Coordination of expectations in a Learning-to-Forecast Experiment

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Abstract.

The development of many aspects or economic variables are affected by the expectations that economic agents have in the markets regarding the development of these variables in the future. In this paper, we show that market behavior depends to a large extent on whether market prices respond positively or negatively to price expectations. In the case of treatment of negative feedback expectations, the prices converge quickly to their fundamental value. This confirms the hypothesis of rational expectations, as it happens in commodity markets. In the case of treatment of positive feedback expectations, the prices have large deviations from the fundamental value. This confirms irrational expectations, as it happens in the financial markets. Therefore, we study individual predictions to see how they react in each kind of feedback of expectations.

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1. Introduction

Expectations formation models are active in modern macroeconomics and finance where participants face decisions over time and these decisions are made under uncertainty. Participants should form expectations about future interest rates and market prices. Households must form expectations, for example, about the price of housing in order to decide whether to buy a new house and thereby know how to finance it. In the same way, fund managers must form expectations about the future price of the assets to develop an optimal investment portfolio. The economy can be described as an expectations feedback system that is, the participants take into account the market behavior in the past and thereby determine the individual expectations that also determine the current market behavior. In addition, when all the participants form rational expectations, the market will reach the rational equilibrium of expectations.

In this work we will distinguish two important kind of feedback: positive and negative. Positive feedback seems to be important for speculative assets and negative feedback for markets such as commodities.

In terms of positive feedback, if participants expect the price of the asset to increase and thus begin to buy the asset, aggregate demand will increase. This is given by the law of supply and demand. In the same way, when the participants expect the price to go down, exactly the opposite will happen since the aggregate demand, in this case, will decrease. However, in the negative feedback, if the participants expect the price of basic products to be high, production will increase and with the law of supply and demand the market price will fall. In the same way, when participants expect the price to go down, companies will produce smaller quantities and at that time the market price will be high.

Haltiwanger and Waldman (1985) argue that positive feedback is related to the concept of strategic complements because participants have an incentive to imitate other participants. This is the case where the price prediction close to the predictions of the other participants is more profitable. Therefore, the coordination of predictions about prices increases and the convergence to rational fundamental value becomes unlikely. On the other hand, they argue that negative feedback is related to the concept of

strategic substitutes because participants have an incentive to deviate from the other participants, that is, move away from what the majority predicts. In this case, the coordination of predictions about prices is lower and the convergence to the fundamental value becomes more probable. This will be checked in the following sections of the paper.

In experiments already carried out previously by economists, this kind of concept has already been studied. Fehr and Tyran (2008) study the impact of different strategic environments, which are two: strategic complementarity and strategic substitutability. Fehr and Tyran study the adjustment of nominal prices after an anticipated monetary shock in a price-fixing game with curves with a positive slope or with a negative slope, which are strategic complements and strategic substitutes, respectively. They have found a much faster convergence in the case of strategic substitutes than in the case of strategic complements. In addition, they conclude that the "rigidity of price expectations" is the key to understand the different results in the two strategic environments.

In relation to the article by Fehr and Tyran (2008), the authors propose an additional treatment in which they would like to move the location of the fundamental value to see if the convergence towards the new equilibrium in the two treatments is the same as with only one value fundamental. This in our experiment and in that of Heemeijer et al. (2009) is already done so that the participants do not tell each other their strategies when the session of their experimental group ends. In this paper we will see if the same occur in the article by Heemeijer et al. (2009). In this article there are no differences between the groups of the two treatments with different fundamental values. Positive feedback treatments also have strong coordination and slow convergence and negative feedback treatments have a fast convergence and a slightly slower coordination.

Although the formation of expectations plays an important role in modern macroeconomics, we see that survey data on expectations about future macroeconomic variables do not generate incentives to provide a solid and careful response. This happens because the subjects do not have an incentive to behave rationally, since they are not economically compensated in many occasions and they do not feel motivated to answer correctly. In many cases, the subjects refuse to answer them for this reason. Also, it takes a lot of time.

On the other hand, in the experiments on the formation of expectations with subjects in the laboratory, better results are obtained. This happens because the subjects are duly

incentivized and motivated, which makes the formation of expectations optimal. With the experiments, the experimenter has much more controlled subjects. Participants only know the information that is offered at the time of the experiment without any influence, which does not happen in the surveys. Also, in the laboratory experiments they have a larger group size. Even so, it is necessary to indicate that the experiments show the subjects behavior of a more consistent way than the surveys, but they do not reflect exactly the market behavior, since this is more complex than a laboratory experiment.

This document aims to study how the market and participants behave depending on the kind of expectations feedback (positive and negative). In addition, to see if our results are similar to those of other articles published on this subject.

At this point, it is important to mention that the work that will be developed will be compared with the article by Heemeijer et al., 2009 to see if their conclusions and those of this work are similar and therefore robust, since this work is based on fundamentally in that article. In the article by Heemeijer et al., 2009, they conclude that the negative feedback treatment has a slow coordination and a fast convergence and the positive feedback treatment has a fast coordination and a slow convergence. At the end of the document we will see if the main conclusions we reach are the same as in the article, even if the data are different.

The document is organized as follows. In section 2, the positive and negative feedback systems are exposed and set out the experimental design. Section 3 describes the aggregate market behavior. In section 4 the results of individual expectations are analyzed. In addition, section 5 concludes. Finally, Appendix A contains a more detailed description of the results of the individual estimates of positive and negative feedback and the classification of the experiment participants according to their forecasts.

2. Feedback mechanism of expectations and experimental design

The price adjustment rule will be of the simple form (1) where $\bar{p}_t^e$ is the forecast of average expectations of all the participants in the market. In fact, we assume that the supply and demand are linear in the experiment; the map f in equation (1) will be linear and will have a positive or negative slope depending on the type of feedback.

$$p_t = f(\bar{p}_t^e) \tag{1}$$

As stated above, positive and negative feedback is related to the concepts of strategic complements and strategic substitutes, respectively. Therefore we use the same function, but changing the sign. The pricing equation connecting the prediction and the price, in the case of a negative feedback system is given by

$$p_t = p_f - \frac{1}{1+r}(\bar{p}_t^e - p_f) + \epsilon_t \quad (2)$$

and the pricing equation in a positive feedback system is given by

$$p_t = p_f + \frac{1}{1+r}(\bar{p}_t^e - p_f) + \epsilon_t \quad (3)$$

In all sessions r = 0.05 and *d* equals 3.5 or 3.25 depending on the session. In addition, in both cases the fundamental value is calculated as $p_f = \frac{d}{r}$ and $\bar{p}_t^e$ is the average of the six participants in the experimental market and is calculated as

$$\bar{p}_t^e = \frac{1}{6} \sum_{i=1}^{6} p_{h,t}^e \quad (4)$$

and with it the random term $\epsilon_t \sim N(0, 0.25)$. The two treatments are opposite. The only difference that we find is the fundamental value in some experimental groups, in some the fundamental value is p* = 65 and in others it is p* = 70 that corresponds to the value in steady state. This happens in the same way in negative feedback treatment as in the positive feedback treatment. Therefore, if the participants of the groups with p* = 65 predict $p_{h,t}^e = 65$ the resulting market price will be $p_t = 65 + \epsilon_t$ and if the participants of the groups with p* = 70 predict $p_{h,t}^e = 70$ the resulting market price will be $p_t = 70 + \epsilon_t$. Everything is the same in both treatments, taking into account the difference in the sign of the slope and the fundamental value.

The experiment is formed by fifteen markets of twenty periods, eight are of negative feedback and seven of positive feedback. Each market consists of six participants, who earn more money if they predict market prices more accurately. In this experiment it is denoted as $\pi_{i,t}^e$ the payment to the subject, which depends on its proximity in the short-term prediction of prices during the experiment. These are the equations that represent the payment:

$$\pi_{i,t}^e = \frac{250}{1+\beta} \qquad \text{where} \qquad \beta = \left(\frac{p_{h,t}^e - p_t}{2}\right)^2 \quad (5)$$

The participants do not have information about the forecasts that the other participants have submitted and, at the same time, they do not know what exactly is the best

answer. They only observe the market prices that have been generated and the predictions that they have made individually. Also, they do not even know how many participants are in the market (experiment) that are affecting the price. Participants were not informed about the mechanism of price generation, but acquired qualitative information from the market as the determination of the market price is governed by the "law of supply and demand". The market price will increase when there is an excess demand or decrease when there is an excess supply.

The dataset used consists of a total of 15 markets, specifically; there are 8 markets in the negative feedback treatments and 7 markets in the positive feedback treatments. These markets are formed by groups of 6 participants, who act in the market for 20 periods.

In this work, the data resulting from the experiment to be analyzed have already been given. These data have been obtained by an experiment carried out in the Laboratory of Experimental Economics (LEE) in the Universitat Jaume I (UJI) of Castellón, Spain. With the data extracted from the experiment, a short-term analysis will be carried out on the stability of prices and volatility in the markets with feedback of positive and negative expectations. In addition, these results are compared with those of the article by Heemeijer et al., (2009).

3. Aggregate market behavior

The results of the experiments are shown in Figure 1 and Figure 2. In them we can see the fundamental values and the predictions in the negative feedback treatment (Figure 1) and the fundamental values and predictions in the positive feedback treatment (Figure 2). In this experiment there are two fundamental values: on the one hand there is a fundamental value of 65 and on the other hand there is a fundamental value of 70.

