

Online Appendix to “Regulation and the Demand for Credit Default Swaps in Experimental Bond Markets”

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A Experimental Instructions for the Regulated Treatment

We reproduce here the full instructions in the regulated treatment *REG*. Differences in instructions between the treatments are discussed in Section C.

Instructions

Welcome to this experiment! Please read these instructions carefully as they explain how you earn money from the decisions that you make. You will be paid privately at the end, after all participants have finished the experiment. On your desk you will find a calculator and scratch paper, which you can use during the experiment.

During the experiment you are not allowed to use your mobile phone or other electronic devices. You are also not allowed to communicate with other participants. If you have a question at any time, please raise your hand and someone will come to your desk.

The experiment consists of four identical rounds. Each round consists of 11 periods, numbered from 0 to 10. Your earnings for each of the four rounds will be in points. **At the end, only your earnings from one randomly chosen round will be paid out to you!** The points from the chosen round will be exchanged into euros at the exchange rate **1000 points = 1 euro**. In addition you will receive a show-up fee of 7 euros.

All participants will be randomly divided into groups of 6 people. The group composition will not change during the experiment. You will not know the identity of any group member nor will they know your identity even after the experiment is over. The following describes what you will be doing in each of the four rounds.

Market Setting

You will start the round with an endowment of 20 650 points (your “cash”). During most of the experiment, you will be given an opportunity to trade assets with the other participants in your group (there are two types of assets, assets of type A and assets of type B). In total there are 25 assets of type A and 12 assets of type B. In each period, there will first be a market in which asset A can be traded and after a market in which asset B can be traded.

Holding assets can give you earnings in a way that will be explained below.

If you want to buy some of these assets you can enter the number of assets you want to buy (bid for) at a certain price using the computer interface. You can state as many different bid prices and quantities as you like.

Example (the numbers here provide no indication of what you should enter in the experiment): Imagine that you would like to buy 12 assets if the price per asset is at most 356 points, 7 assets if the price is larger than 356 but no more than 688 points, and only 2 assets if the price is larger than 688 points but no more than 911.5 points. To indicate this, you can enter numbers into the computer interface as follows (if you wanted to enter more numbers you could click on the “show more fields” button):

[Figure A.1 appears here in the experimental instructions.]

If the market price turns out to be 600 points, you will then receive 7 assets for 600 points each (thus NOT 2 plus 7, i.e. the quantities that you enter are for the total number you want to buy at a certain price).

I would like to buy this quantity	if the price (per asset) is at most
<input type="text" value="12"/>	<input type="text" value="356"/>
<input type="text" value="7"/>	<input type="text" value="688"/>
<input type="text" value="2"/>	<input type="text" value="911.5"/>

Figure A.1: Input fields of the computer interface. [Not labeled in the instructions.]

If you want to sell assets you previously bought, you can do something similar. You can enter the number of assets that you want to sell (offer quantity) and the offer price that you would like to receive for those units (the interface will be almost identical to the buying example above). You can again enter multiple combinations of quantities and prices.

The bids and offers that you can enter into the computer interface are restricted as follows:

- You can only enter positive integer number as quantities.
- You can only enter positive numbers as prices (if you want to enter a decimal, use a point and not a comma).
- You cannot try to sell more assets than you have at that moment. Similarly, you cannot try to buy more assets than there are available (which is 25 minus the number of assets you have for assets of type A and 12 minus the number of assets you have for assets of type B).
- You cannot enter bids that you would not be able to pay for (with the amount of cash you have).
- You cannot enter multiple bids to buy assets with the same quantity or the same price.
- Similarly you cannot enter multiple offers to sell assets with the same quantity or the same price.

- You cannot try to buy more assets for a higher price than you would want to buy for a lower price (i.e., if you enter for example the quantity 20 with the price 1850, you cannot enter the quantity 10 with the price 1480 in the fields for your bids to buy assets).
- Similarly you cannot try to sell more assets at a lower price than you would sell at a higher price.
- Finally, all of your sell offers must be at a higher price than your bids to buy (i.e. you cannot sell to yourself).

Market Price and Actual Trades

The market price in each period is determined by supply and demand. This means that the price will be chosen that makes the most trades possible. All trades are then carried out at this single market price, which is centrally determined for your group in each period.

Explanation: Imagine you enter that you would like to buy 6 assets if the price is at most 1500 points and one other participant enters that she would like to buy 9 assets if the price is at most 1500. Imagine further that nobody else in the market enters a buying bid at 1500 points or a higher price. This means that *all participants of the market together* would like to buy 15 assets if the price is at most 1500 points per asset. The aggregation of the buy orders can be done for all prices and yields the market demand schedule. This demand schedule contains the information of all buy orders for *all participants of the market together* and can be represented by a step function as below. On the horizontal axis you can see the total quantity demanded for each price on the vertical axis (this is a very simple example and the quantities and numbers provide no indication of what you should enter in the experiment). In the graph of this simple example you can see that all participants of the market together are willing to buy up to 75 assets at a price of 500 points per asset, only 50 assets at a price of 1000 points per asset, and only 15 assets at a price of 1500 points per asset.

[Figure A.2 appears here in the experimental instructions.]

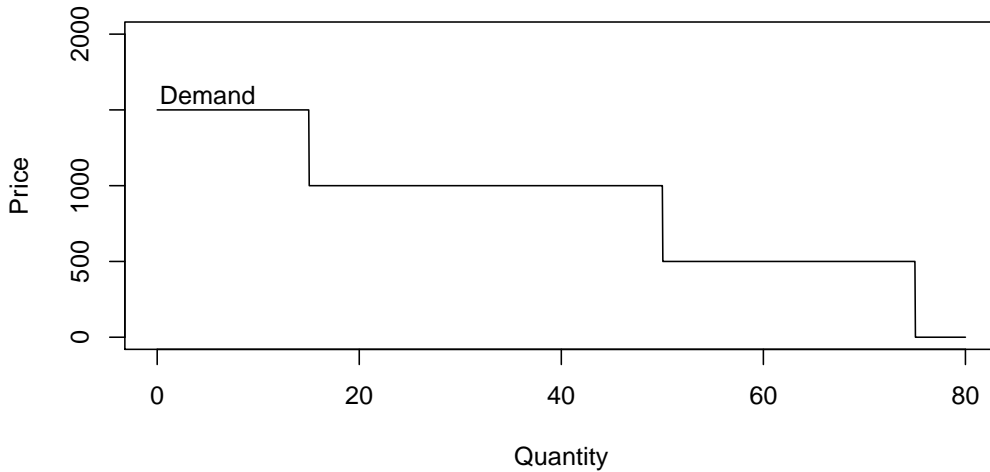


Figure A.2: Demand schedule. [Not labeled in the instructions.]

