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Macroprudential Policy in the Lab*

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Abstract

Higher capital ratios are believed to improve system-wide financial stability through three main channels: (i) higher loss-absorption capacity, (ii) lower moral hazard, (iii) stabilization of the financial cycle if capital ratios are increased during good times. We examine these mechanisms in a laboratory asset market experiment with indebted participants. We find support for the loss-absorption channel: higher capital ratios reduce the bankruptcy rate. However, we do not find support for the moral hazard channel. Higher capital ratios (insignificantly) increase asset price bubbles, an aggregate measure of excessive risk-taking. Additional evidence suggests that bankruptcy aversion explains this surprising result. Finally, the evidence supports the idea that higher capital ratios in good times stabilize the financial cycle.

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1 Introduction

The 2008 financial crisis led regulators to increase the capital requirements of financial institutions to reduce systemic risk (Hanson et al., 2011). Higher capital ratios are believed to improve system-wide financial stability through three main channels. First, they increase the loss-absorption capacity of banks. As a result, a negative shock is less likely to lead to bankruptcy. Second, they reduce moral hazard. Because financial institutions are protected by limited liability, they have an incentive to take excessive risks. Higher capital, however, should reduce excessive risk-taking because of the higher downside risk. Third, higher capital ratios in good times help dampen the financial cycle by limiting the capacity of financial institutions to invest more and thus amplify the cycle.

This paper proposes to study these mechanisms in a laboratory experiment. This approach has obvious limitations but it also has two unique advantages. First, we can exogenously vary the capital ratio for the whole economy. Thus, we can study how capital ratios affect aggregate variables such as bankruptcy rates or asset prices. A few studies have successfully identified exogenous variation in capital ratios using real-world data (Jiménez et al., 2017; Gropp et al., 2018), but the identification relies on comparing different institutions with different levels of capital ratios. Thus, they cannot study the effect of capital ratios on macro outcomes. Second, we can measure asset price bubbles because we know the fundamentals. Bubbles provide an aggregate measure of excessive risk-taking that is useful to study the moral hazard channel.

We conduct an asset market experiment in which indebted participants can trade assets at their desired prices. By varying the amount of debt, we also vary the capital ratio. We can then investigate whether the level of the capital ratio has an impact on trader behavior and on different measures of system-wide financial stability.

Our first finding is that higher capital ratios decrease the bankruptcy rate. While higher capital ratios increase the loss-absorption capacity of participants, the lower bankruptcy rate is not the mechanical outcome of exogenous shocks to the asset value, as is assumed in microprudential policy (Borio, 2003). Instead, participants become bankrupt as a result of their trading decisions and of their common exposure to asset price fluctuations.

Our second finding is inconsistent with the moral hazard channel. We do not observe a significant relationship between capital ratios and asset price bubbles. With higher capital ratios, limited liability implies a lower downside risk, which should increase risk-taking, potentially leading to asset price bubbles. While we do observe asset price bubbles at all levels of capital ratios, the size of bubbles (insignificantly) increases with capital ratios.

Why are investors not willing to trade at a higher price when they face less downside risk? Three facts suggest that participants behave more cautiously because they are averse to bankruptcy. First, the lower the capital ratio, the stronger the relationship between risk tolerance and asset prices. This fact suggests that participants perceive payoffs under lower capital ratios as riskier. As a result, risk tolerance plays a more important role in determining their willingness to pay for the asset. Second, we compare the behavior of bankrupt and solvent participants. Bankrupt participants have nothing to lose anymore and should thus take more risk. They should be willing to buy assets at higher prices and hold onto their assets. However, we observe the opposite. They are willing to pay less for the assets and sell more assets. Third, we implement a more positive framing with identical payoffs. Instead of having to repay debt, participants receive a bonus if their performance exceeds a certain threshold. We find that asset prices are higher in the bonus treatment. This result suggests that participants behave more cautiously when they can become bankrupt than when they can earn a bonus, even though the payoff structure is the same.

These results suggest that more convex incentives do not necessarily increase risk-taking. This is in contrast to findings from several earlier experimental asset markets that produced more risk-taking and larger asset price bubbles when traders were compensated with larger bonuses (e.g. James and Isaac, 2000; Isaac and James, 2003; Baghestanian et al., 2016). There are two main differences with our setup that may explain these differences. First, subjects start further away from the region where limited liability binds, which may mitigate moral hazard. Second, the negative framing associated with debt repayment and possible default may deter risk-taking compared to a framing with bonuses. The absence of a significant relationship between capital ratios and risk-taking also echoes the literature on banking regulation. Many theoretical models indeed find inconsistent or ambiguous effects, depending on the specifics of the environment (e.g. Koehn and Santomero, 1980; Rochet, 1992; Blum, 1999). See also VanHoose (2007) for a survey of this large literature. Relatedly, several micro empirical studies find negligible effects of capital ratios on bank risk-taking (e.g. Rime, 2001; Grill et al., 2015).

Our third finding is that higher capital ratios during good times help dampen the financial cycle. To obtain this result, we compare an environment in which capital ratios are kept constant when the asset price fluctuates (constant capital requirement) to an environment in which capital ratios increase with the asset price (countercyclical capital requirements). When asset prices increase, we either keep capital ratios constant by letting subjects take on more debt or we make capital ratios countercyclical by keeping debt constant and thus letting capital ratios increase. With constant capital ratios, bubbles are larger and inflate over time. By contrast, bubbles remain stable with countercyclical capital ratios, indicating a stabilization of the financial cycle. This result has a natural explanation. With constant capital ratios, higher asset prices increase the aggregate liquidity in the economy, which may fuel bubbles by increasing the cash-to-asset ratio (Caginalp et al., 2001). By contrast, countercyclical capital ratios stabilize aggregate liquidity and bubbles.

Our work is related to the following studies. Ackert et al. (2006) find that asset prices increase when participants can borrow. We extend this study along two main dimensions. When we compare different levels of capital ratios, we keep aggregate liquidity constant while they increase it. This first difference may explain why we do not observe a positive relationship between debt and asset prices. When we compare constant and countercyclical capital ratios, debt increases endogenously as a result of the evolution of asset prices while they consider an exogenous increase. Cipriani et al. (2018) study how the possibility to use some assets as collateral affects their price. They report that collateralizeable assets trade at a higher price than non-collateralizeable assets, in spite of identical payoffs. Füllbrunn and Neugebauer (2013) also study the role of limited liability on risk-taking, but in the context of a social dilemma. They find that participants behave in a socially responsible way when excessive risk-taking imposes losses on the group. Fischbacher et al. (2013) study the effect of monetary policy and liquidity requirements in an asset market experiment. They find that higher interest rates decrease liquidity but fail to contain asset price bubbles. They also find that announcing the possibility of higher reserve requirements can successfully deflate asset price bubbles. Finally, Meissner (2016) studies a consumption-saving experiment and finds that participants are reluctant to use debt to smooth their consumption, indicating debt aversion. Relatedly, we find that participants behave more cautiously when we use a debt framing.

