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Security Returns and Tax Aversion Bias: Behavioral Responses to Tax Labels*

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Abstract

This paper studies behavioral responses to taxes in financial markets. It is motivated by recent puzzling empirical evidence of taxable municipal bond yields significantly exceeding the level expected relative to tax exempt bonds. A behavioral explanation is a tax aversion bias, the phenomenon that people perceive an additional burden associated with tax payments. We conduct market experiments on the trading of differently taxed and labeled securities. The data show an initial overvaluation of tax payments that diminishes when subjects gain experience. The tax deduction of expenses is valued more than an equivalent tax exemption of earnings. We find that the persistence of the tax aversion bias critically depends on the quality of feedback. This suggests that tax aversion predominantly occurs in one-time, unfamiliar financial decisions and to a lesser extent in repetitive choices.

Keywords: Behavioral finance, Behavioral taxation, Investor psychology, Tax aversion, Experiment

JEL classification: D03 · G32 · H20 · H3

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1 Introduction

Standard financial theory views taxes as transaction costs without any direct benefit to its payers. In contrast, the psychological literature reports that taxes are expenses which induce the arousal of various feelings (e.g. Kirchler 1998). A recent puzzling result is reported by Ang et al. (2010). These authors show that yield premiums of taxable municipal bonds significantly exceed the level expected relative to comparable tax exempt bonds. This finding results in implicit tax rates that are significantly above the statutory tax rates of investors. Ang et al. (2010) propose two alternative explanations of this tax premium puzzle. A rational story is that the yield premiums represent an inconvenience yield demanded by investors to deal with the additional complexity of taxes. A behavioral explanation is a tax aversion bias, the phenomenon that people may perceive an additional burden associated with tax payments compared to economically equivalent payments labeled differently.

Following the empirical result of Ang et al. (2010), this article deals with the tax aversion bias in financial decision making. We study how tax aversion affects the behavioral responses to differently taxed securities. The current evidence of tax aversion is limited to survey studies and environmental economics. To overcome this objection, we conduct two laboratory market experiments about the pricing of differently taxed securities with related and appropriate rewards. To this end, we study whether or not different labels distort the yield difference between tax-favored and disfavored securities. The experimental design controls for the inconvenience of tax calculation. This permits to test whether a yield premium of tax-disfavored securities is due to a tax aversion bias or an inconvenience yield.

Due to the sophistication of today's financial market, we do not presume that tax aversion impacts most investment decisions. However, we believe that in case of infrequent or even once in a lifetime financial decisions of inexperienced market participants with non-existing competitive market prices, investors are often unaware of the correct after-tax optimization strategy. Examples of this kind of decision are found in the case of individual investments in tax-favored, illiquid securities such as exotic closed-end funds. Another example are life insurances or temporary investment tax relief measures and incentives granted by the government. In this case, individual investors may irrationally focus on tax minimization rather than considering solely the net returns and investment risk. Therefore, the focus of this study is in particular on inexperienced decision makers and the determinants of learning effects.

Our experimental design is based on Miller's model of optimal capital structure

(Miller 1977). This study constitutes a standard capital market equilibrium model that includes corporate and personal taxation (for an overview, see Graham 2003). In the model companies can choose whether they finance their real investments either with fully taxable or with tax-favored securities. Correspondingly, investors can purchase either fully taxable or tax-favored securities. The experimental differentiation between buyers and sellers of securities enables us to investigate whether the degree of tax aversion differs if one is expecting a tax deduction of an expense (company) or a tax exemption of earnings (investor) upon trading differently taxed securities. In addition, the usage of an efficient market setting allows us to track learning effects on responses to taxes. Thus, we can analyze whether tax aversion remains, given appropriate feedback, a competitive market setting and clear financial incentives, or diminishes over time with increasing experience in the experiment.