A similar schedule can be derived for the supply side of the market, aggregating all the sell offers. When drawn in the same graph, the supply schedule is an increasing step function.

[Figure A.3 appears here in the experimental instructions.]

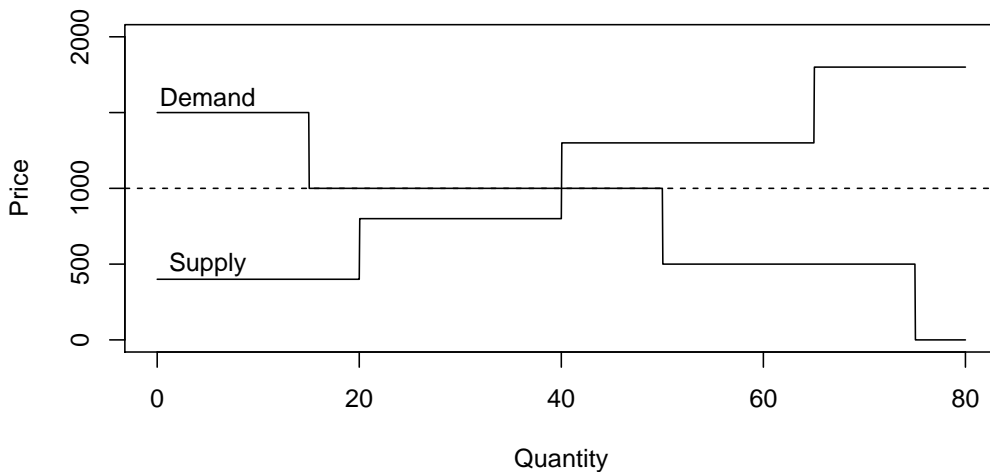


Figure A.3: Demand and supply schedules. [Not labeled in the instructions.]

The market price is the price at which the two curves intersect (in this example 1000). Note that at this price, 10 more assets are demanded than supplied (50 assets are demanded

while only 40 are supplied). In this case a random selection of 10 bids *from all the bids at the market price* would not be fulfilled (it is similarly possible that there is more supply at the market price than demand).

In some rare cases there can also be a whole interval of prices at which most trades can be carried out and the demand and supply schedule overlap vertically. In such cases the middle of the interval will be the market price. If no bids or offers are made at all or if all bids to buy are at lower prices than all offers to sell there will be no trade and also no market price.

You will always be told the market price after the trading. You will not be told the total number of trades in the market (except if there are none).

Properties of Asset A

There will be no trading in period 10. If you hold assets of type A in period 10, you will receive 1000 points for each asset, provided that the assets have not defaulted (more on this below).

In each of the periods 1-10 you receive interest payments on your asset A holdings (if they have not defaulted). The interest payment per asset is 12% of the final value (1000 points), which means that you will receive 120 points for each asset A you hold in a period. These earnings will be paid to a separate account – they are part of your earnings for the round, but you cannot use those points to buy more assets.

Asset A has a special property. There is a constant possibility of “default”. At the beginning of each period (from period 1 on to period 10) it is determined whether a default occurs or not. How this probability of default is determined will be explained shortly. If a default occurs, all assets will become completely (!) worthless for all periods remaining in the round. This means that from the period of default onward there will be no interest payments and there will be no payoff of 1000 points per asset after period 10.

Period 0 Trading of Asset A and Probability of Default

The first period of each round is a special period (period 0). In this period, none of the participants holds any of the 25 assets of type A. You can try to buy them as in the regular periods 1,2,...,9, but instead of buying them from other participants you will buy them directly from the experimenter. The computer interface is similar to the computer interface in the regular periods (i.e. you can enter the number of assets you want to buy at a certain price). The experimenter only sells assets in period 0 and does not interfere with the market thereafter. The experimenter will sell all assets in this period, for the highest unique price at which all of them can be sold (if there is not enough demand to sell all assets even at a minimal price, the experimenter will sell as many assets as are demanded).

The outcome of this period 0 is important not only because it distributes the type A assets amongst the participants in the group. It also determines the probability that these assets default in each of the other periods. The higher the market price is in period 0, the lower is the probability that there will be a default (this probability is determined in period 0 and stays constant once period 0 is over). The following graph shows you the exact relationship between period 0 price and default probability. On the horizontal axis you can see possible period 0 prices and on the vertical axis you can see the default probability that would result from each price.

[Figure [A.4](#) appears here in the experimental instructions.]

The following short table gives you some period 0 prices and the corresponding default probabilities.

[Table [A.1](#) appears here in the experimental instructions.]

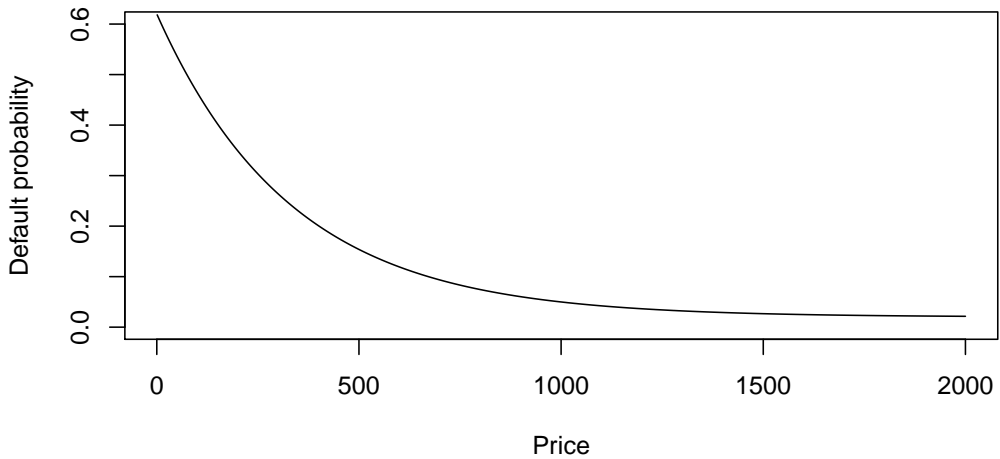


Figure A.4: Default probability function. [Not labeled in the instructions.]

Table A.1: Values Default Probability Function. [Not labeled in the instructions.]

Price	1	100	200	400	600	800	1000	1500	2000	3000	5000
Prob.	0.618	0.464	0.349	0.201	0.119	0.074	0.050	0.027	0.021	0.020	0.020

At the beginning of each of the regular periods, the computer program determines whether or not there is a default *for the whole market* using the default probability determined by the price in period 0.

