5: What is the median of the following sequence of numbers

a. 3, 6, 8, 12? _____

b. 3, 6, 8, 12, 25? _____

AVERAGE HOLDING VALUE TABLE

Ending Period	Current period	Number of Remaining Dividend Payments	*	Average Dividend Value Per Period	=	Average Holding Value Per Unit of Inventory
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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

ID#:_____

PERIOD EARNINGS SHEET

(1) PERIOD	(2) BEGINNING CASH	(3) +SALES -PURCHASES	(4) CLOSING X ON HAND	(5) DIVIDEND PER UNIT	(6) PERIOD DIVIDEND EARNINGS	(7) END CASH	(8) BEGINNING CASH	(9) PERIOD EARNINGS
1	10000						10000	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Instructions Summary

- The experiment will consist of 15 trading periods in which you will have the opportunity to buy and sell in a market.

- The currency used in the market is francs. All trading and earnings will be in terms of francs. Your francs will be converted into dollars at the rate

  360 francs = 1 NZ dollar.

  The more francs you earn, the more dollars you earn.

- In each period, you may buy and sell units of a good called X in a market. Each unit of X in your inventory at the end of each trading period pays a dividend to you. The dividend paid on each unit is the same for every participant.

- The dividend in each period has an equally likely chance of being 0, 8, 28, or 60. The average dividend per period for each unit of X is 24 francs. The dividend draws in each period are independent. That means that the likelihood of a particular dividend in a period is not affected by the dividend in previous periods.

- At the beginning of the experiment, you will be given 10,000 francs in your Cash inventory and 10 units of X. Your earnings for the entire experiment are equal to your Cash inventory at the end of period 15.
  All dividends you receive are added to your Cash inventory. All money spent on purchases is subtracted from your Cash inventory. All money received from sales is added to your Cash inventory.

- Example on how to read Average Holding Value Table.

Suppose for example that there are 7 periods remaining. Since the dividend paid on a unit of X 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 unit of X. If you hold a unit of X for 7 periods, the total dividend paid on the unit over the 7 periods is on average 7*24 = 168.

- Market and Trading Rules

- Your offers to sell are limited by your inventory of X. Your offers to buy are limited by (1) a maximum of 10 units each period, and (2) your cash holdings and the maximum price of X you are willing to pay.

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Quiz

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Question 2: Suppose that you purchase a unit of X in period 15.

a. What is the average dividend payment on the unit of X for period 15? _____
b. If you hold that unit of X till the end of the experiment (1 period including the current period), what is the average total dividend paid on the unit of X? _____
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Question 4: What is the value of the asset after the final dividend payment in period 15? _____

Question 5: What is the median of the following sequence of numbers

a. 3, 6, 8, 12? _____

b. 3, 6, 8, 12, 25? _____

AVERAGE HOLDING VALUE TABLE

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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

PERIOD EARNINGS SHEET

(1) PERIOD	(2) BEGINNING CASH	(3) SALES/ PURCHASES	(4) CLOSING X ON HAND	(5) DIVIDEND PER UNIT	(6) PERIOD DIVIDEND EARNINGS	(7) END CASH	(8) BEGINNING CASH	(9) PERIOD EARNINGS
1	10,000						10,000	
2								
3								
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