The change of the fundamental values in the markets has been done like this because there is a change of participants in each session, with this modification, the experimenter has avoided that the possible results were communicated. If the results are communicated and the participants enter the experiment knowing more information than the one provided on the day of the experiment, the results may be affected. If this happened, the results of the experiment would not be valid. That is why the difference in fundamental value is established.

Figure 1 shows the 8 negative feedback markets and Figure 2 shows the 7 positive feedback markets. Each panel shows the six time series of the individual predictions of

the participants for each experimental market, that is, the six time series of the individual predictions of each group of participants in the experiment. In addition, the average of the individual predictions of each group of participants is also shown. Likewise, it shows the fundamental values. With this, we see that in these panels there are already notable differences between negative feedback treatments and positive feedback treatments.

First, in the negative feedback markets we see that the predictions tend to go through an initial phase of high volatility, finally converging to the fundamental value, p_f. In addition, in this type of feedback, participants have an incentive to deviate from the other participants, that is, move away from what the majority predicts. Therefore, the initial phase of high volatility is observed. If we look at the mean of the P_t predictions, we can see that they converge to the fundamental value in all markets of this treatment.

In these markets there are two fundamental values (65 and 70). In the first four markets (N1, N2, N3 and N4) the fundamental value is 65 and in the next four (N5, N6, N7 and N8) the fundamental value is 70.

Continuing with the negative feedback markets, as mentioned, convergence to the fundamental value is observed, although on some specific occasions, with more difficulty. This would be, for example, the case of the N4 market that converges, but later. Keep in mind that this analysis is short-term, so in some market it takes longer to reach the fundamental value. Even with some exception, the period in which the fundamental value is reached, in general, is in period 10, that is, it is reached quickly. This would be related to the theory that relates this type of feedback to the concept of strategic substitutes, that is, this concept defends that the convergence to the fundamental value is very probable in this case. Therefore, in the case of negative feedback treatments if the fundamental value is reached.

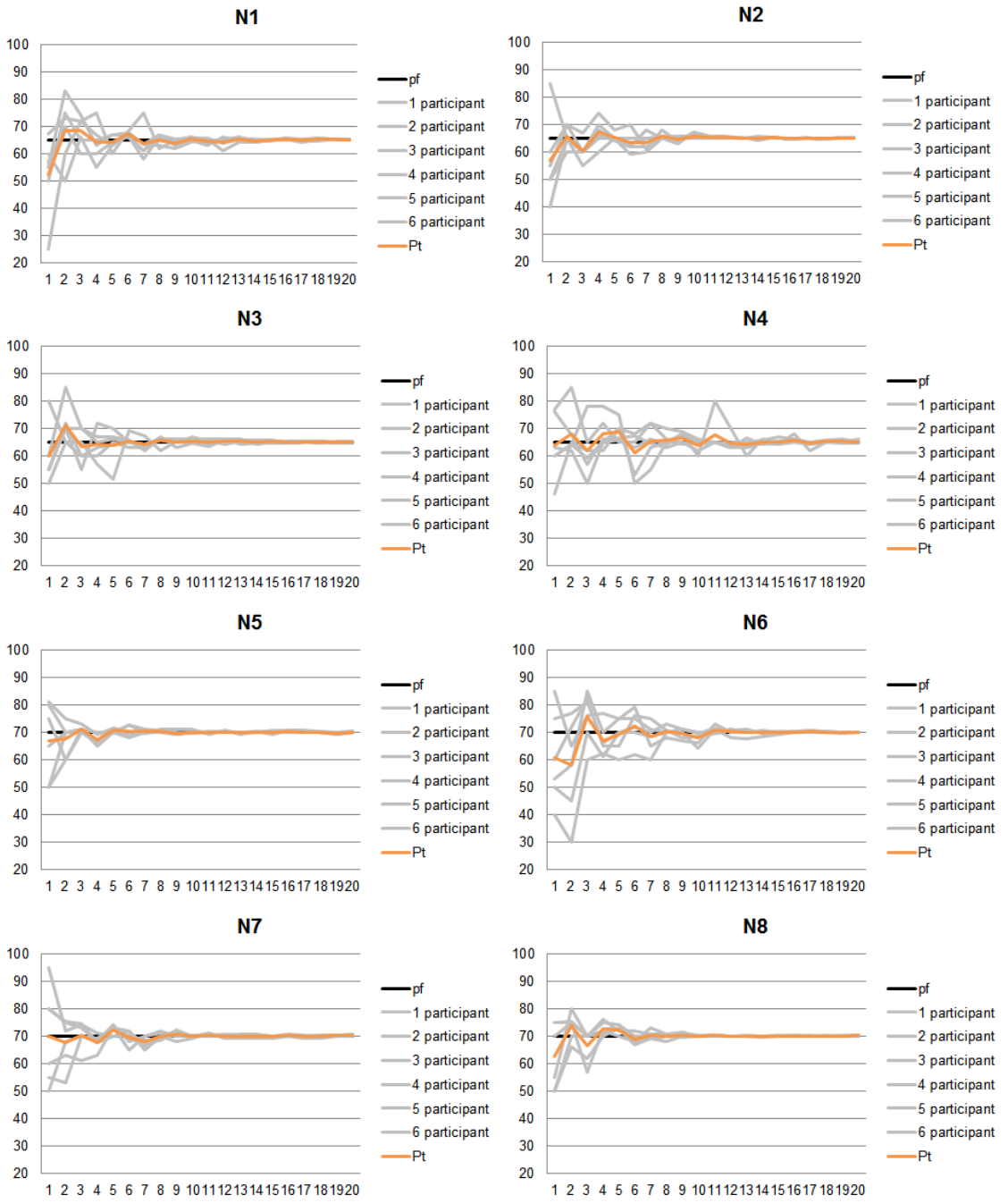

Figure 1. Individual predictions in the NEGATIVE feedback treatment. Each panel contains a series of the fundamental value 65 or 70 (black line - p_f), the individual prediction time series of the six participants for an experimental market (gray lines) and the average of the individual predictions (orange line - P_t).

Regarding the markets in the positive feedback treatment of Figure 2, we see differences with the negative feedback treatment. In this case we observe that there is not so much volatility, since in a few periods the individual predictions coordinate. What is remarkable in this case is that there is no convergence to the fundamental value p_f in any of the cases. There is coordination towards the same point, but there is no

convergence towards the fundamental value. This would be related to the theory that relates this type of feedback with the concept of strategic complements, that is, this concept states that the convergence to the fundamental value is unlikely in this case. In addition, the tendency of the participants in this type of feedback is to imitate other participants, so individual predictions are linked to the same point quickly.