Properties of Asset B

In the beginning of a round, each participant has 2 assets of type B. Type B assets are traded in the same way as assets A, but for type B assets period 0 does not play a special role (type B assets are traded in period 0 in the same way as in any of the periods 1,...,9).

Type B assets do not pay any interest and they are not exchanged for points in period 10. However, they become valuable if there is a default of type A assets. If you have type A assets when a default makes them worthless, type B assets you possess may give you points. You will receive 1000 points for each type B asset as long as you hold more type A assets than type B assets or an equal number of both types. If you have more type B assets than type A assets at the time of default you will receive 1000 points times the number of type A assets. You will receive nothing for the remaining type B assets. For example,

assume that at the time of default, you hold 4 assets of type A. If you have 2 assets of type B you will receive 2000 points. If you hold 4 assets of type B you will receive 4000 points and if you hold 6 assets of type B you will also receive 4000 points.

There is a special rule for buying type B assets. In any period, you may not buy so many type B assets that you would have more of them than of type A assets. If you have for example 8 assets of type A and 4 assets of type B at a certain point, you can try to buy at most 4 type B assets. This does not mean that you cannot end up having more type B assets than type A assets – you may for example have equally many type A and type B assets at some point and then decide to sell type A assets, which would leave you with more type B assets than type A assets. However, as explained before, the type B assets in excess of type A assets will not pay you 1000 points in case of default of type A.

Information on Defaults

Although it will be determined at the beginning of each period whether there is a default in this period or not, we will not tell you whether or not a default has occurred! You will always continue the experiment as if no default has ever occurred – only after each 11 period round we will tell you if there was a default or not and if so, in which period the (earliest) default occurred. Your earnings for that round are then determined as of the period the default occurred (your earnings are your cash holdings and the points earned in your interest account at the time of default, plus the earnings from your type B assets – your type A assets at the time of default do not affect your earnings in any way). This means that any action you took after the default occurred does not affect your earnings (but when you take the decisions you don't know whether a default had previously occurred).

Summary of the Information

- 4 identical rounds
- 10 regular periods per round

- 20 650 points cash to buy assets per round
- Period 0 is special and the price of type A assets determines the default probability.
- If there is a default all type A assets become completely worthless. Earnings are then based on interest paid before the default, cash holdings at the time of default, and earnings from type B assets.
- If there is a default, you receive 1000 points for each type B asset you have at the time of default if you have at least as many type A assets as type B assets. If you have more type B assets than type A assets you will receive 1000 points times the number of type A assets you have.
- Each type A asset pays 120 points interest per period (if the asset is not in default).
- Points earned on type A assets in the interest account cannot be used to buy assets.
- If there is no default, then in period 10 each type A asset is exchanged for 1000 points. Type B assets are not exchanged for points in period 10.
- You cannot buy so many type B assets that you would have more of them than of type A assets.
- We don't tell you during a round if there is a default, you always continue as if there is none. However, the default is used to determine your round earnings.

B Comprehension Test Questions in the Regulated Treatment

We reproduce here the test questions in treatment *REG*, with check marks added to indicate correct answers. Differences in test questions between the treatments are discussed in Section C. Note that subjects had to answer all questions on a given screen correctly to proceed to the next screen. If they did not answer all questions correctly and tried to proceed to the next screen, they received the following error message: “You did not answer all questions correctly. Take another look at the instructions or raise your hand if you need help.”

B.1 Screen 1

In period 0, the experimenter tries to sell all 25 type A assets. Imagine that all of the other 5 participants in your market enter only one bid each and that all of their bids are equal, specifying a quantity of 2 and a price of 1500. Imagine that you enter the following three bids:

Quantity 4 and Price 2000,

Quantity 8 and Price 900,

Quantity 25 and Price 50.

What will be outcomes of this?

- (a) All others receive 2 type A assets each and pay a price of 1500 points per asset. You receive 15 type A assets, some for a higher price than 1500 points, some for a lower price.
- (b) All others receive 2 type A assets each and you receive 15 type A assets. Everyone pays 50 points per asset. ✓

- (c) All others receive 2 type A assets each and you receive type A 4 assets. Everyone pays 1500 points per asset.
- (d) All others receive 2 type A assets each and you receive 25 type A assets. Everyone pays 50 points per asset.

In period 0 in the market for asset A, imagine that 4 of the other 5 participants in your market enter only one bid each and that all of their bids are equal, specifying a quantity of 5 and a price of 800. The fifth other participant and you both enter a quantity of 10 and a price of 600. What will be outcomes of this?

- (a) The market price will be 600. The 4 participants that entered the same bids receive 5 type A assets each, you and the person entering the same bid as you will receive 5 type A assets each.
- (b) The market price will be 800. The 4 participants that entered the same bids receive 5 type A assets each, you and the person entering the same bid as you will receive 5 type A assets each.
- (c) The market price will be 600. The 4 participants that entered the same bids receive 5 type A assets each, you and the person entering the same bid as you will receive 5 type A assets *together* (who receives how many exactly will be determined randomly).
✓
- (d) The market price will be 800. The 4 participants that entered the same bids receive 5 type A assets each, you and the person entering the same bid as you will receive 5 type A assets *together* (who receives how many exactly will be determined randomly).

Imagine that you want to buy 25 assets in total if the price is at most 204 points per asset. If the price is larger than 204 points but at most 788 points you want to buy 13 assets in total. If the price is larger than 788 points but at most 1800.5 points you want to buy 8 assets. What do you enter into the corresponding part of the computer interface?

- (a) Quantity: 25, Price 204, Quantity 13, Price 788, and Quantity 8, Price 1800.5. ✓

(b) Quantity: 8, Price 1800.5, Quantity 5, Price 788, and Quantity 12, Price 204.

B.2 Screen 2

In periods 1 to 9 you can trade the asset with the other members of your group. You can enter bids to buy assets and offers to sell assets. Imagine that you consider both, buying and selling assets of one type. Which of the following is correct?

- (a) You cannot try to buy assets at a higher price than the lowest price at which you are willing to sell assets of the same type. ✓
- (b) You can try to bid for as many assets as you like at any price. If the market price turns out to be high, your cash holdings may become negative.
- (c) You can make sell offers for the same quantity at different prices.

In the very beginning of each period from period 1 to 10 it will be determined whether there is a default. If there is a default, what happens to the assets of type A?

- (a) The assets will not pay any interest anymore for the remaining periods of this round. In the last period they will nevertheless be exchanged into 1000 points per asset.
- (b) The asset will not pay any interest anymore for the remaining periods of the round and participants will not receive any points for the assets in the last period. ✓

The default probability depends on the market price of asset A in period 0. Which of the following is NOT correct?