The paper is organized as follows. Section 2 introduces the experimental design. Section 3 presents the results. Section 4 concludes.

2 Experimental Design

Environment. A group of subjects can trade in an asset market. Each subject receives an initial endowment of 5 assets and 1000 ECU (Experimental Currency Unit). There are 10 trading periods, each of which lasts 120 seconds. All the assets pay the same dividend at the end of the last period. Each asset pays a dividend of 200 ECU with probability 20% or of 75 ECU with probability 80%. The expected dividend is thus 100 ECU. Subjects can trade assets against ECU by posting bids or asks that can be seen by everyone (continuous multi-unit open book double auction). Interested subjects can then accept these offers. Short-selling and margin buying are not allowed. Portfolios are carried over from one period to the next.

	100% CR	50% CR	20% CR	Bonus	Constant CR
Debt	0	750	1200	(1200)	1200
Initial cash / asset endowment	1000 / 5	1000 / 5	1000 / 5	1000 / 5	1000 / 5
High dividend / low dividend	200 / 75	200 / 75	200 / 75	200 / 75	200 / 75
Prob. high dividend / low dividend	.2 / .8	.2 / .8	.2 / .8	.2 / .8	.2 / .8
Exchange rate (ECU/EUR)	180	90	36	36	36
Expected payoff in EUR	8.33	8.33	8.33	8.33	8.33
Number of sessions	7	7	7	7	7

Table 1: Summary of treatment parameters.

Table 1 summarizes the parameters of the environment and the treatment differences.

Capital Ratios. We first vary the level of debt that subjects had to repay at the end of the experiment. Within a session, all the subjects had to repay the same level of debt, which was either 0, 750, or 1200. Since the expected payoff of the starting portfolio is 1500 ECU, this corresponds to capital ratios of, respectively, 100%, 50%, and 20%. We vary the exchange rate across these treatments to ensure that subjects all have the same expected payoff before trading starts. See Table 1 for the specific exchange rates we used. In the treatment with a 100% capital ratio, payoffs depend linearly on the final ECU holdings. In the treatments with positive debt, subjects may default. If this happens, they are protected by limited liability, which limits their downside risk, as illustrated in Figure 1.

Bonus. This treatment has the same payoff structure as with a debt of 1200 but a different framing. Instead of having to repay debt, subjects receive a bonus if their final ECU holdings exceed 1200. This bonus is equal to their ECU holdings minus 1200.

Constant and Countercyclical Capital Ratios. In the treatments considered so far, we only set the initial capital ratio. If the asset price subsequently changes, the capital ratio also changes. For example, a higher price leads to a higher capital ratio. As a result, this environment can also be interpreted as an implementation of countercyclical capital ratios.

To study constant capital ratios, we slightly modify the environment. The initial conditions are the same as in the treatment with 1200 debt or 20% capital ratio. However, we now force subjects to maintain this capital ratio as asset values fluctuate. When the asset value of a participant increases, we also increase his debt. This increases their cash position as well as the debt they have to repay at the end of the experiment. If the asset value decreases, we force him to repay some of his debt and reduce his cash positions accordingly. In some cases, he may not have enough cash available to maintain his capital ratio. In these cases,

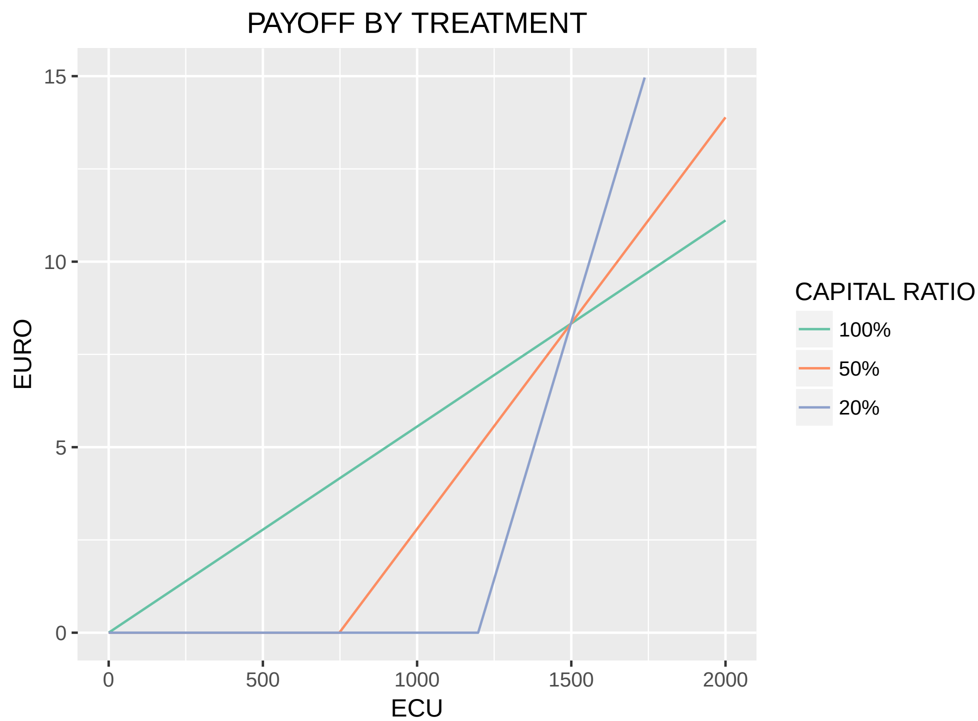

Figure 1: Conversion from ECU to EUR by treatment.

we keep things simple by taking all his cash and letting him operate at too low a capital ratio. We thought about implementing bankruptcy procedures for such cases to make sure that capital ratios really remain constant, but such an extension would have complicated the experiment. Although subjects can temporarily be below the desired capital ratio, we take all their cash and they can thus only sell assets, which is exactly what bankruptcy procedures try to achieve.

For example, consider a subject with an initial asset value of 1500, debt of 1200. The capital ratio is 20%. Assume that the asset value decreases to 1400, which brings the capital ratio to 14.3%. In this case, we take 400 of cash from the subject and reduce his debt position by 400. Asset value is now 1000, debt is 800, and the capital ratio is restored to 20%.

If the asset value increases to 1600, the capital ratio increases to 25%. In this case, we lend an additional 400 to the subject. Asset value increases to 2000, debt increases to 1600, and the capital ratio is restored to 20%.

An alternative implementation of the idea of constant capital ratios would be to let subjects decide on how much debt they would like to take. However, this would increase the complexity of the experiment and the benefits would be uncertain. Indeed, when the portfolio value decreases, we would have had to implement some punishments or fines to make sure that subjects reduce their debt. We can achieve a similar effect by directly reducing their debt. When the portfolio value increases, we impose subjects to take additional debt even though, they may not have wanted it. However, subjects could simply decide not to use this extra cash and thus act as if their level of debt was unchanged.