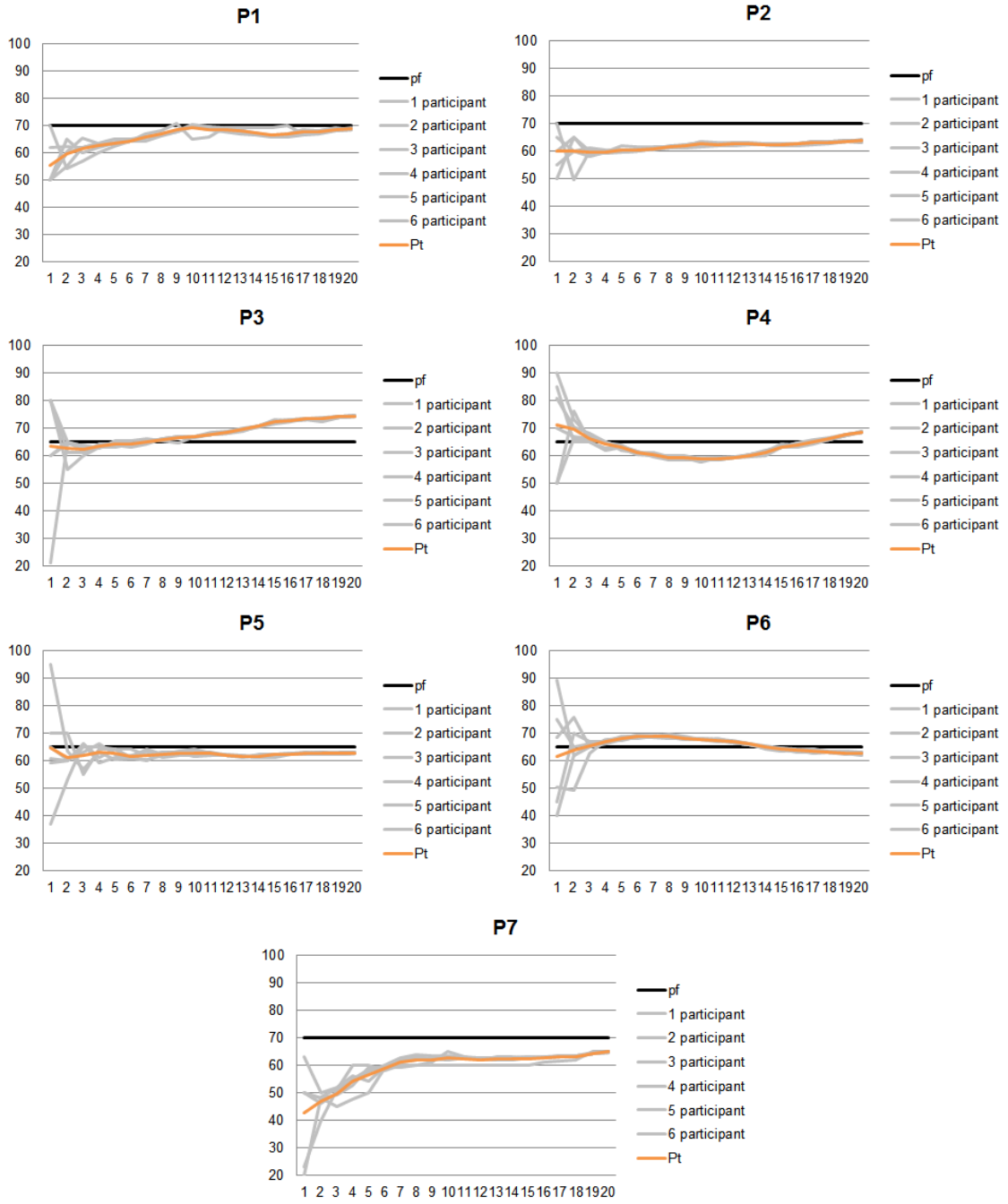

Figure 2. Individual predictions in the POSITIVE feedback treatment. Each panel contains a series of the fundamental value 65 or 70 (black line - p_f), the individual prediction time series of the six participants for an experimental market (gray lines) and the average of the individual predictions (orange line - P_t).

In these markets there are also two fundamental values. In the markets P1, P2 and P7 the fundamental value is 70 and in the markets P3, P4, P5 and P6 the fundamental value is 65.

In this type of market, we observe that most of the groups show movements around the fundamental values, but they do not converge at all to the fundamental value. With this, we can comment that in the positive feedback treatments convergence of prices to the fundamental value is not observed any of the groups at any time in the short-run.

Now we can see the same results in an aggregate way. In the panels of Figures 3 and 4 we see the distribution of individual predictions estimated by the participants in the experiments in the negative and positive feedback treatments, respectively. In turn, divided into the two fundamental values (65 and 70).

In Figure 3 we can see in the negative feedback treatment a fast convergence to the fundamental value. For what corresponds to the predictions of the negative feedback treatment with a fundamental value of 65, almost 40% of the participants converge to the fundamental value and in the negative feedback treatment with a fundamental value of 70; a little more than 32% of the Participants converge to the fundamental value. In this case, we observe that it converges to the fundamental value, that is, the predictions of the participants individually predict the fundamental value more quickly.

In Figure 4 we can see that in the positive feedback treatment the participants do not converge to the fundamental value. For what corresponds to the predictions of the positive feedback treatment with the fundamental value is 65, we observe that the distribution of the individual prediction of prices is very dispersed, that is, the predictions are distributed in all prices and little more than 8% of the participants predict the fundamental value. This is a low prediction level. On the other hand, we observe the positive feedback treatment with the fundamental value of 70 in which we can perceive that the fundamental value has not been reached in any period and therefore the predictions of the fundamental value have been null. In this case we observe that it does not converge to the fundamental value.

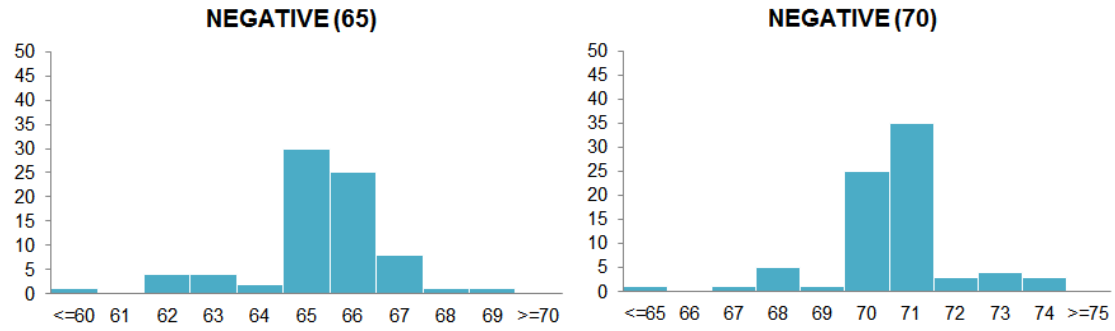

Figure 3. Distribution of individual predictions in the experiments. The panels show the distribution of the individual predictions of the negative feedback treatment. Charts separated by the fundamental value 65 and the fundamental value 70, depending on the sessions.

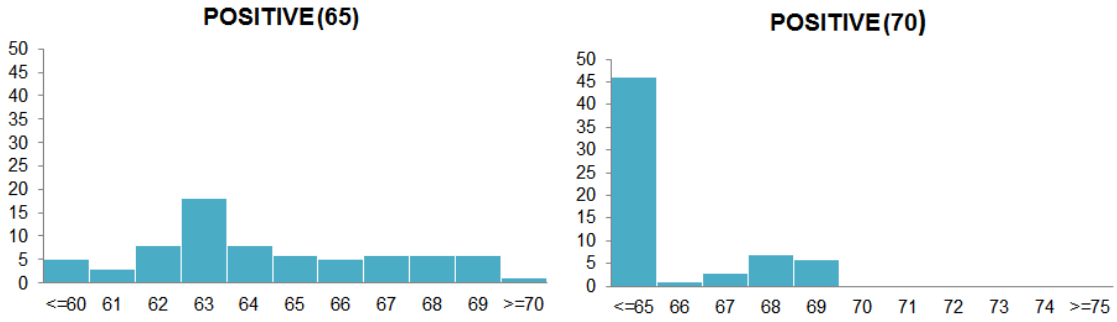

Figure 4. Distribution of individual predictions in the experiments. The panels show the distribution of the individual predictions of the positive feedback treatment. Charts separated by the fundamental value 65 and the fundamental value 70, depending on the sessions.

With everything analyzed so far, we could reach some conclusions about how negative feedback treatments and positive feedback treatments work, in terms of their convergence and their coordination. However, in Figures 5 and 6 it will be seen more clearly and specifies how convergent and coordinated are the participants in the two types of feedback. They show a blue line corresponding to the negative feedback treatment and a green dotted line that corresponds to the positive feedback treatment.

Before analyzing these two aspects, it must be clear what they mean. According to the Real Academia Española (2014), convergence is the property of two or more things that come together at the same point and coordination is the organization to carry out a common action.

First, the price convergence is demonstrated in more detail in the panel of Figure 5, which shows the median of 7 (positive feedback treatment) or 8 (negative feedback treatment) markets of the absolute difference between the price of market and the fundamental value (depending on the market the fundamental value is 65 or 70). A low

absolute difference between the market price and the fundamental value indicates a high level of convergence in predictions of future fundamental value among the participants. It shows the values in an aggregate form, since in some markets the fundamental value is 65 and in others it is 70.

Looking at this panel in Figure 5, we observe that the negative feedback treatment has a much higher degree of convergence than the positive feedback treatment. The negative feedback treatment converges to the fundamental value in period 2, although later it is observed that there is a slight oscillation until period 10 where it is already directed towards the fundamental value. On the other hand, we see that the positive feedback treatment does not converge at any time to the fundamental value.

Likewise, price convergence can also be analyzed assuming a margin of error. For this we have to see Figure 1 and 2 and observe in which periods converged in each group.

In this case I have assumed a margin of error of 3%, therefore, for the fundamental value of 65 it is [63.05, 66.95] and for the fundamental value of 70 it is [67.90, 72.10]. We analyze the data with these parameters and we observe that in the negative feedback treatments the groups have converged in the periods 13, 11, 11, 18, 8, 12, 8 and 8, respectively, with the groups N1, N2, N3, N4, N5, N6, N7 and N8, but we also observe that in the case of positive feedback we do not have convergence for any of the groups (P1, P2, P3, P4, P5, P6 and P7).

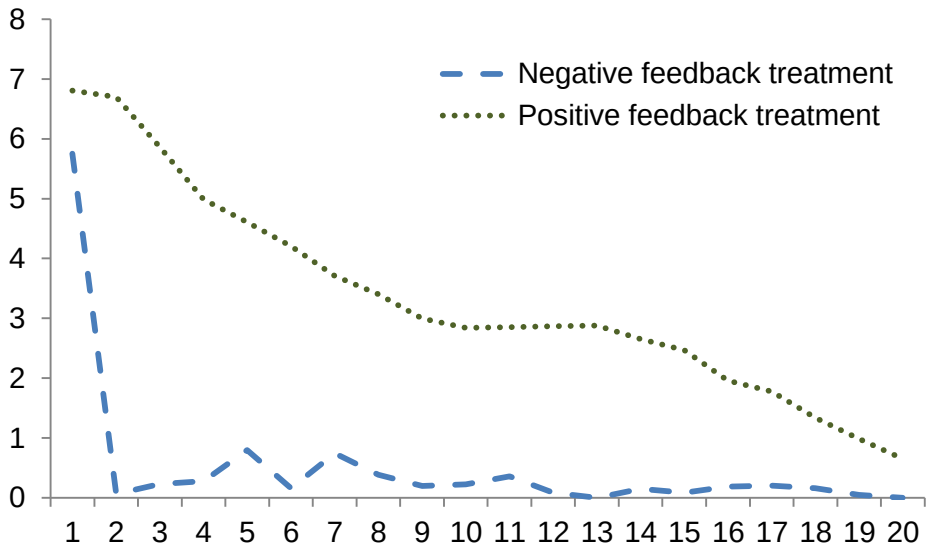

Figure 5. Convergence: absolute median difference, between the market price and the fundamental value. The blue line corresponds to the negative feedback treatment and the dotted green line corresponds to the positive feedback treatment.