- (a) After period 0 has ended, the probability that there is a default is fixed for the rest of the round.
- (b) You can see in the corresponding graph in the instructions how the price in period 0 determines the probability of default.
- (c) When a new round starts, the default probability in the round before does not matter anymore for the new round.

(d) The default probability for each period is determined in the period before. ✓

Imagine that in period 6 you hold 7 type A assets. Other members of your group each offer to sell 3 units at a price of 1100 and ask to buy 6 units at a price of 1000. You offer to sell 7 units at a price of 1151 and ask to buy 6 units at a price of 1149. What trades are you involved in, in period 6?

- (a) You sell 7 units at a price of 1151.
- (b) You sell 7 units at a price of 1149.
- (c) You sell 7 units at a price of 1100.
- (d) You sell 7 units at a price of 1000.
- (e) You buy 6 units at a price of 1000.
- (f) You buy 6 units at a price of 1100. ✓
- (g) You buy 6 units at a price of 1149.
- (h) You buy 6 units at a price of 1151.

B.3 Screen 3

If you hold type A assets at some point you may receive interest payments. Which of the following is correct?

- (a) You can use the money from your interest account to buy assets in later periods.
- (b) For each type A asset you are holding in a period you receive an interest payment of 120 points (if there has been no default before). ✓
- (c) A type A asset only pays interest in the period right after you bought it, even if you hold it for multiple periods.

There are rounds and periods in this experiment. Which of the following is correct?

- (a) There are 4 rounds in the experiment (each consisting of 10 regular periods and period 0). When you start a new round you have 20650 points in cash, 0 points in your interest account, no assets of type A, and 2 assets of type B. ✓

- (b) In each of the regular periods you have 20650 points of cash to buy assets with.
- (c) Type A assets only last for one period, once the interest of a type A asset has been paid the asset always loses its value.

In each period there is the possibility of a default that makes all type A assets completely worthless. What happens when such a default occurs?

- (a) You will immediately be informed that the default occurs, your earnings are determined and your group will continue straight with the next round.
- (b) You will only be informed after the end of the round that this default occurred. Without you knowing it, the further actions you take during the rest of the round will no longer influence your earnings of the round. ✓

B.4 Screen 4

If there is a default, you can earn points with the type B assets you have. Which of the following is correct?

- (a) For each type B asset you have at the time of default you receive 1000 points – but only if you have at least as many type A assets as type B assets, otherwise you receive less. ✓
- (b) You will only be informed at the end of a round if a default occurred before. The number of type B assets you have after period 10 determine your earnings if a default occurs, also if this default occurs in an earlier period.
- (c) You receive interest for each period that you have held a type B asset before the default occurs.
- (d) You cannot earn points with type B assets if a default occurs. If no default occurs, each type B asset is exchanged for 1000 points at the end of the round.

You can trade with type B assets. Which of the following is correct?

- (a) As in the case of trade with type A assets, also the price of type B assets in period 0 determines the probability of default of the assets.
- (b) Each participant has 2 type B assets in the beginning of each round. Type B assets are traded in period 0 exactly in the same way as in periods 1,...,9. ✓
- (c) In each period, type B assets are traded before type A assets.

There are some restrictions on buying and selling assets. Which of the following is NOT correct?

- (a) You cannot try to buy more assets than there are (at most 25 assets of type A and 12 assets of type B).
- (b) You cannot try to sell more assets than you have.
- (c) You cannot have more assets of type B than of type A. ✓
- (d) You cannot try to buy so many assets of type B that you would have more of them than of type A assets.

Assume that a default occurs in period 5. In that period, you hold 5 assets of type A and 8 assets of type B. In period 10 you hold 9 assets of type A and 9 assets of type B. How much will you receive for your type B assets in this round altogether?

- (a) 0 points
- (b) 1000 points
- (c) 5000 points ✓
- (d) 8000 points
- (e) 9000 points

C Differences in Instructions and Test Questions between Treatments

Instructions and test questions are very similar between treatments. Below, the differences between treatments *REG* and *FREE* are detailed. The full instructions and test questions of the control treatment can be found in the online appendix to [Weber et al. \(2018\)](#). In short, the instructions in the control treatment are very similar to the ones reproduced here, without any mention of asset B (and referring to asset A just as the asset).

C.1 Differences in Instructions

The instructions in the unregulated treatment *FREE* are very similar to the reproduced instructions in the regulated treatment *REG*. Only the explanations about the regulations concerning type B assets are left out. To be precise, the instructions are different in the following points:

- The second paragraph under the heading “Properties of Asset B” reads “Type B assets do not pay any interest and they are not exchanged for points in period 10. However, they become valuable if there is a default of type A assets. If there is a default, which makes type A assets worthless, you will receive 1000 points for each type B asset at the time of default.”
- The third paragraph under the heading “Properties of Asset B” in the regulated treatment is removed in the unregulated treatment.
- The sixth bullet point in the summary reads “If there is a default, you receive 1000 points for each type B asset you have at the time of default.”
- The second to last bullet point in the regulated treatment is removed in the unregulated treatment.

C.2 Differences in the Comprehension Test Questions

The first three screens of test questions are identical in both treatments. Screen 4 is as follows in the unregulated treatment:

If there is a default, you can earn points with the type B assets you have. Which of the following is correct?

- (a) For each type B asset you have at the time of default you receive 1000 points. ✓
- (b) You will only be informed at the end of a round if a default occurred before. The number of type B assets you have after period 10 determine your earnings if a default occurs, also if this default occurs in an earlier period.
- (c) You receive interest for each period that you have held a type B asset before the default occurs.
- (d) You cannot earn points with type B assets if a default occurs. If no default occurs, each type B asset is exchanged for 1000 points at the end of the round.

You can trade with type B assets. Which of the following is correct?

- (a) As in the case of trade with type A assets, also the price of type B assets in period 0 determines the probability of default of the assets.
- (b) Each participant has 2 type B assets in the beginning of each round. Type B assets are traded in period 0 exactly in the same way as in periods 1,...,9. ✓
- (c) In each period, type B assets are traded before type A assets.

There are some restrictions on buying and selling assets. Which of the following is NOT correct?

- (a) You cannot try to buy more assets than there are (at most 25 assets of type A and 12 assets of type B).
- (b) You cannot try to sell more assets than you have.
- (c) You cannot have more assets of type B than of type A. ✓

Assume that a default occurs in period 5. In that period, you hold 5 assets of type A and 8 assets of type B. In period 10 you hold 9 assets of type A and 9 assets of type B. How much will you receive for your type B assets in this round altogether?