Ideally, our implementation of countercyclical capital requirements would more closely follow Basel III, which imposes banks to hold an additional countercyclical buffer when credit growth exceeds a certain threshold. Such an experimental setup would additionally require an explicit countercyclical buffer and a threshold above which this buffer would become effective. We did not implement these features to make the setup easier to understand for participants and to keep it closer to the existing literature.

Elicitation of Risk Preferences. We elicit risk preferences before the start of the asset market experiment with a simple investment task similar to Gneezy and Potters (1997). Subjects are endowed with 2 EUR of cash. They can invest a fraction of this amount in a risky project. The project either succeeds or fails with equal probability. The amount invested is doubled in case of success and is halved in case of failure. Project proceeds are paid together with the amount not invested. The success or failure of a project is announced to the subjects at the end of the experiment. The amount that subjects invest in the lottery gives us a measure of their risk tolerance.

Procedures. The experiments were conducted in the Frankfurt Laboratory of Experimental Economics (FLEX) during the Fall 2016 and Spring 2017. ORSEE (Greiner, 2003) was used to recruit subjects. We ran a total of 35 sessions, more specifically 7 sessions for each of the 5 treatments. The number of participants varied between 7 and 11 per session. A total of 229 subjects participated in the experiment. Each session lasted approximately 75 minutes. The experiment started after subjects read the instructions, answered a number of control questions that tested their understanding both of the investment game and of the market structure, and played three practice periods to familiarize themselves with the asset market. The investment game was conducted before the asset market, with instructions described on screen. Programming was done in z-Tree (Fischbacher, 2007). At the end of the experiment, subjects were called forward one by one and paid privately. The average payment was 15 EUR.

3 Results

3.1 Bankruptcy Rates

We first study the relationship between capital ratios and the bankruptcy rate. Higher capital ratios increase the loss-absorption capacity and should thus lower the chance of bankruptcy. We define a participant as bankrupt if he would be no longer able to repay his debt if his assets paid the low dividend. With a 100% capital ratio, participants do not have any debt to repay and thus cannot default. With a 50% capital ratio, 1% of participants are bankrupt. With a 20% capital ratio, this number increases to 21%. Thus, higher capital ratios are associated with a lower bankruptcy rate.

When they start the experiment, the asset value of participants is high enough to repay their debt even if their asset pays the low dividend. Participants are endowed with 1000 of cash and 5 assets. If these assets pay 75 each, total asset value becomes 1375, which is more than the highest amount of debt they may have to repay, which is 1200. Thus participants who end up bankrupt must have traded. In particular, paying more than 75 for the asset moves participants closer to bankruptcy. We indeed observe that bankrupt participants are net buyers of the asset and hold 8 stocks on average against 4 stocks for solvent participants.

3.2 Asset Prices

Figure 2 shows the evolution of average asset prices at different levels of capital ratios. The evolution of asset prices at the session level is presented in the Appendix. Asset prices overall lie between 110 and 130 and are thus higher than their fundamental value of 100, indicating bubbles in all treatments. Furthermore, the size of bubbles increases with the capital ratio. Asset prices with a 100% capital ratio are on average higher than asset prices with a capital ratio of 50%, which in turn are higher than asset prices with a 20% capital ratio.

To study the significance of these initial observations, we estimate a pooled OLS regression that relates average asset prices in a period/session to capital ratio dummies, where the omitted category is the 100% capital ratio. Standard errors are clustered at the session level. The results are displayed in column 1 of table 2. The coefficients on the capital ratio dummies are not significantly different from zero, suggesting no significant relationship between asset prices and capital ratios.

In column 2, we additionally control for the fraction of male subjects in a session and for risk tolerance, which is equal to the average fraction of the endowment invested during the risk preference elicitation task. On average, traders invested 64% of their initial endowment in the risky asset with a standard deviation of 26%. The coefficient on risk tolerance is large

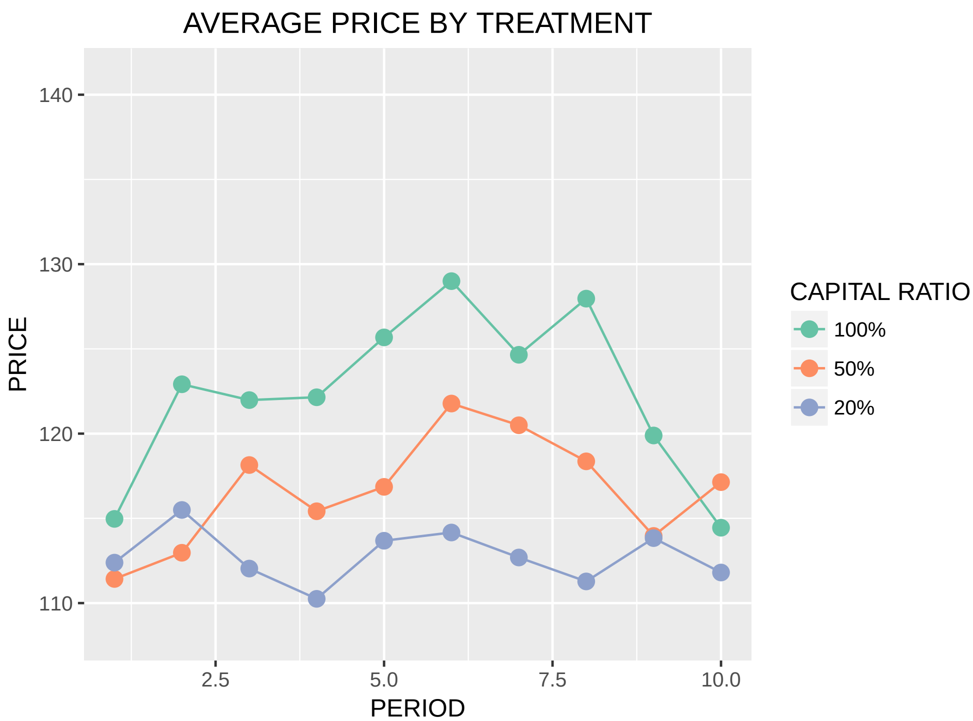

Figure 2: Mean session/period asset prices by treatment.

but insignificant. A 10 percentage point increase in risk tolerance increases prices on average by 2 ECU. This is consistent with the idea that more risk averse traders demand a higher risk premium. The coefficient on the share of male subjects is negative but insignificant. The coefficients on capital ratio dummies remain insignificant.

These initial results are surprising because we expected risk-taking to decrease with capital ratios. Investors are indeed more likely to benefit from limited liability if capital ratios are lower, which limits their downside risk, and should thus encourage risk-taking and increase asset prices. However, we observe the opposite. Asset prices increase with higher capital ratios, although this relationship is not significant.