On the other hand, the coordination of expectations is measured by the standard deviation of the individual expectations of the participants in the market.

It is observed in detail in Figure 6, which shows the median of 7 (positive feedback treatment) or 8 (negative feedback treatment) markets of these standard deviations for each period. A low deviation indicates a high level of coordination in the predictions of future fundamental value among the participants.

We found that the large standard deviation in the first 13 periods in the negative feedback treatment and, therefore, the coordination is lower in these periods. The same happens with the positive feedback treatment, in which the standard deviation is also great in the first 6 periods, and, therefore, coordination is lower in these periods. This changes in the following periods, where coordination is high in both treatments. Therefore, we observe that after period 14 the coordination is very high in both treatments, since the standard deviation is close to zero.

Continuing with Figure 5 and 6, it should be noted that in the negative feedback treatment there is a strong coordination from period 14 and a strong convergence from period 12. This means that the participants begin to converge, more or less, in the same period. Regarding the positive feedback treatment, as mentioned before, they have a strong coordination, but do not converge to the fundamental value.

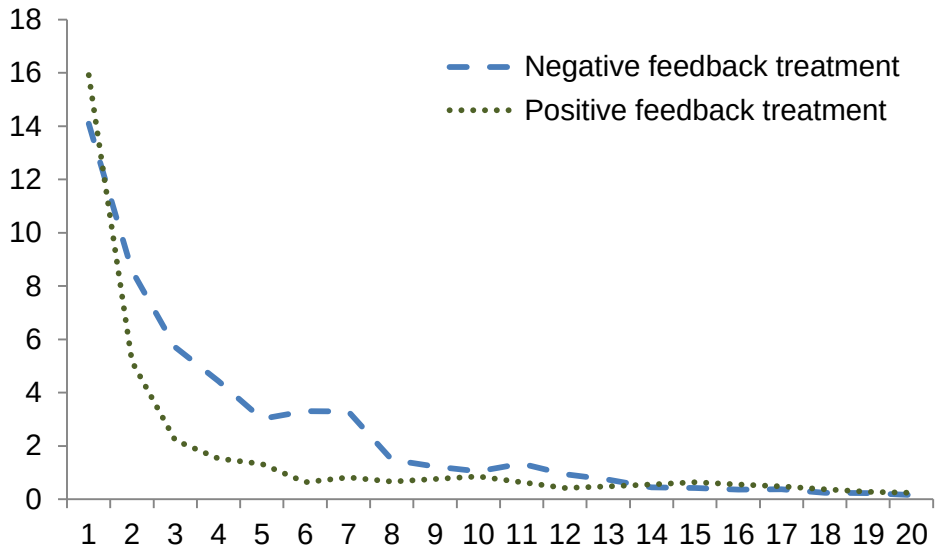

Figure 6. Coordination: median of the standard deviations of the individual predictions of the different groups. The blue line of stripes corresponds to the negative feedback treatment and the green line of points corresponds to the positive feedback treatment.

As noted, we must mention the rapid coordination that the participants have had of positive and negative feedback treatments in the short term. This is surprising because the participants could not observe the predictions of the other participants. This happens because the participants in the negative feedback treatment are better off disagreeing with the majority and the participants in the positive feedback treatment should agree with the majority.

All of this seems to confirm what has been said above about the relationship between negative feedback and positive feedback with the concepts of strategic substitutes and strategic complements. Therefore we can say that in the negative feedback treatment the coordination is slow and the convergence is fast and in the positive feedback treatment the coordination is fast and the convergence is slow.

4. Expectations rules

Before investigating individual forecasting strategies in the experiment, we consider two benchmark points of expectations, naïve expectations and average price expectations. The concepts and equations of this section have been consulted in the article by Heemeijer et al., (2009).

4.1. Two simple benchmark rules

Naïve expectations are those in which all participants use the last observation as their expectation, that is, in the way shown in equation (6).

$$p^{e}_{h,\,t} = p_{t} \tag{6}$$

The average expectations refer to the case in which all the participants take as a reference the average of the market prices of the previous periods to which the participant is at that moment. This average is used by the participant as his expectation, that is, in the way shown in equation (7).

$$p^{e}_{h,\,t} = \frac{1}{t}\sum_{j=0}^{t-1} p_{j} \tag{7}$$

Figures 7 and 8 show average prices, naïve expectations and average expectations for the two treatments. These figures suggest that naïve expectations and average expectations are consistent with the results of Figures 1 and 2.

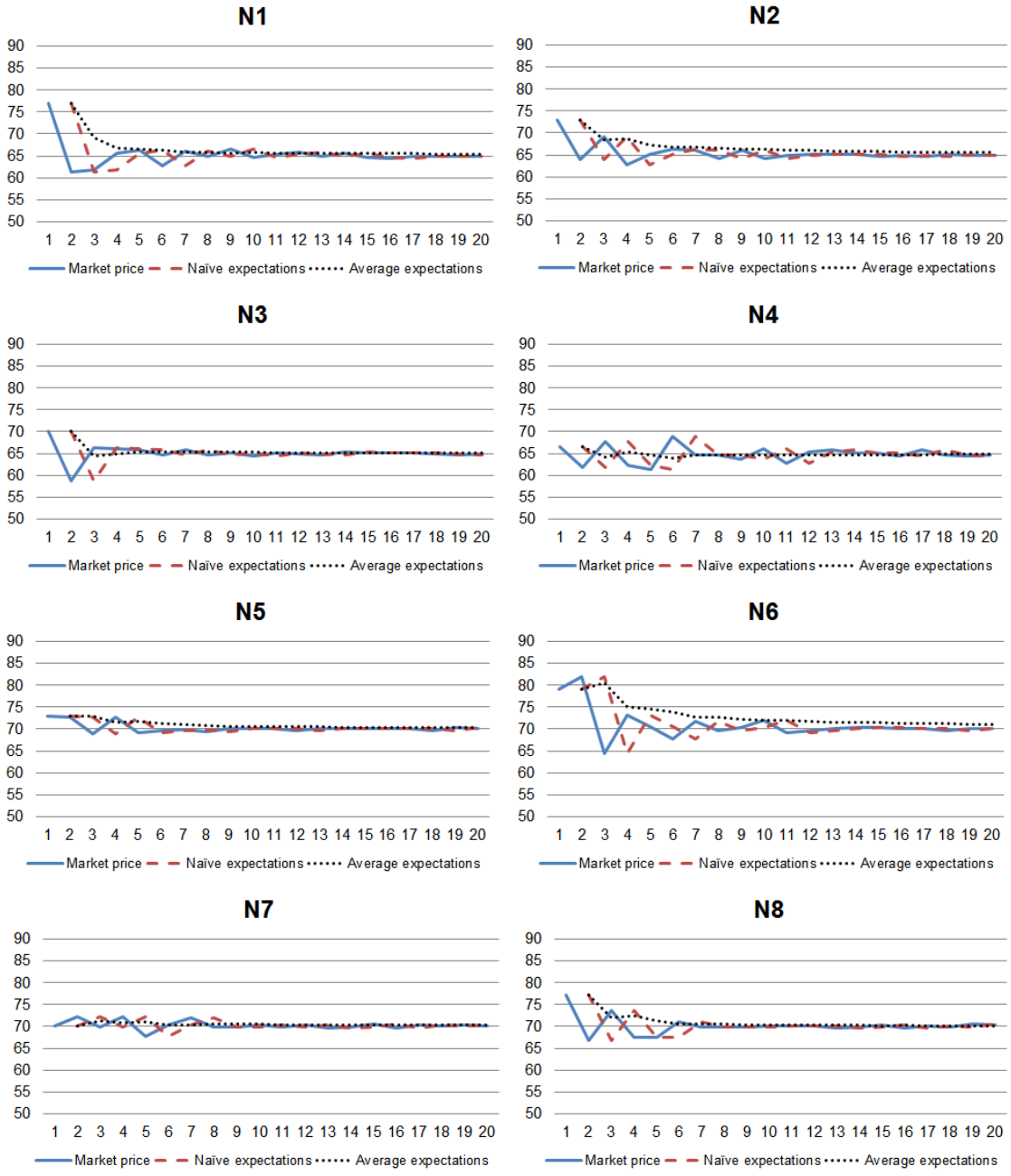

Figure 7. Market prices, naïve expectations and average expectations of the NEGATIVE feedback treatment. In the first four markets (N1, N2, N3 and N4) the fundamental value is 65 and in the next four (N5, N6, N7 and N8) the fundamental value is 70.

First, we compare the groups belonging to the negative feedback treatment of Figure 1 with Figure 7. In the first four markets (N1, N2, N3 and N4) the fundamental value is 65 and in the next four (N5, N6, N7 and N8) the fundamental value is 70. With this, we can observe that, in Figure 7, the convergence in the naïve expectations and the average expectations of the negative feedback treatment at the fundamental value is very similar to that in Figure 1. There is a rapid convergence towards the fundamental value.