- (a) 0 points
- (b) 5000 points
- (c) 8000 points ✓
- (d) 9000 points

D Graphs of Prices in all Markets

Figures D.1 to D.7 show the market prices in all rounds and periods for all groups. Each row corresponds to one group, starting with the first round on the left and ending with the fourth round on the right. Market prices in the bond markets are shown with red circles. Red crosses show the mean of the highest bid and the lowest offer price when no trade is carried out in the bond market, but when both bids and offers are present. The equilibrium fundamental value is drawn with a solid black line. Furthermore, the actual (endogenous) fundamental value within a round is drawn with a dotted blue line (this value depends on the price in the IPO and is different across groups and rounds).

In the CDS market, market prices are shown with dark green diamonds. Dark green pluses show the mean of the highest bid and the lowest offer price when no trade is carried out, but when both bids and offers are present. The equilibrium and the actual (i.e., endogenous) fundamental value (the latter depending on the IPO price in the bond market) are drawn with a solid brown line and a dotted violet line.

As there is no more trade in the tenth period, periods only reach from 0 to 9. In the bond market, period 0 is the IPO. In the CDS market, period 0 is just a regular trading period. The fourth round of group 8 in *FREE* does not show prices for most periods (in bond and CDS markets) due to the software failure described in Footnote 18 in the main text. Figures D.6 and D.7 show the bond market prices from the control treatments (from [Weber et al., 2018](#)), in which no CDS exist.

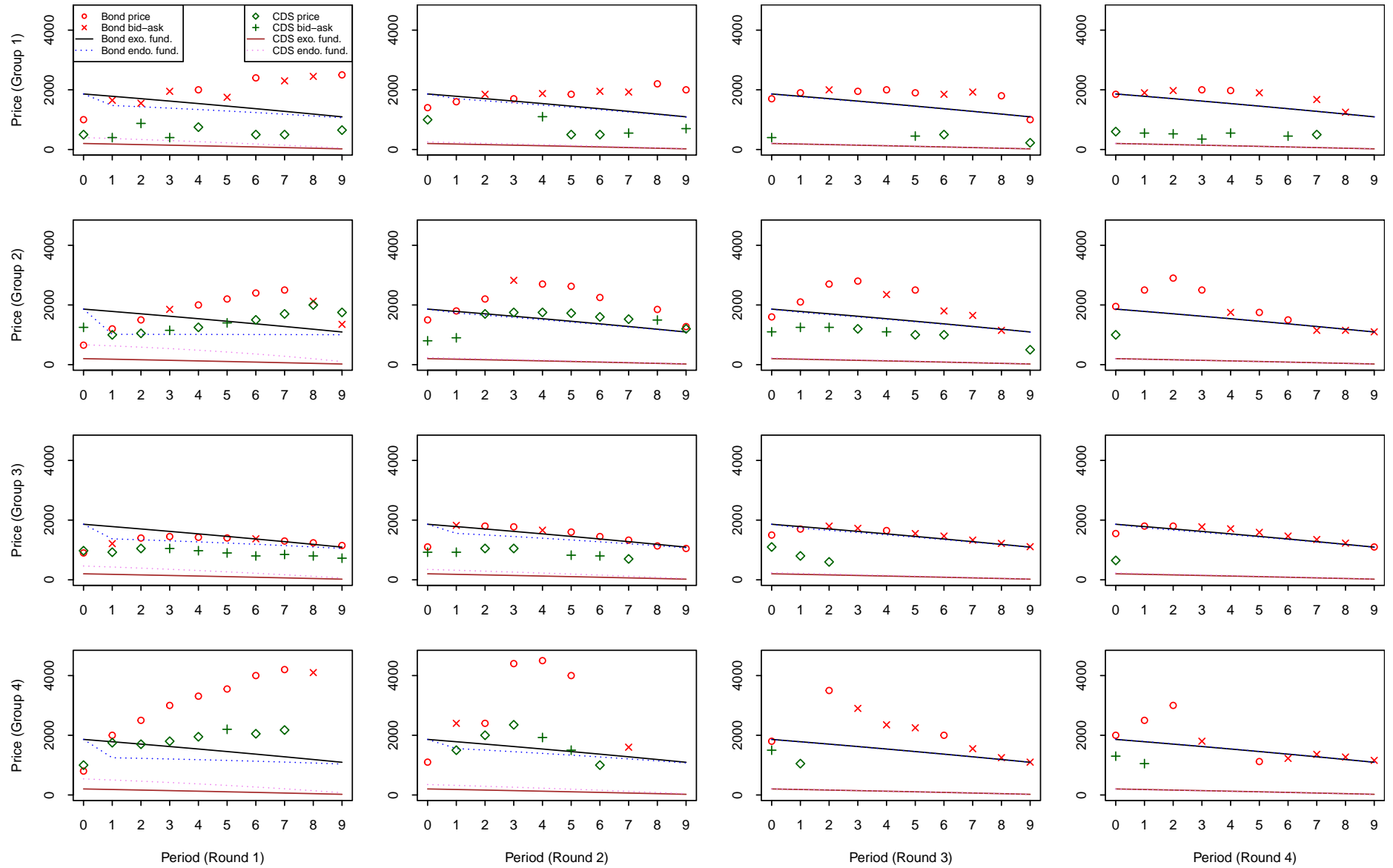


Figure D.1: Bond and CDS Market Prices in all Periods and Rounds, Groups 1 to 4, Treatment *REG*