A possible explanation for why asset prices increase with the capital ratio is that treatments with higher capital ratios move participants closer to the default region. The previous section indeed shows that default is more likely with lower capital ratios. As a result, participants may trade more cautiously if they are averse to bankruptcy. To explore this conjecture, we include interaction terms between treatment dummies and risk tolerance in column (3) of table 2. We expect that asset prices would increase more in treatments with lower capital ratios and with more risk tolerant market participants. The interaction between average risk tolerance and the 20% capital ratio dummy has a large and positive effect on asset prices, suggesting that a higher risk tolerance increases asset prices in this treatment. The coeffi-

	Asset prices		
	(1)	(2)	(3)
20% Capital Ratio	-3.101	-4.455	-38.08
	(0.649)	(0.556)	(0.375)
50% Capital Ratio	-5.493	-5.202	10.88
	(0.357)	(0.397)	(0.794)
Risk tolerance		20.49	
		(0.458)	
Fraction Male		-0.507	5.850
		(0.972)	(0.718)
20% CR*Risk Tolerance			63.16*
			(0.064)
50% CR*Risk Tolerance			-11.98
			(0.723)
100% CR*Risk Tolerance			15.45
			(0.788)
Constant	121.2***	108.7***	109.7***
	(0.000)	(0.000)	(0.005)
Observations	208	208	208
Adjusted R^2	0.015	0.027	0.063

Table 2: **Capital Ratios and Asset Prices.** The regressions use session/period level data for treatments with 100%, 50%, and 20% capital ratios. The dependent variable is mean price. The results are from pooled OLS regressions. In column (1), we only control for treatment dummies. Column (2) additionally controls for average risk tolerance measured as mean fraction invested in the investment task and for the share of male subjects. Column (3) controls for the interaction between the measure of risk tolerance and capital ratio dummies. Standard errors clustered at the session level in parentheses. Significance levels denoted by * p¡0.10, ** p¡0.05, *** p¡0.01.

cient is significant at the 10% level. A 10 percentage point increase in risk tolerance in this treatment increases prices by 6.3 ECU. By contrast, risk tolerance plays no significant role when capital ratios are 50% or 100%. These results suggest that low capital ratios discourage risk-taking in spite of the lower downside risk, because of the higher chances of default. This may in part explain why asset prices are lower when the capital ratio is low.

Behavior of bankrupt and solvent participants. We now compare the trading behavior of bankrupt and solvent participants. As before, we define a participant as bankrupt if he would no longer be able to repay his debt if the low dividend value realized. The moral hazard argument suggests that bankrupt participants should take more risk because they do not have any downside risk anymore. They should thus hold more assets and be willing to pay a higher price for these assets. We only study this conjecture using the treatment with 20% capital ratio because bankruptcies are sufficiently frequent there.

We study these questions using a fixed effect regression of different measures of trading behavior on a bankruptcy dummy. Fixed effects control for individual unobserved characteristics and let us evaluate whether participants behave differently when bankrupt. Table 3 presents the results.

Column 1 studies the effect of bankruptcy on the mean price that participants are willing to accept to sell assets in a given period. It shows that bankrupt participants are willing to sell at 5 ECU more than solvent participants, although this difference is not significant.

Column 2 studies the effect of bankruptcy on the mean price that participants are willing to pay for assets in a given period. Bankrupt participants are willing to pay 22 ECU less than solvent participants and this difference is significant at the 5% level.

Column 3 studies the effect of bankruptcy on the mean prices at which participants sold their assets in a given period. Bankrupt participants are able to sell their assets at 5 ECU more than solvent participants and this difference is significant at the 5% level.

Column 4 studies the effect of bankruptcy on the mean prices at which participants bought their assets in a given period. Bankrupt participants pay 4 ECU less for their assets, although the difference is not significant.

Column 5 studies the effects of bankruptcy on the net quantity of assets sold and bought within a period. This net quantity is equal to the difference between the number of assets bought and the number of assets sold by a participant. Bankrupt participants sell 1.2 assets more than solvent participants. This effect is highly significant.

Overall, these results suggest that once bankrupt participants do not take more risk than when they were solvent, even though it would be in their interest to do so. Once bankrupt, they buy assets at lower prices and try to get rid of their assets. A possible explanation is that participants are averse to bankruptcy.

Table 3: Trading Behavior and Bankruptcy

	(1) Ask	(2) Bid	(3) Sell P	(4) Buy P	(5) Net Q
Bankrupt	5.396	-22.80**	5.511**	-4.201	-1.241***
	(4.221)	(10.11)	(2.365)	(2.864)	(0.336)
Constant	142.4***	103.1***	115.9***	116.1***	0.252***
	(0.825)	(1.418)	(0.405)	(0.462)	(0.0682)
Observations	353	335	298	310	522
Adjusted R^2	-0.001	0.066	0.020	0.018	0.033

Table 4: **Trading and bankruptcy.** The regressions use individual level data of the treatment with a 20% capital ratio. The dependent variables are shown in the first column. *Ask* refers to the average price that a participant posted in a period to sell an asset. *Bid* refers to the average price that a participant posted in a period to buy an asset. *Sell P* refers to the average price at which a participant sold assets in a period. *Buy P* refers to the average price at which a participant bought assets in a period. *Net Q* is the difference between the number of assets bought and the number of assets sold by a participant in a period. All regression results include individual fixed effects. The independent variable in all regressions is a dummy variable indicating whether a subject is bankrupt at the beginning of a given period. Buy prices, sell prices, bids and asks are quantity weighted. Note that there is not an observation for every subject and every period, because not every subject engaged in either selling or buying each period. Standard errors clustered at the individual level in parentheses. Significance levels denoted by * p¡0.10, ** p¡0.05, *** p¡0.01.

Framing The previous analysis suggests that an aversion to bankruptcy may explain why participants do not take more risk when their capital ratio decreases even though it would be in their interest to do so. We further explore this conjecture by studying the role of framing in our experiment. We now tell participants that they will receive a bonus if their final payoff exceeds 1200 ECU and nothing otherwise. The bonus they receive is equal to their payoff minus 1200. Thus, payoffs are unchanged compared to the treatment with a debt of 1200. We expect this more positive framing to encourage risk-taking and thus to lead to higher asset prices.

Figure 3 shows the evolution of asset prices for the debt and bonus treatment. Since the bonus treatment has by construction the same payoffs as the treatment with 1200 of debt, we focus our comparison solely on this debt treatment. Asset prices are higher throughout the bonus treatment, starting with a value of approximately 140 before declining to values below 130. By contrast, asset prices in the debt treatment are lower at around 110 and stay roughly constant. This difference suggest that framing payoffs as a bonus encourages risk-taking, which in turn increases asset prices.