Only in the N6 market, average expectations take a little longer to converge to the fundamental value.

As mentioned above, in negative feedback treatments there is a principle where expectations are oscillating, since participants have an incentive to deviate from the other participants. Therefore, the initial phase of volatility is observed.

On the other hand, if we analyze separately the naïve expectations and the average expectations of the negative feedback treatment, we observe that the average expectations are more convergent towards the fundamental value than the naïve expectations, since the average expectations have a much less volatile start. This occurs because, in this case, participants have incentives not to imitate the other participants and this causes slow coordination and rapid convergence.

Second, we compare the groups belonging to the positive feedback treatment of Figure 2 with Figure 8. In these markets there are also two fundamental values, in markets P1, P2 and P7 the fundamental value is 70 and in markets P3, P4, P5 and P6 the fundamental value is 65. With this, we can observe that, in Figure 8, the convergence to the fundamental value of the naïve expectations and the average expectations of the positive feedback treatment to the fundamental value is slow. There is good coordination among the participants, but the convergence towards the fundamental value is quite slow. In most markets they do not even come close to the fundamental value of their treatment.

If we compare the direction of the curves of each of the two figures, we observe that they have the same direction, therefore, it must be said that in the case of positive feedback we have no convergence for any of the groups (P1, P2, P3, P4, P5, P6 and P7). This would be related to the theory that relates this type of feedback with the concept of strategic complements, the tendency of the participants in this type of feedback is to imitate other participants; therefore the individual predictions are joining to the same point quickly. There is rapid coordination, but there is no convergence.

On the other hand, if we analyze separately the naïve expectations and the average expectations of the positive feedback treatment, we observe that the naïve expectations are very close to the market price and the average expectations are not so close to the market price. This happens because the participants in this case have incentives to imitate the other participants and this causes a rapid coordination and a slow or non-existent convergence, in this case.

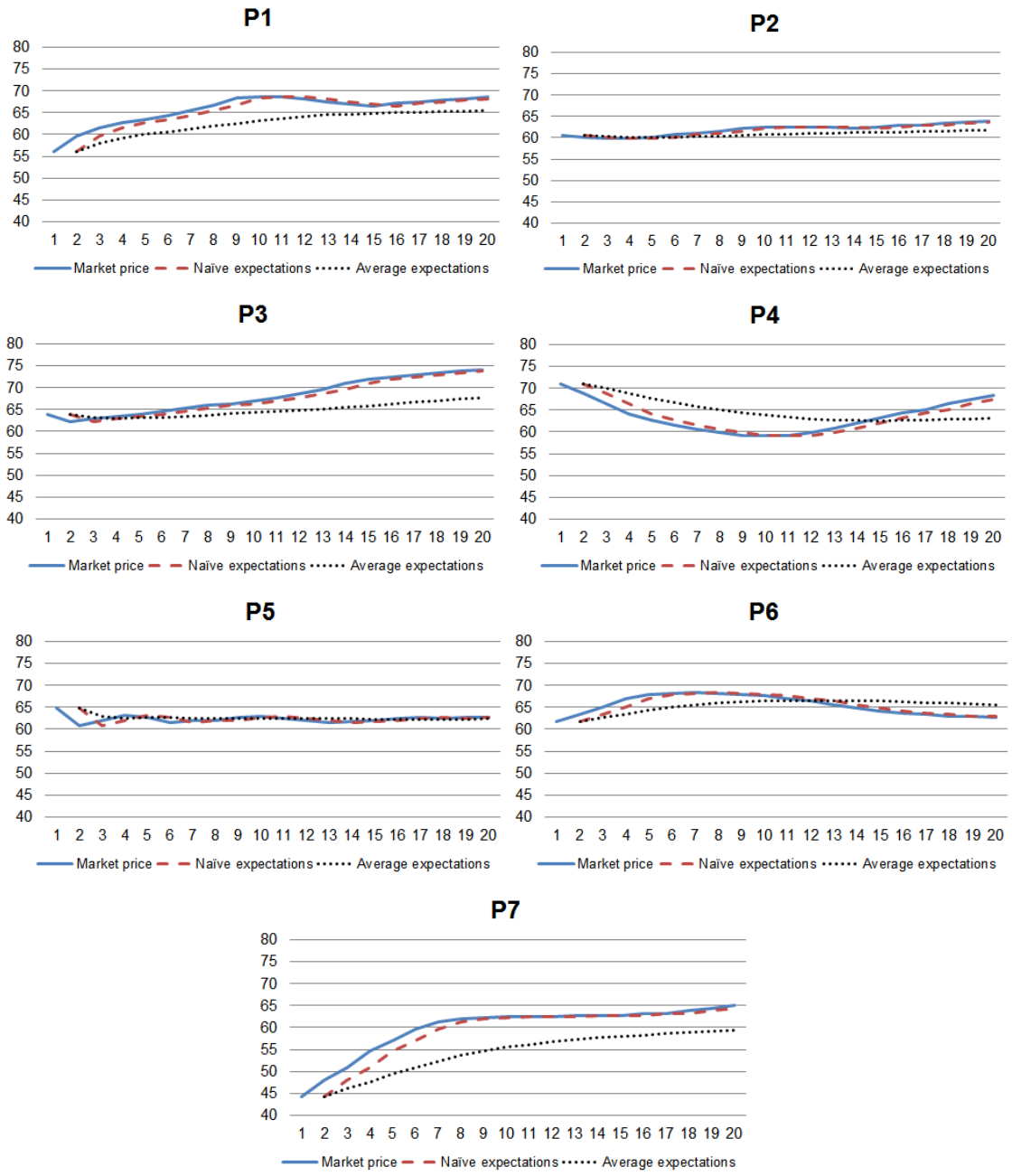

Figure 8. Market prices, naïve expectations and average expectations of the POSITIVE feedback treatment. In the markets P1, P2 and P7 the fundamental value is 70 and in the markets P3, P4, P5 and P6 the fundamental value is 65.

From these simple simulations, I conclude that naïve expectations and average expectations lead to results quite similar to those developed in previous sections for both feedback treatments. Therefore, these figures offer a good description of the individual results in the experiments.

4.2. Individual prediction strategies

Rules of linear prediction, with three delays in market prices and in price expectations, with equation (8) and has been estimated for each participant individually.

$$p^e_{h,\,t} = c + \sum_{i=1}^{3} o_i p_{t-i} + \sum_{i=1}^{3} o_i p^e_{h,\,t} + v_t \qquad (8)$$

The expectations of 90 participants were estimated: 48 participants in the negative feedback treatment and 42 participants in the positive feedback treatment. To see these predictions it is necessary to see appendix A, where the different estimates with equation (8) are shown with four tables. In addition to the long-term equilibrium price, which is prepared with the following equation:

$$\hat{p} = \frac{c}{1 - \sum_{i=1}^{3} o_i - \sum_{i=1}^{3} s_i} \qquad (9)$$

Figure 9 and 10 show the frequency distribution of the long-run equilibrium price level, $\hat{p}$ in equation (9), which corresponds to the estimates of the individual expectations for the negative feedback treatment and the positive feedback treatment, respectively.

For the negative feedback treatment, 42 (18 with fundamental value 65 and 24 with fundamental value 70) of the 48 individual predictions were used (Table A1 and Table A2, appendix A), because some predictions did not turn out to be significant. With this, it has been observed that more than 70.80%, with fundamental value 65, have a level of equilibrium $\hat{p}$ very close to the fundamental value and 87.50%, with fundamental value 70, have a level of equilibrium $\hat{p}$ very close to the fundamental value. Therefore, about 79.20%, in general, approach the fundamental value. The average equilibrium level of $\hat{p}$ is 65.02 in the negative feedback treatment with the fundamental value of 65 and, on the other hand, the average equilibrium level of $\hat{p}$ is 70.92 in the negative feedback treatment with the fundamental value of 70. In this case we would conclude that the above is true. Most of the participants in this treatment converge to the fundamental value in this case.

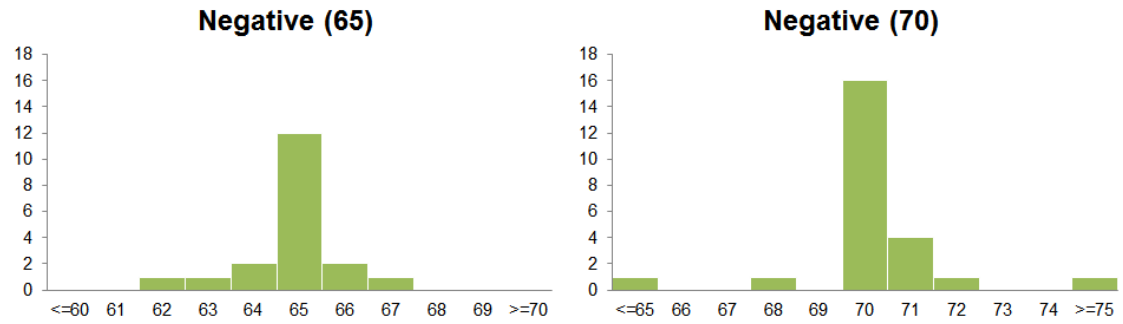

Figure 9. Frequency distribution of the long-term equilibrium price level $\hat{p}$ in (9), which corresponds to the estimated individual forecast rules for the negative feedback treatment with the fundamental value 65 or 70. For this treatment, 39 of the 48 forecast rules have been used (Table A1 and Table A2 in the Appendix A).