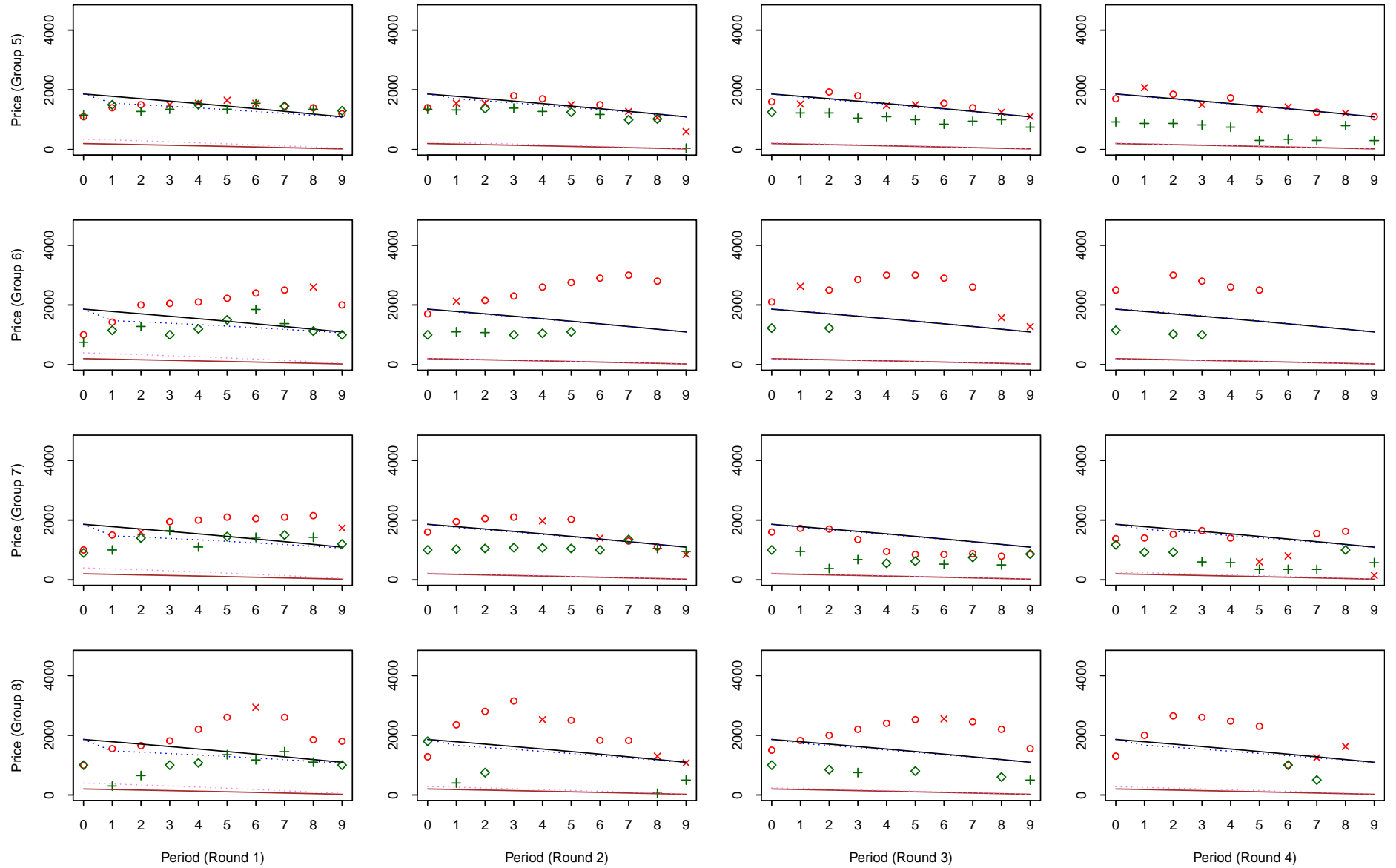


Figure D.2: Bond and CDS Market Prices in all Periods and Rounds, Groups 5 to 8, Treatment *REG*

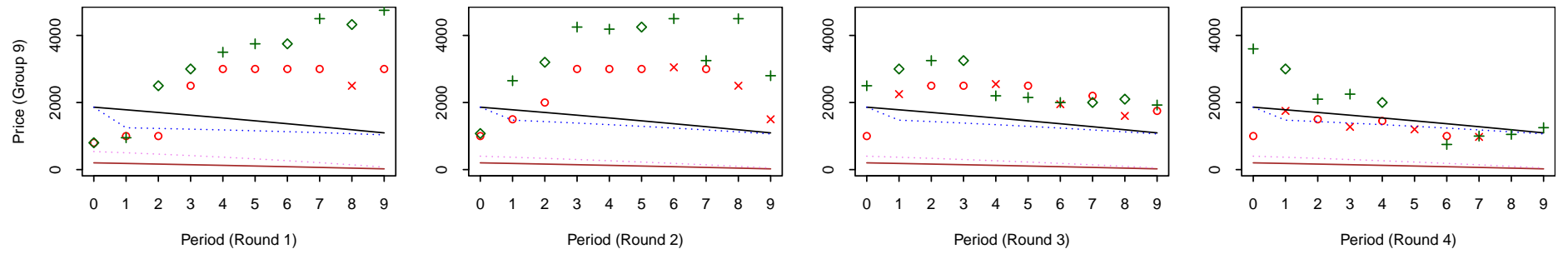


Figure D.3: Bond and CDS Market Prices in all Periods and Rounds, Group 9, Treatment *REG*