To study the significance of these initial observations, we estimate a pooled OLS re-

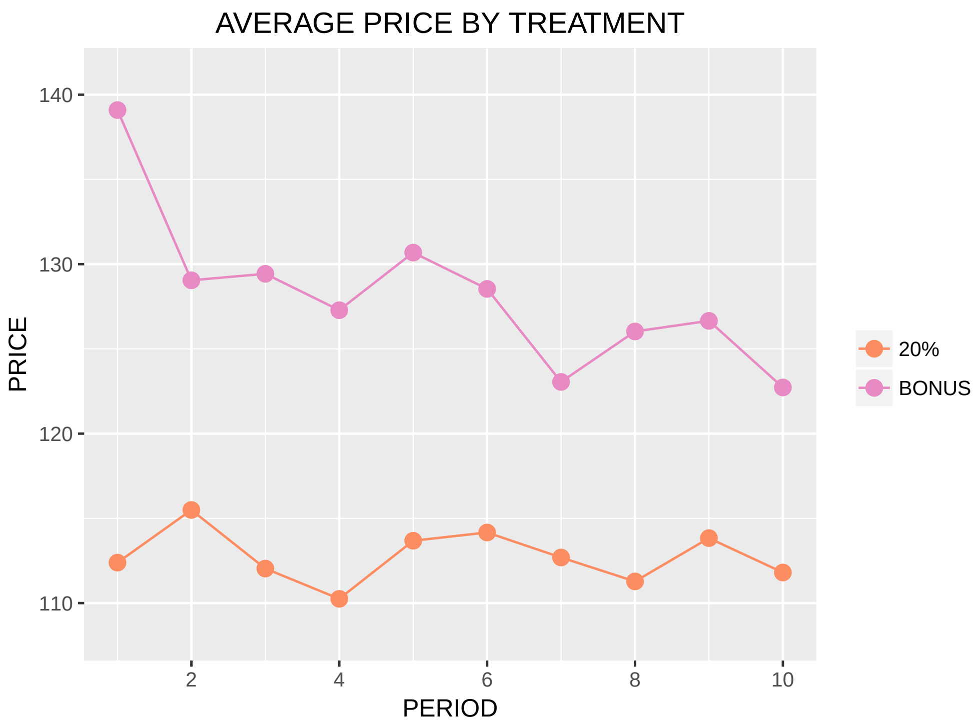

Figure 3: Mean session/period asset prices by treatment.

gression that relates average asset prices in a period/session to a bonus treatment dummy. The results are displayed in column 1 of table 5. The coefficients on the framing treatment dummy is positive and large, but it is not significantly different from zero. In column 2, we additionally control for risk aversion and the fraction of male subjects. These additional controls are not significantly related to asset prices. The treatment dummy, however, slightly increases to 12 ECU and becomes significant at the 10% level.

At first, our result that higher capital ratios fail to decrease asset prices is surprising. The combination of lower capital ratios and limited liability implies more convex incentives that limit the downside risk and should thus increase asset prices. Several studies have already shown that asset market experiments that increase the convexity of incentives through bonuses indeed lead to higher asset prices (e.g. James and Isaac, 2000; Isaac and James, 2003; Baghestanian et al., 2016). The results in this section suggest, however, that these results may be sensitive to how payoffs are framed. More specifically, more convex incentives framed as larger bonuses may encourage risk-taking while more convex incentives framed as higher payoffs after debt repayment may instead discourage risk-taking because they increase the chance of bankruptcy.

	Asset prices	
	(1)	(2)
Bonus	10.46	12.81*
	(0.148)	(0.085)
Risk tolerance		-5.576
		(0.856)
Fraction male		-19.74
		(0.160)
Constant	115.7***	127.2***
	(0.000)	(0.000)
Observations	137	137
Adjusted R^2	0.109	0.167

Table 5: **Framing and Asset Prices.** Regressions use session/period data from the treatments 20% capital ratio and framing. The dependent variable is mean prices. The results are from pooled OLS regressions. In column (1), we only control for a bonus treatment dummy. Column (2) additionally controls for average risk tolerance measured as mean fraction invested in the investment task and for the share of male subjects. Standard errors clustered at the session level in parentheses. Significance levels denoted by * p¡0.10, ** p¡0.05, *** p¡0.01.

3.3 Stabilization

We now study whether higher capital ratios in good times can stabilize the financial cycle. To this end, we compare asset prices with constant and countercyclical capital ratios. Note that the treatment on countercyclical capital ratios is the same as in the previous section with an initial ratio of 20%.

Figure 4 shows the evolution of average asset prices for countercyclical and constant capital ratios. With countercyclical capital ratios, asset prices stay roughly constant at 115. By contrast, asset prices with constant capital ratios are higher and are increasing over time from about 120 to about 130. This suggests that countercyclical capital ratios stabilize the financial cycle. Although bubbles do not disappear with countercyclical capital ratios, they stay relatively constant. By contrast, bubbles inflate over time with constant capital ratios, thus suggesting an amplification of the financial cycle.

To study the significance of these initial observations, we estimate a pooled OLS regression that relates average asset prices in a period/session to a constant capital ratio dummy, where the omitted category is the countercyclical capital ratio dummy. The results are displayed in column 1 of table 6. The coefficients on the constant capital ratio treatment dummy is positive and quite large, although it is not significantly different from zero. In column 2, we additionally control for risk aversion and the fraction of male participants. These additional controls are not significantly related to asset prices and do not change the size of the coefficient on the constant capital ratio treatment dummy. In column 3, we addition-

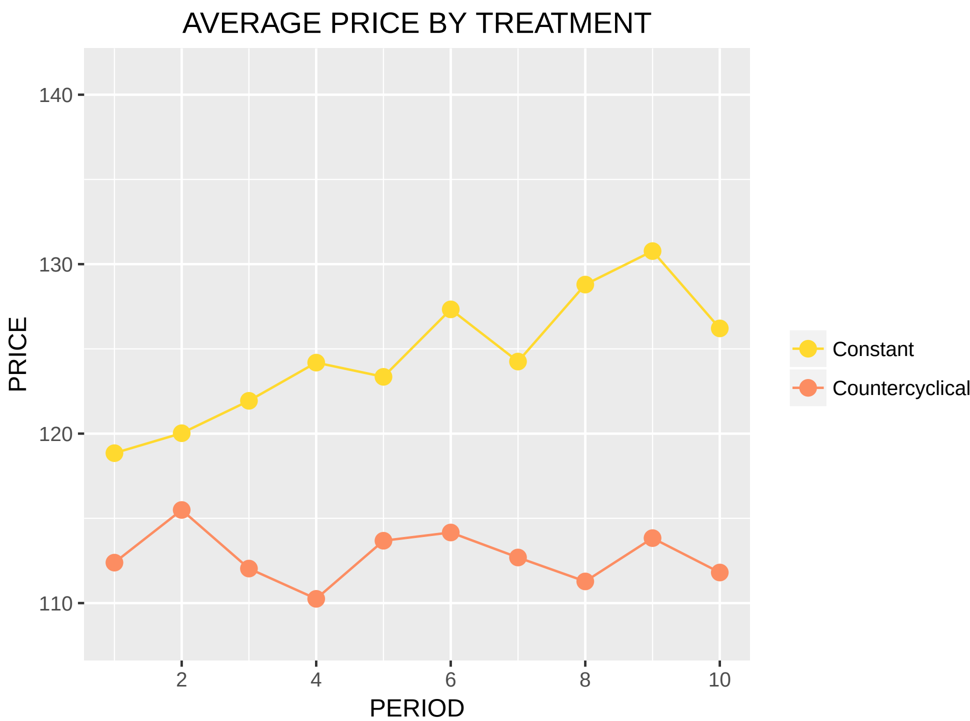

Figure 4: Mean session/period deviation from FV by treatment.