Regarding the positive feedback treatment, 36 (20 with fundamental value 65 and 16 with fundamental value 70) of the 42 individual predictions were used (Table A3 and Table A4, appendix A). With this, it has been observed that in this type of treatment the equilibrium level is not reached as we can see in Figure 10. In the treatment with a fundamental value of 70, only 12.50% of the participants reached it and in the treatment with a fundamental value of 65, no participant reaches it. It is confirmed, therefore, what has been seen in previous predictions. On the other hand, it should be mentioned that the average equilibrium level of $\hat{p}$ is 62.57 in the positive feedback treatment with the fundamental value of 65 and the average equilibrium level of $\hat{p}$ is 67.68 in the positive feedback treatment with the fundamental value of 70.

It seems that in general, in both treatments, participants can learn, in the long term, the level of fundamental $\hat{p}$ equilibrium.

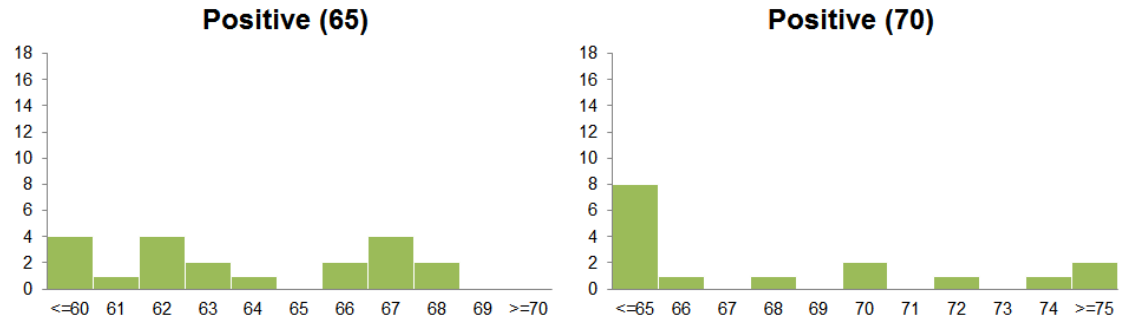

Figure 10. Frequency distribution of the long-term equilibrium price level $\hat{p}$ in (9), which corresponds to the estimated individual forecast rules for the positive feedback treatment with the fundamental value 65 or 70. For this treatment, 36 of the 42 forecast rules have been used (Table A3 and Table A4 in the Appendix A).

This motivates to perform a simpler linear individual expectations equation: equation (10) is the one developed for a fundamental value of 65 and equation (11) is that developed for a fundamental value of 70.

$$p^{e}_{h,\,t} = \alpha_1\, p_{t-1} + \alpha_2\, p^{e}_{h,\,t-1} + (1 - \alpha_1 - \alpha_2)\, 65 + \beta(p_{t-1} - p_{t-2}) + v_t \qquad (10)$$

$$p^{e}_{h,\,t} = \alpha_1\, p_{t-1} + \alpha_2\, p^{e}_{h,\,t-1} + (1 - \alpha_1 - \alpha_2)\, 70 + \beta(p_{t-1} - p_{t-2}) + v_t \qquad (11)$$

These equations include the last observed market price p_{t-1}, the last individual forecast about the price $p^{e}_{h,\,t-1}$ and the long-term equilibrium with the fundamental value of 65 and the fundamental value of 70, and all this extrapolates to the last price change $\beta(p_{t-1} - p_{t-2})$, called trend. Given that equations (10) and (11) are based on a delay in the price, expectations and trend, we refer to it as the "first order heuristic". In this case, 89 of the 90 participants have been able to successfully estimate the first order heuristic. The non-significant participant belongs to the positive feedback treatment.

The estimated parameters are presented in Table A5 of Appendix A. These results are shown grouped in Table 1, where we see the classification of participants in the negative feedback treatment and in the positive feedback treatment.

Thus, as we can see in Table 1, the participants behave, in general, as naïve or as naïve trend follower, mostly. With 32.58% and 30.34% of the participants, respectively. This indicates that most of the participants take into account the prices that have been made in the market and not so much the predictions made by the participants in the previous period.

Now, if we compare the two treatments, we see that, in the negative feedback treatment, two fifths of the participants are naïve, whereas in the positive feedback treatment only one fifth of the participants are naïve. We also see difference, in the two treatments, with the participants who behave as naïve trend follower. A little more than a fifth of the participants in the negative feedback treatment are naïve trend follower and almost half of the participants in the positive feedback treatment are naïve trend follower. Therefore, we can affirm that in negative feedback treatment there are more purely naïve participants than in the positive and in the positive feedback treatment there are more naïve trend follower participants than in the negative.

On the other hand, we must mention the participants naïve and adaptive trend follower; these also stand out in our data. These occupy a little more than a one fifth of the participants in the negative feedback treatment and almost a one third of the

participants in the positive feedback treatment. Participants in this category also take into account the predictions made by participants in the previous period, in addition to the prices that have been made in the market.

As mentioned before, we can affirm that more than half of the participants in the experiment take into account the market prices realized and not so much the expectations of the other participants.

Classification of participants with our data:

	Negative	Positive	Participants	%
Naïve	20	9	29	32.58
Naïve trend follower	10	17	27	30.34
Naïve and adaptive trend follower	10	13	23	25.84
Naïve and adaptive	7	1	8	8.99
Naïve and fundamentalist	1	0	1	1.12
Adaptive trend follower	0	1	1	1.12
	48	41	89	100.00

Table 1. Classification of participants in the negative and positive feedback market. This classification has followed the criteria established in Appendix A.

Following the classification of the participants, Table 2 shows the classifications of the article Heemeijer et al., (2009). In it we can see that the participants behave, mostly, as naïve and as naïve trend follower. This is the same as what happens with the classification of the participants with our data. In addition, we must mention that they also coincide in the third most important position in the classification of the participants, that is, we also have many participants naïve and adaptive trend follower. In this case the participants also take into account the predictions made by the individuals, although they do not leave out the market prices realized.

Classification of the participants of the article Heemeijer et al., (2009)

	Negative	Positive	Participants	%
Naïve	7	4	11	35.48
Naïve trend follower	2	7	9	29.03
Naïve and adaptive trend follower	0	8	8	25.81
Naïve and adaptive	1	1	2	6.45
Naïve and fundamentalist trend follower	1	0	1	3.23
	11	20	31	100.00

Table 2. Classification of participants in the negative and positive feedback markets using the data in Heemeijer et al., (2009).

Now we compare the participants of the article Heemeijer et al., (2009) with our data in Table 3 and observe all that has been mentioned above. The rankings that stand out in the two studies are, in order of importance, naïve, naïve trend follower and naïve adaptive trend follower. Therefore, there is no difference between the results of our experiment and those of the article Heemeijer et al., (2009).

Heemeijer et al., (2009) and our data.

	Our data %	Heemeijer et al., (2009) %
Naïve	32.58	35.48
Naïve trend follower	30.34	29.03
Naïve and adaptive trend follower	25.84	25.81
Naïve and adaptive	8.99	6.45
Naïve and fundamentalist	1.12	0.00
Naïve and fundamentalist trend follower	0.00	3.23
Adaptive trend follower	1.12	0.00

Table 3. Comparison of the participants of the article Heemeijer et al., (2009) with our data.

In summary, one can say that in positive feedback treatment participants tend to base their prediction on a weighted average of the last price and the last prediction, and extrapolate to trends in past prices, without taking into account the equilibrium price. Regarding the negative feedback treatment, the predictions are a weighted average between the last observed price and the equilibrium price. Therefore, in the negative feedback treatment they take into account the market prices realized and in the positive feedback treatment they take into account both the market prices realized and the expectations of the other participants.

5. Conclusion

According to neoclassical economic theories, individuals form rational expectations, that is, individuals make correct forecasts of prices and this results in prices converging rapidly to the fundamental value of the market. However, large price fluctuations in financial markets have fueled the debate over whether this is really a good description of economic behavior (Heemeijer et al., 2009). That is why we have observed large differences between financial markets and commodity markets in our experiment. Financial markets have the structure of positive feedback treatments in which speculative demand is less rational and therefore, the market is relatively unstable and excessively volatile. This drives financial markets to easily differ from the market equilibrium price and thereby hinder convergence towards the steady state. As for commodity markets, they are much more stable and close to the equilibrium price of the market and therefore it is easier to converge towards the steady state. This market

is related to the negative feedback treatment in which participants behave more rationally and there are not as many fluctuations in the market. Of course, real markets are much more complex than our experimental structure, but as shown in our experiment, we can study in a simple way the difference between the positive feedback structure of expectations and the negative feedback structure and how this difference it can affect the stability of prices and the convergence towards the steady state.

In the positive feedback treatment, the participants predict slow oscillatory prices that cause the steady state convergence to be delayed and, specifically, in our experiment does not converge in any of the periods. In the negative feedback treatment, the participants predict more stable prices that cause the convergence to the steady state to be fast and, concretely, in our experiment it begins to converge in period 2, although later it is observed that there is a slight oscillation until the period 10 where it is already directed towards the steady state. Regarding coordination, in the positive feedback treatment is faster than in the negative feedback treatment, although finally in both treatments there is a strong coordination among the participants. In addition, we can add that in the negative feedback treatment we can observe that coordination only occurs after converging towards the steady state and instead in the positive feedback treatment there is a strong coordination, but it does not converge in any of the periods. Therefore, we can say that in the negative feedback treatment the coordination is slow and the convergence is fast and in the positive feedback treatment the coordination is fast and the convergence is slow.