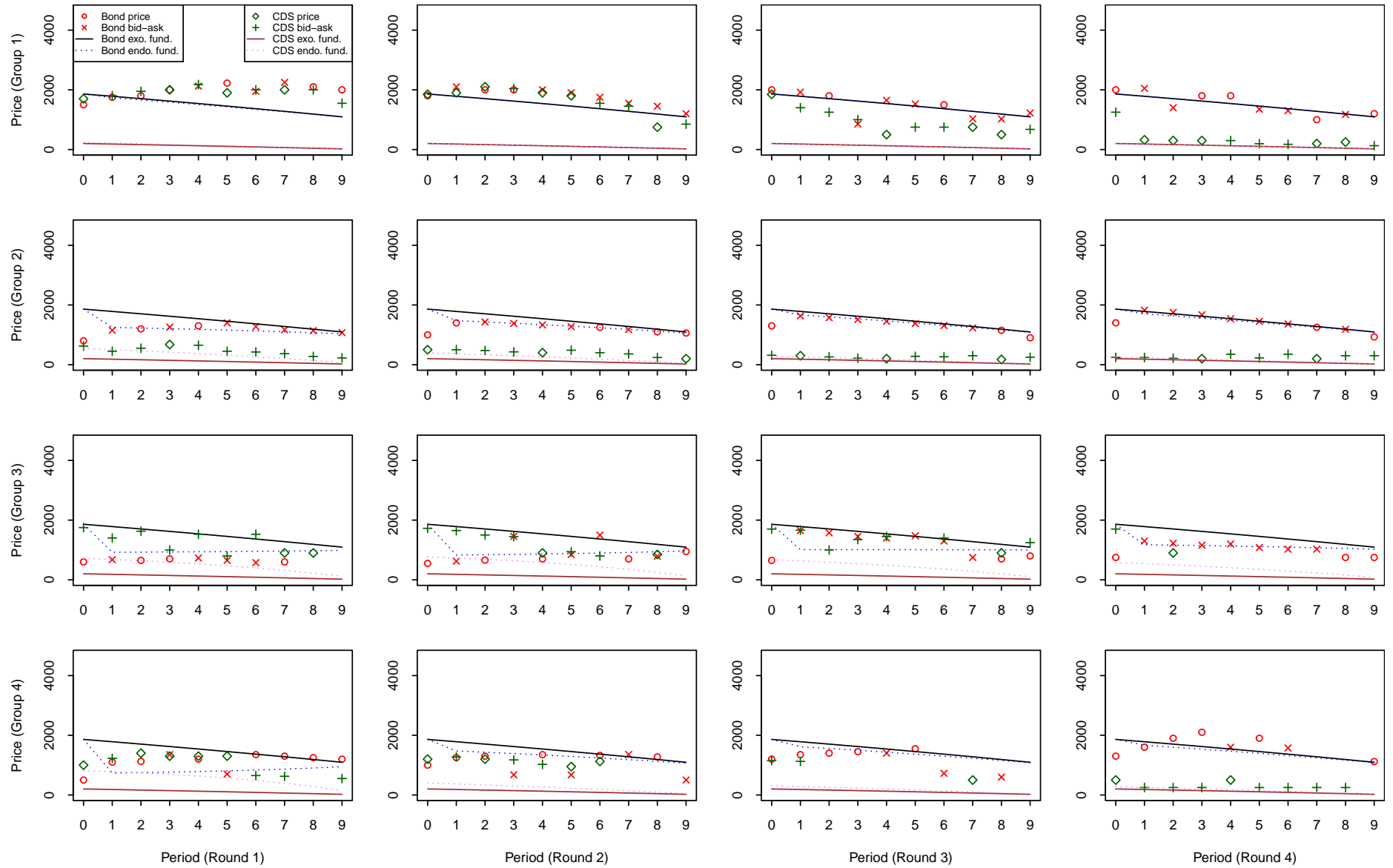


Figure D.4: Bond and CDS Market Prices in all Periods and Rounds, Groups 1 to 4, Treatment *FREE*

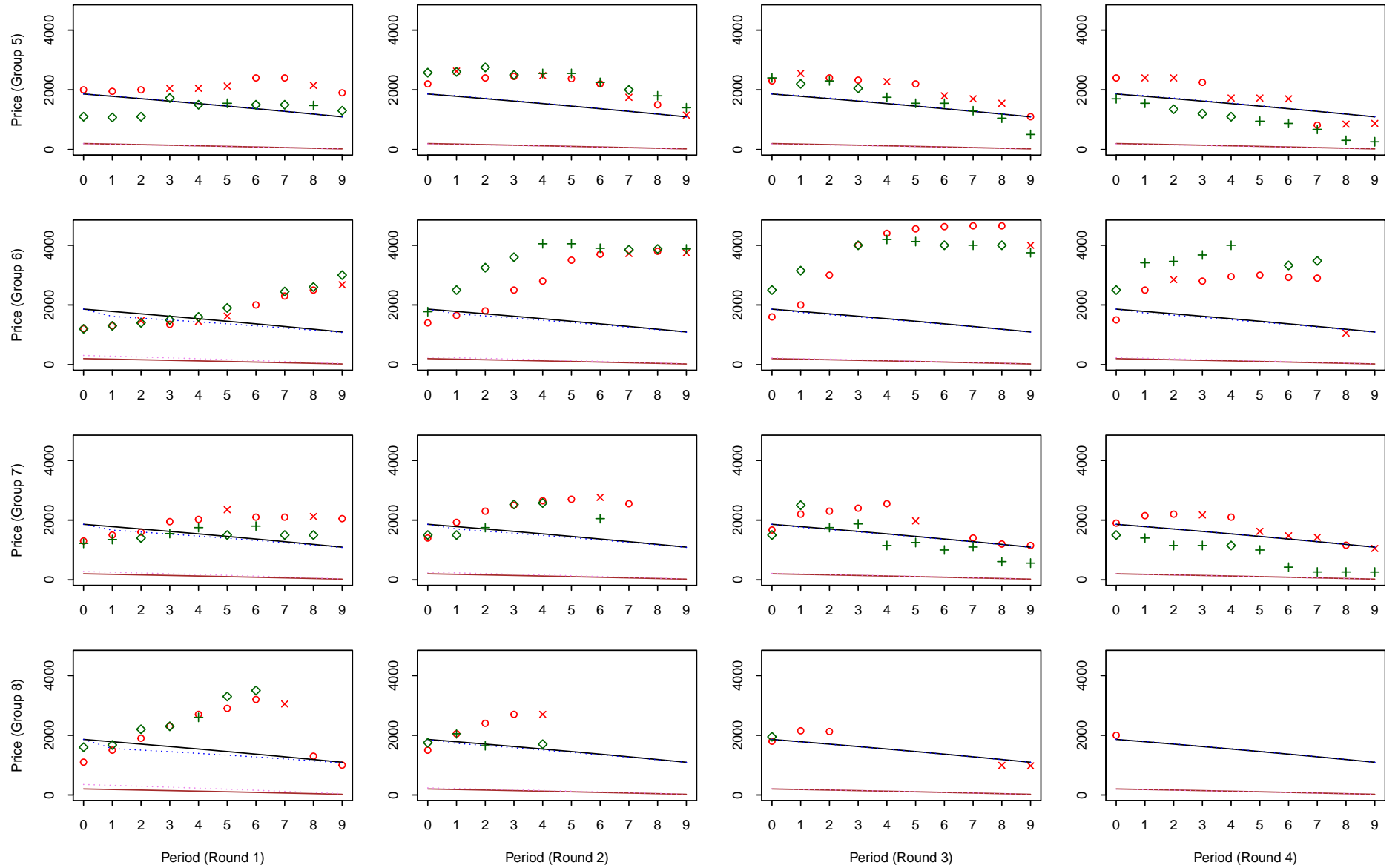


Figure D.5: Bond and CDS Market Prices in all Periods and Rounds, Groups 5 to 8, Treatment *FREE*