ally control for the interaction between period and each treatment dummy. The interaction between period and constant capital ratio dummy is positive and significant, indicating a positive trend in asset prices, as already observed in the previous figure. Each period, asset prices increase by about 1.1 ECU. By contrast, the interaction between countercyclical capital ratio and period is insignificant and close to 0. This confirms the initial observation that asset prices remain stable with countercyclical capital ratios.

The main difference between constant and countercyclical capital ratios is that the cash to asset ratio increases with constant capital ratios. As asset prices increase, subjects are given additional cash while the quantity of assets in the economy stays constant. A well-known result in the literature is that a higher cash-to-asset ratio increases asset prices (Caginalp et al., 2001) and a similar mechanism may be at work in our setup. This would explain why we observe a positive trend in asset prices with constant capital ratios. Since the asset prices are higher than the fundamental value in the first period, subjects receive additional liquidity compared to the countercyclical capital ratio treatment. This additional liquidity in turn increases asset prices. This creates a spiral where higher prices increases aggregate liquidity, and higher liquidity increases prices. With countercyclical capital ratios, by contrast, higher asset prices do not increase aggregate liquidity. This stabilizes asset prices.

	Asset prices		
	(1)	(2)	(3)
Constant capital ratio	7.981	65.58	60.10
	(0.225)	(0.201)	(0.220)
Risk tolerance		10.24	10.24
		(0.775)	(0.777)
Fraction male		38.49	38.49
		(0.246)	(0.249)
Countercyclical CR*Period			0.110
			(0.862)
Constant CR*Period			1.107**
			(0.033)
Constant	118.1***	92.21***	91.60***
	(0.000)	(0.007)	(0.008)
Observations	140	140	140
Adjusted R^2	0.074	0.155	0.169

Table 6: **Countercyclical and Constant Capital Ratios.** Regressions use session/period data from the treatments high leverage and framing. The dependent variable is mean prices. The results are from pooled OLS regressions. In column (1), we only control for treatment dummies. Column (2) additionally controls for average risk tolerance measured as mean fraction invested in the investment task and for the share of male subjects. Column (3) controls for the interaction between period and capital ratio dummies. Standard errors clustered at the session level in parentheses. Significance levels denoted by * p¡0.10, ** p¡0.05, *** p¡0.01.

4 Conclusion

We study macroprudential policy in a laboratory asset market experiment. We find that higher capital ratios reduce the bankruptcy rate, consistent with a higher loss absorption capacity.

Furthermore, we do not find that higher capital ratios limit moral hazard. This result is surprising because higher capital ratios increase the skin in the game and should thus decrease moral hazard. We proposed several facts consistent with the following explanation. If participants dislike being bankrupt, higher capital ratios may lead participants to trade at lower prices because they increase the chance of bankruptcy.

Finally, we find that higher capital ratios in good times stabilize the financial cycle. This is because when asset prices increase, constant capital ratios increase aggregate liquidity, which in turn encourages risk-taking and increases asset prices. By contrast, letting capital ratios increase when asset prices increase stabilizes the supply of liquidity and thus asset prices.

Overall, our results contribute to the literature on banking regulation. We find evidence consistent with the widely held view that higher capital ratios increase the loss absorption capacity and that countercyclical capital ratios can help stabilize the financial cycle. However, our results shed new light on the moral hazard mechanism by suggesting that limits to downside risk may not encourage risk-taking. Finally, our experimental setup could be extended by studying additional policies that also limit the downside risk, such as deposit insurance or bailouts.

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Appendix: Additional Figures