Our results on the estimates estimated individually have given us a clear idea of how the participants of each treatment behave. In their classification, we have observed that participants in the positive feedback treatment tend to behave more as followers of the trend than the subjects of the negative treatment. This happens because participants in the positive feedback treatment have incentives to imitate the other participants, that is, imitate what the majority predicts. Therefore, in this treatment, behavior predominates as followers of the trend. Positive feedback is related to the concept of strategic complements for all this. As for negative feedback participants, they do not tend to behave as followers of the trend because they have an incentive to deviate from what other participants do, that is, move away from what the majority predicts. The negative feedback is related to the concept of strategic substitutes for all this.

Explaining the differences between the two treatments, if we observe the first periods in each of them we can see that the participants of the positive feedback treatment imitate the other participants and the participants of the negative feedback treatment move

away from the decisions taken by the others participants, as already mentioned above. Regarding the positive feedback treatment, we observed that the participants make heterogeneous forecasts, that is, if the participants give importance to the observed market price and this will lead to the rapid coordination of the forecasts. After this rapid coordination, market prices move slowly and, as our results have shown, trendsetter behavior reinforces slow price movements. Regarding the negative feedback treatment, we observed that the participants make forecasts contrary to those of the other participants, that is, the participants give importance to the observed market price, but they in the next period forecast a realized market price that is on the other side of the fundamental value and so on, until reaching the steady state. This will lead to a slower coordination of individual forecasts.

At this point, it is important to compare this work with the article by Heemeijer et al., (2009). This is the article on which I have based my work, but analyzing the data of another laboratory experiment. Seeing the conclusions that I have reached with the analysis of my data and the conclusions of the article by Heemeijer et al. (2009), we can affirm that the results of the experiment of both are very similar, although the data that have been used to perform each of them have been from different laboratory experiments. Therefore, we observe that in both studies, the negative feedback treatment has a slow coordination and a fast convergence and the positive feedback treatment has a fast coordination and a slow convergence. Thus, we can affirm that the conclusions are robust and therefore are similar.

On the other hand, in the article by Heemeijer et al. (2009) the results were compared with the article by Fehr and Tyran (2008) and, therefore, we will also compare our work. Fehr and Tyran compare the strategic complements and strategic substitutes that are related to the positive feedback treatment and the negative feedback treatment, respectively. In their experiment the participants have to form expectations about the average prices of the other participants, while in our experiment the participants have to make predictions about the real market price, this is the first difference. Another important difference refers to the information available to participants. In their experiment, the participants have information about the previous average forecasts of other participants and, in addition, they are shown a payment table that offers the best response to the average forecasts expected by the other participants. In our experiments, the participants do not have information about the prognosis made by the other participants, nor do they know exactly which is the best response. Participants only know the prices of markets made, but they also do not know how many participants affect the price. Despite the limited information, similar results are

obtained, that is, the results show a rapid convergence in the negative feedback and a slow convergence in the positive feedback. A novel feature in our experiment is the study of the estimation of individual forecasting strategies, which show that in our experiment individual expectations are, in fact, important to explain the differences between our two treatments.

In relation to the article mentioned above, the authors propose an additional treatment in which they would like to move the location of the fundamental value to see if the convergence towards the new equilibrium in the two treatments is the same as with only a fundamental value. This in our experiment and in that of Heemeijer et al. (2009) has already been done so that the participants do not tell each other their strategies when the session of their experimental group ends. That is why we would have the answer to the proposal made by Fehr and Tyran. There is no difference between the groups of both treatments with fundamental value 65 with those of fundamental value 70. Positive feedback treatments also have a strong coordination and almost zero convergence and the negative feedback treatments have a fast convergence and a little coordination slower.

Finally, for all the above, it seems that the results of our experiment are consistent and give an answer to how the behavior of the positive feedback treatment and the negative feedback treatment is in the market.

Appendix A. Estimation rules of individual forecasting rules

Estimation individual forecasting rules with negative and positive freedback.

Tables A1 - A4 show the results of the individual estimates (negative and positive feedback). The first column shows the numbers of participants; from the second to the eighth column the estimates of the coefficients of equation (8) are shown; the ninth column shows the statistical Rsquared: the last column contains the long-term equilibrium price, using equation (9).

Table A1 shows the estimation of the individual forecast of the negative feedback treatment with the fundamental value 65. Predictions of the 24 participants of this treatment has been estimated.

Table A2 shows the estimation of the individual forecast of the negative feedback treatment with the fundamental value 70. Predictions of the 24 participants of this treatment has been estimated.

Table A3 shows the estimation of the individual forecast of the positive feedback treatment with the fundamental value 65. Predictions of the 24 participants of this treatment has been estimated.

Table A4 shows the estimation of the individual forecast of the positive feedback treatment with the fundamental value 70. Predictions of the 18 participants of this treatment has been estimated.

Table A5 shows the estimation of first-order individual heuristics. They have been estimated for the 90 participants of this treatment. These have been classified as: fundamentalist, trend follower, adaptive, naïve and the combinations between them. They have followed these rules:

- $\alpha_1, \alpha_2 \cong 0$; Fundamentalist
- β ; Trend follower
- $\alpha_1, \alpha_2 \neq 0$; Adaptive
- α_1 ; Naïve

Table A 1: Estimation individual forecasting rules (negative feedback) with the fundamental price equal to 65.

Participant	c	p_t - 1	p_t - 2	p_t - 3	p^e_t - 1	p^e_t - 2	p^e_t - 3	R^2	Eq.
1	-482.213	3.093	2.773	0.595	1.237	0.725	0	0.782	64.969
2	141.290	-2.253	0	0.846	0	0	0.246	0.756	65.361
3	19.963	0	0	0	0	0.411	0.289	0.623	66.605
4	23.876	0.619	0	0	0	0	0	0.759	62.739
5	13.614	0.792	0	0	0	0	0	0.696	65.468
6	20.477	0.595	0	0	0	0	0.093	0.871	65.653
7	-66.767	0	1.088	0.805	0	0.473	-0.340	0.984	65.079
8	92.757	0	-0.428	0	0	0	0	0.666	64.975
9	-69.080	0.605	0.606	-0.176	0.472	0.557	0	0.944	64.955
10	-78.075	1.273	0	0	0.927	0	0	0.704	65.077
11	147.624	0	-1.267	0	0	0	0	0.647	65.128
12	-266.191	0	2.796	2.280	0	0	0	0.903	65.300
13	-42.671	2.707	0	-0.331	0	-0.351	-0.364	0.839	64.448
14	79.811	0.568	-0.440	-0.218	0	-0.135	0	0.906	65.181
15	34.944	0	0	0.300	-0.390	0	0.551	0.927	64.812
16	103.973	0	0	-0.583	0	0	0	0.265	65.693
17	-90.473	1.884	0	0	0.529	0	0	0.966	64.053
18	-299.449	2.217	2.793	0	0.613	0	0	0.443	64.774

Table A 2: Estimation individual forecasting rules (negative feedback) with the fundamental price equal to 70.

Participant	c	$p_t - 1$	$p_t - 2$	$p_t - 3$	$p^e_t - 1$	$p^e_t - 2$	$p^e_t - 3$	R^2	Eq.
1	117.526	0	0	0.510	-0.735	-0.823	0.367	0.924	69.882
2	47.866	0	0.319	0	0	0	0	0.268	70.241
3	116.994	0	0	-0.667	0	0	0	0.387	70.186
4	41.369	0	0	0	0	0.407	0	0.840	69.798
5	87.951	0	0	0	0	0	-0.259	0.690	69.872
6	-101.851	1.738	0	0	0.718	0	0	0.891	69.952
7	79.188	0.495	0	0	0	-0.617	0	0.900	70.581
8	-49.237	1.022	0.680	-0.309	0	0.477	-0.167	0.990	70.086
9	70.637	0	0.639	0	-0.634	0	0	0.938	71.002
10	-238.215	3.466	0	0.400	0.736	-0.923	0.718	0.957	70.122
11	43.703	0.392	0	0	0	0	0	0.409	71.907
12	-161.124	2.145	0	0	1.135	0	0	0.508	70.668
13	6.228	0	0.908	0	0	0	0	0.369	67.656
14	2.728	0	1.034	0.524	-0.290	0	-0.312	0.789	61.482
15	-148.723	1.994	0.634	0	0	0.393	0.097	0.960	70.215
16	89.156	0	0.723	0.531	-1.342	-0.446	0.260	0.973	69.991
17	217.660	0	-2.072	0	0.424	-1.013	0.554	0.937	70.051
18	15.856	0	0.774	0	0	0	0	0.324	70.155
19	-33.388	0.399	0.910	0	0	0.286	-0.116	0.961	69.894
20	0.643	0.518	0	0	0.475	0	0	0.646	98.344
21	12.803	0.726	0	-0.576	0	0.669	0	0.911	70.789
22	99.709	0	-0.430	0	0	0	0	0.221	69.747
23	-102.782	0.654	0.465	0.457	0.292	0.432	0.169	0.988	70.001
24	-45.960	0	0	0.736	0.435	0	0.490	0.790	69.609

Table A 3: Estimation individual forecasting rules (positive feedback) with the fundamental price equal to 65.