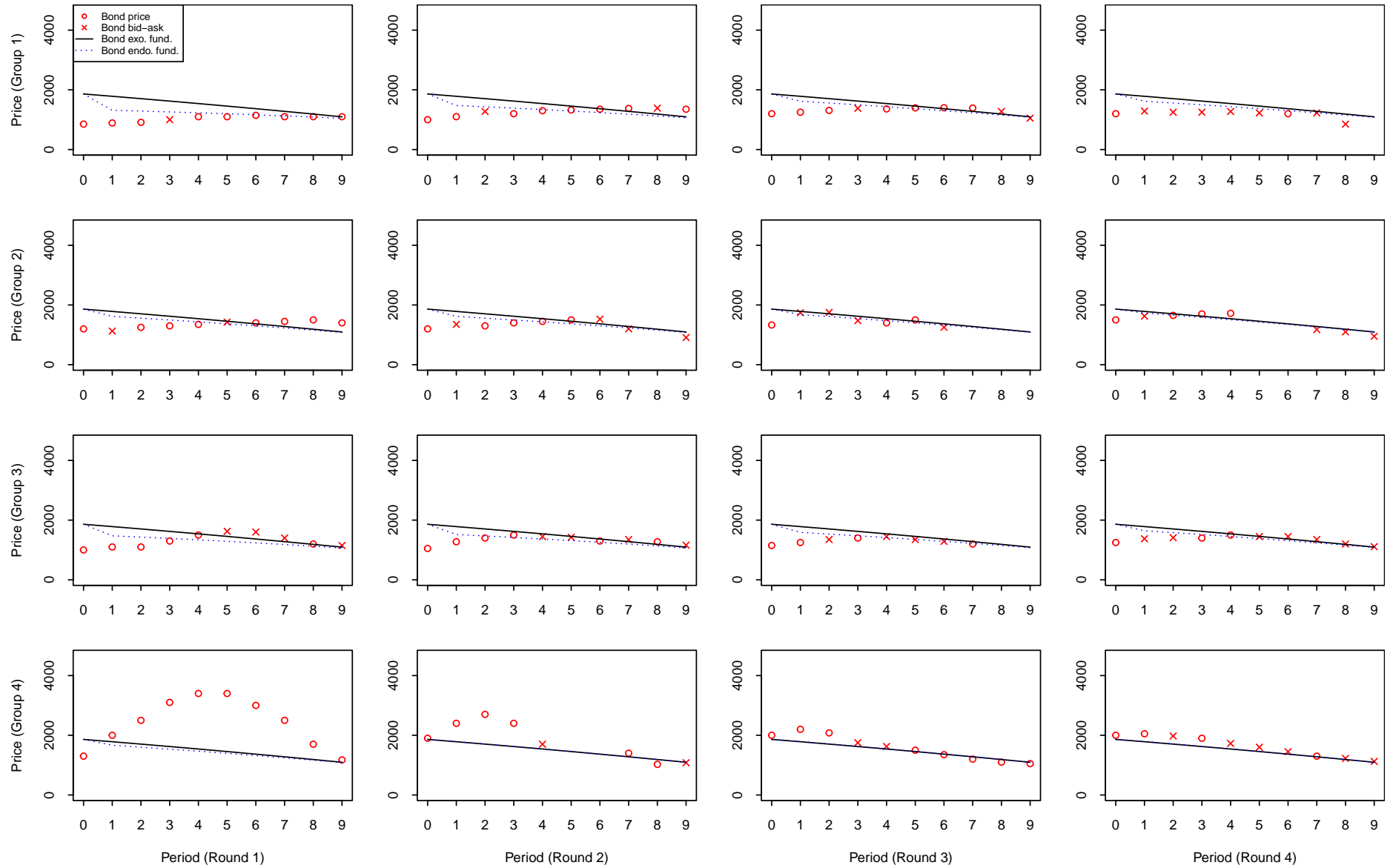


Figure D.6: Bond Market Prices in all Periods and Rounds, Groups 1 to 4, Treatment *Control* (Weber et al., 2018)

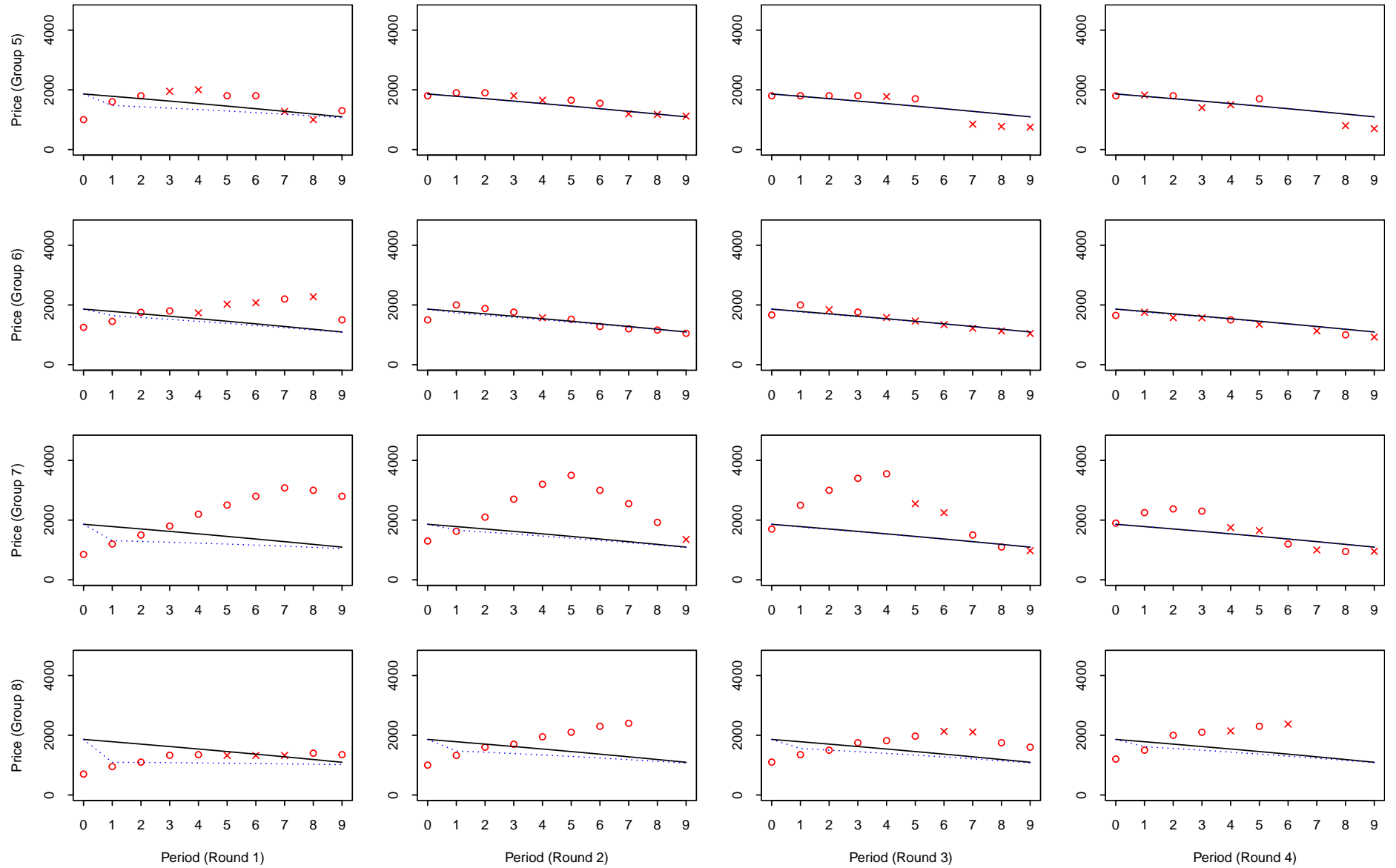


Figure D.7: Bond Market Prices in all Periods and Rounds, Groups 5 to 8, Treatment *Control* (Weber et al., 2018)