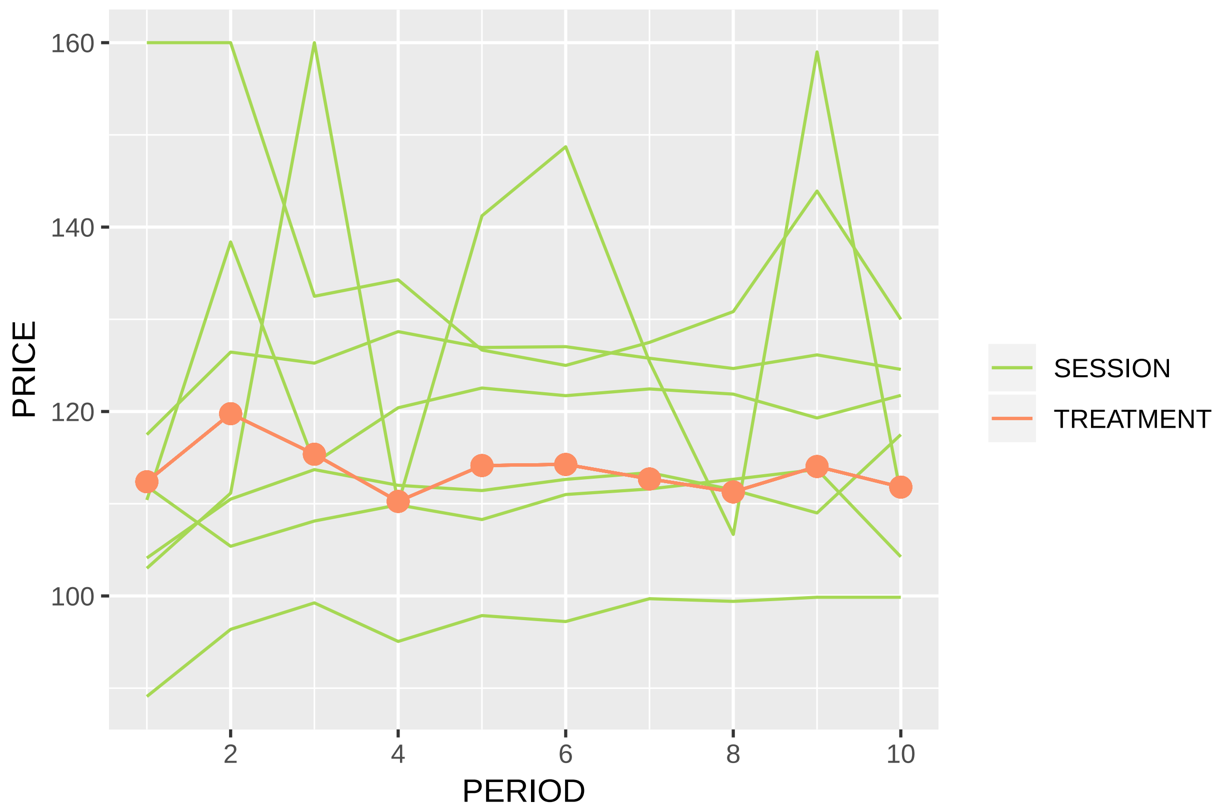

Figure A.1: Mean period/session prices - 20% Capital Ratio

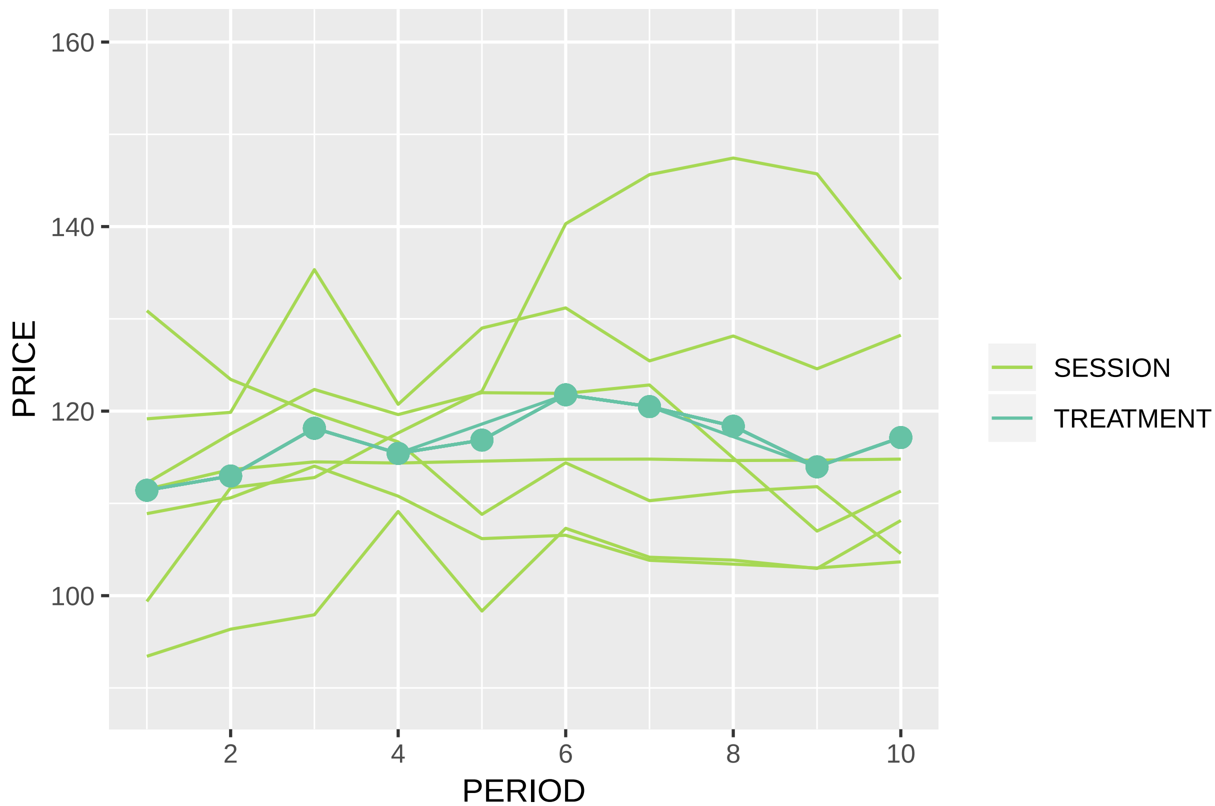

Figure A.2: Mean period/session prices - 50% Capital Ratio

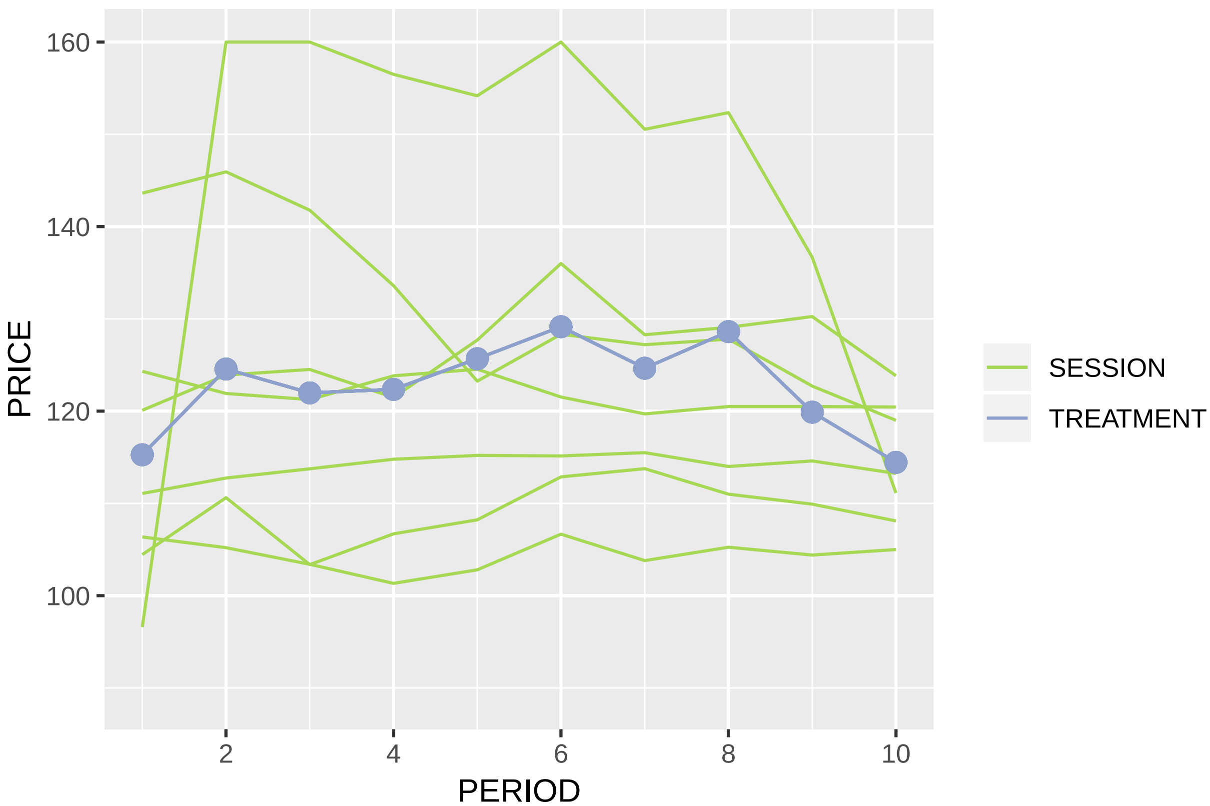

Figure A.3: Mean period/session prices - 100% Capital Ratio