Participant	c	p_t - 1	p_t - 2	p_t - 3	p^e_t - 1	p^e_t - 2	p^e_t - 3	R^2	Eq.
1	-3.564	1.063	0	0	0	0	0	0.985	56.994
2	-4.148	1.066	0	0	0	0	0	0.948	63.257
3	-3.114	1.202	0	0	0	0	-0.155	0.999	66.021
4	-15.080	1.222	0	0	0	0	0	0.836	68.013
5	-1.338	1.030	0	0	0	0	0	0.992	44.951
6	-11.172	1.386	0	0	0	0	-0.220	0.976	67.125
7	3.077	0	2.591	-1.636	0	0	0	0.977	67.319
8	6.828	2.060	0	-0.691	-0.482	0	0	0.958	60.961
9	4.329	1.763	0	0	0	-0.842	0	0.977	54.731
10	11.428	0.809	0	0	0	0	0	0.736	59.733
11	2.242	0.964	0	0	0	0	0	0.914	61.864
12	65.233	1.630	-1.682	0	0	0	0	0.970	62.019
13	148.078	0	-1.388	0	0	0	0	0.641	62.020
14	-26.184	0	1.418	0	0	0	0	0.717	62.707
15	27.359	0.592	0	0	0	0	0	0.293	67.015
16	2.125	1.702	-1.558	0.314	0.573	0	-0.063	0.999	66.686
17	-24.512	1.028	0	0	0.342	0	0	0.731	66.319
18	5.651	0.916	0	0	0	0	0	0.949	67.600
19	-2.959	1.048	0	0	0	0	0	0.820	61.664
20	28.794	0	0.553	0	0	0	0	0.452	64.365

Table A 4: Estimation individual forecasting rules (positive feedback) with the fundamental price equal to 70.

Participant	c	p_t - 1	p_t - 2	p_t - 3	p^e_t - 1	p^e_t - 2	p^e_t - 3	R^2	Eq.
1	10.685	0.899	-0.065	-0.002	0.046	0	0	0.988	87.582
2	4.071	0.945	0	0	0	0	0	0.923	73.866
3	13.407	0.000	0	-0.467	1.274	0.000	0	0.943	69.673
4	10.091	1.285	0	0	0	-0.429	0	0.968	70.024
5	25.544	0.624	0	0	0	0	0	0.884	68.015
6	-1.333	1.024	0	0	0	0	0	0.954	56.046
7	-10.492	1.138	0	0	0	0.034	0	0.961	60.956
8	-15.396	1.575	0	0	0	-0.334	0	0.939	63.802
9	1.829	0.975	0	0	0	0	0	0.516	72.396
10	-3.434	1.056	0	0	0	0	0	0.942	61.111
11	46.022	0	0	0.274	0	0	0	0.640	63.367
12	-44.076	2.719	-2.521	0	0	1.083	0.452	0.912	60.127
13	11.504	1.225	0	0	0	-0.405	0	0.992	63.904
14	13.991	0.789	0	0	0	0	0	0.974	66.338
15	-0.799	0	1.411	0	0	0	-0.402	0.983	85.100
16	3.041	1.926	0	0.165	-0.490	-0.390	-0.261	0.999	60.622

Table A 5: Estimation of individual first order heuristics.

Participant	α_1	α_2	β	Original participant no.	Original group no.	Label
1	0.611	0.387	-0.369	1	N1	Naïve and adaptive trend follower
2	1.019	0	-0.781	2	N1	Naïve trend follower
3	0.990	0	-0.287	3	N1	Naïve trend follower
4	0.990	0	0.034	4	N1	Naïve trend follower
5	0.999	0	0	5	N1	Naïve
6	1.010	0	-0.648	6	N1	Naïve trend follower
7	1.010	0	0	7	N2	Naïve
8	0.304	0.695	0.280	8	N2	Naïve and adaptive trend follower
9	0.990	0	0	9	N2	Naïve
10	0.990	0	0	10	N2	Naïve
11	0.638	0.346	0	11	N2	Naïve and adaptive
12	0.499	0.497	0	12	N2	Naïve and adaptive
13	1.007	0	0.444	13	N3	Naïve trend follower
14	1.001	0	0	14	N3	Naïve
15	0.980	0	-0.811	15	N3	Naïve trend follower
16	0.449	0.554	-0.296	16	N3	Naïve and adaptive trend follower
17	0.693	0.307	-0.282	17	N3	Naïve and adaptive trend follower
18	0.984	0	0	18	N3	Naïve
19	1.002	0	0	19	N4	Naïve
20	0.976	0	0	20	N4	Naïve
21	1.015	0	0	21	N4	Naïve
22	0.743	0.285	0	22	N4	Naïve and fundamentalist
23	1.011	0	0	23	N4	Naïve

24	0.993	0	0	24	N4	Naïve
25	0.999	0	-0.256	25	N5	Naïve trend follower
26	0.554	0.446	-0.406	26	N5	Naïve and adaptive trend follower
27	0.615	0.385	0	27	N5	Naïve and adaptive
28	0.983	0	0	28	N5	Naïve
29	0.365	0.634	0.556	29	N5	Naïve and adaptive trend follower
30	0.761	0.239	0.176	30	N5	Naïve and adaptive trend follower
31	0.995	0	0	31	N6	Naïve
32	0.654	0.343	0.228	32	N6	Naïve and adaptive trend follower
33	1.002	0	0	33	N6	Naïve
34	0.299	0.685	0	34	N6	Naïve and fundamentalist
35	0.602	0.406	-0.343	35	N6	Naïve and adaptive trend follower
36	0.987	0	0	36	N6	Naïve
37	0.997	0	-0.845	37	N7	Naïve trend follower
38	1.001	0	0	38	N7	Naïve
39	0.989	0	0	39	N7	Naïve
40	1.003	0	0	40	N7	Naïve
41	0.428	0.566	0	41	N7	Naïve and adaptive
42	0.999	0	-0.783	42	N7	Naïve trend follower
43	0.999	0	-0.434	43	N8	Naïve trend follower
44	0.523	0.480	0	44	N8	Naïve and adaptive
45	1.005	0	0	45	N8	Naïve
46	0.594	0.406	0	46	N8	Naïve and adaptive
47	0.339	0.664	0.458	47	N8	Naïve and adaptive trend follower
48	0.991	0	0	48	N8	Naïve
49	1.225	-0.221	0.487	1	P1	Naïve and adaptive trend follower
50	0.802	0.198	0.935	2	P1	Naïve and adaptive trend follower
51	0	1.017	1.004	3	P1	Adaptive trend follower

52	0.999	0	1.233	4	P1	Naïve trend follower
53	1.003	0	0.721	5	P1	Naïve trend follower
54	1.020	0	0	6	P1	Naïve
55	1.004	0	-0.536	7	P2	Naïve trend follower
56	0.993	0	0	8	P2	Naïve
57	0.993	0	0.919	9	P2	Naïve trend follower
58	1.177	-0.179	0.973	10	P2	Naïve and adaptive trend follower
59	1.003	0	0	11	P2	Naïve
60	1.001	0	0	12	P2	Naïve
61	1.009	0	0	13	P3	Naïve
62	1.010	0	0	14	P3	Naïve
63	1.304	-0.306	1.003	15	P3	Naïve and adaptive trend follower
64	1.007	0	0	16	P3	Naïve
65	0.880	0.122	0.882	17	P3	Naïve and adaptive trend follower
66	1.006	0	0.496	18	P3	Naïve trend follower
67	0.989	0	0.895	19	P4	Naïve trend follower
68	0.999	0	0.744	20	P4	Naïve trend follower
69	1.181	-0.185	1.236	21	P4	Naïve and adaptive trend follower
70	0.700	0.299	0.879	22	P4	Naïve and adaptive trend follower
71	0.644	0.355	0.972	23	P4	Naïve and adaptive trend follower
72	1.002	0	0.754	24	P4	Naïve trend follower
73	1.175	-0.179	0.934	25	P5	Naïve and adaptive trend follower
74	1.011	0	-0.519	26	P5	Naïve trend follower
75	1.000	0	0	27	P5	Naïve
76	0.667	0.339	0	28	P5	Naïve and adaptive
77	0.993	0	0.725	29	P5	Naïve trend follower
78	0.997	0	-1.355	30	P5	Naïve trend follower
79	0.689	0.310	0.860	31	P6	Naïve and adaptive trend follower

80	0.648	0.352	0.975	32	P6	Naïve and adaptive trend follower
81	0.851	0.148	0.869	33	P6	Naïve and adaptive trend follower
82	1.002	0	0.443	34	P6	Naïve trend follower
83	1.001	0	1.134	35	P6	Naïve trend follower
84	1.001	0	0.893	36	P6	Naïve trend follower
85	0.997	0	1.168	37	P7	Naïve trend follower
86	0	0	0	38	P7	None
87	0.999	0	0.884	39	P7	Naïve trend follower
88	0.287	0.713	0.908	40	P7	Naïve and adaptive trend follower
89	0.996	0	0	41	P7	Naïve
90	0.999	0	0.685	42	P7	Naïve trend follower

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