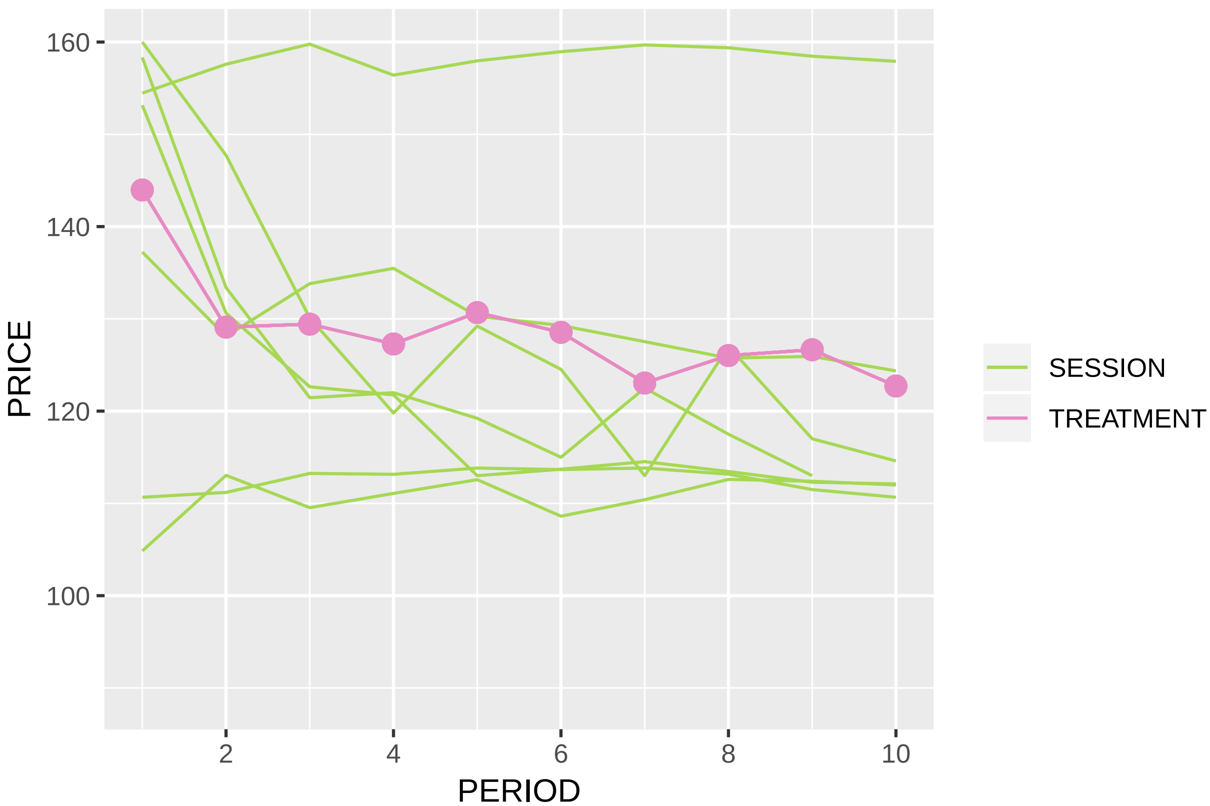

Figure A.4: Mean period/session prices - Bonus

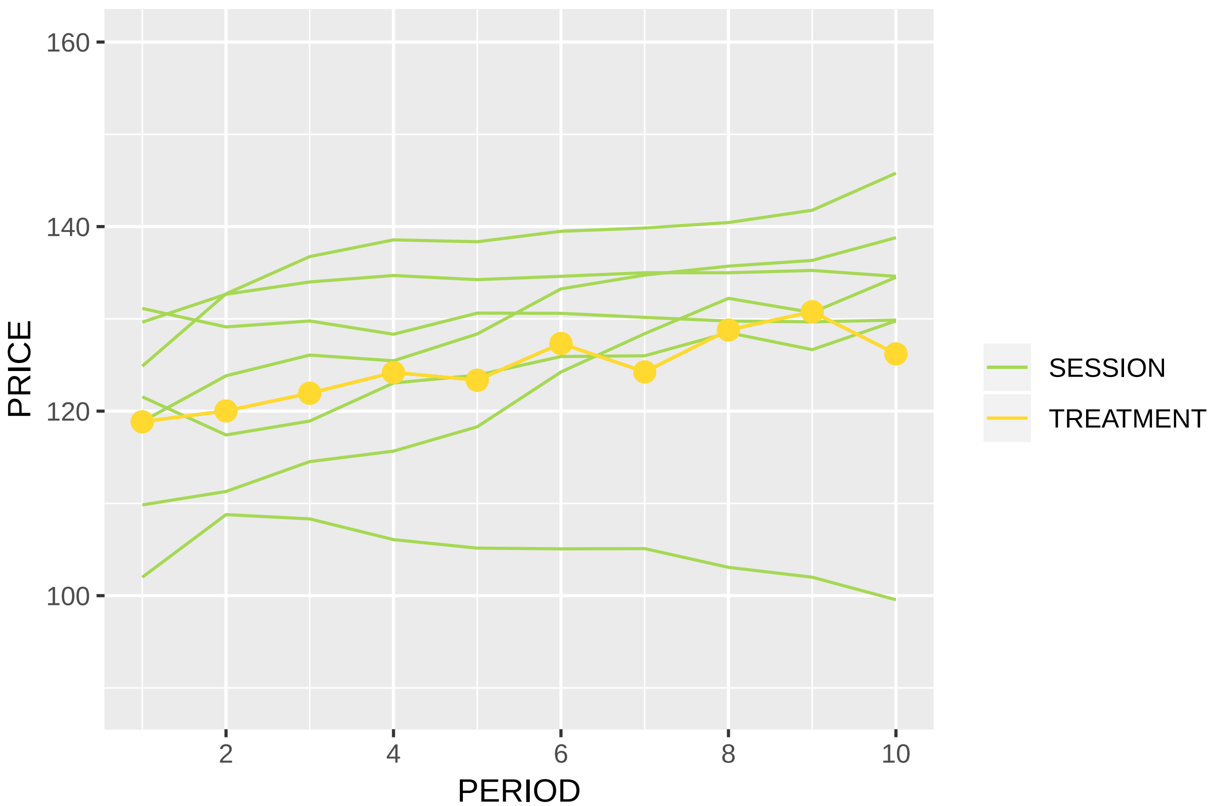

Figure A.5: Mean period/session prices - Constant Capital Ratio

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