The experimental results show that in initial periods individuals price tax aversion in the trading of financial securities. This distorts the yields of differently taxed securities. In addition, our results show that a tax deduction of expenses for tax purposes is valued more than an equivalent tax exemption of earnings. We find, however, that the tax aversion bias diminishes and eventually disappears with increasing experience in the experiment. We attribute this to learning effects and conclude that tax aversion predominantly occurs in one-time, unfamiliar financial decisions and to a lesser extent in repetitive choices. In addition, we show that individual learning effects critically depend on the kind of feedback received. The tax aversion bias is more persistent with reduced quality of competitive market feedback.

The paper proceeds with a discussion of the tax aversion bias and related effects. Afterwards, we develop our hypotheses which are subsequently tested in two market experiments. We discuss the results in the final section.

2 Earmarking, tax aversion and tax labeling effects

Tax aversion refers to an additional burden associated with tax payments compared to economically equivalent payments labeled differently (McCaffery and Baron 2006, Fennell and Fennell 2003). The bias represents different economic behavior depending on the framing or representation of a payment – the labeling with the loaded term tax rather than a neutral term. This is inconsistent with standard economic theory, as it should not matter how a particular payment is labeled as long as it does not change the

economic impact, meaning the payment equivalent that is imposed on individual wealth.[1] The origin of tax aversion can be attributed to a negative attitude towards taxes: some people strongly dislike paying taxes (Kirchler 1998, Schmölders 2006, Hill 2010). One psychological explanation is that tax aversion results from the identifiability effect and the non-affectation principle: in contrast to fees, there is no tax revenue assignment to a specific spending purpose: the revenue use from the individual tax payment is not identifiable. As Loewenstein et al. (2006) note, humans respond stronger to identifiable effects than to statistical ones. This implies that the non-salience of tax revenue use may affect the level of tax sympathy.

The camouflaging of taxes under other names as an instrument for politicians to reduce the perceived tax burden is recommended in the economic literature as early as 1902 (Schmölders 1959). The postulated interrelation between the label "tax" and the perceived burden implicitly assumes the tax aversion of the voting individuals. It implies that a strategy of labeling taxes differently and strategically earmarking taxes could significantly increase the acceptability of a tax (Hundsdoerfer et al. 2010, Kallbekken et al. 2010, Löfgren and Nordblom 2009). Until recently, however, there existed no empirical evidence that tax labeling affects taxpayers' choices. McCaffery and Baron (2006), and Hardisty et al. (2010) identify label effects based on survey data. The first study finds that individuals prefer to pay fees rather than taxes for social services. The latter show a higher air travelers' preference for an optional surcharge labeled a "carbon offset" than for surcharge labeled a "carbon tax". These cited studies indicate the existence of tax aversion. Yet they are based on preference measurement or hypothetical choices. Only Kallbekken et al. (2010, 2011) use economic incentives to control for subjects' preferences. They show experimentally a higher opposition against the introduction of a Pigouvian tax and lump-sum redistribution with a tax label than with a fee label. However, those studies focus on the special context of external effects and voting on the introduction of an earmarked Pigouvian tax and a redistribution scheme while there is commonly no direct benefit for taxpayers that can be attributed to taxes paid on financial transactions.

The experimental test of differently taxed securities relates our study to Collins and Murphy (1995), Murphy and Collins (1995), Anderson and Butler (1997) and Boylan and Frischmann (2006). These authors show experimentally that investors trading differentially taxed securities achieve nearly competitive equilibrium prices as predicted

[1] Tax aversion refers to a misvaluation of transparent taxes. The tax aversion bias must be separate from those misvaluations due to an intransparancy or low salience of taxes (e.g. Sausgruber and Tyran (2005) for hidden taxes and Chetty, Looney and Kroft (2009) for salience effects).

by traditional economic theory, although not before a long learning period. However, these studies avoid the word tax in their experimental settings. Instead, they use the term "management fee". The exception is Boylan and Frischmann (2006) that use tax terms in their experiment. However, they do not control for neutral terminology. Thus, they are not able to identify if their results are (partially) affected by an inconvenience yield or tax aversion. In addition, the studies to date solely consider the behavior of taxed investors (buyers of securities). Financing decisions (selling securities) have been disregarded.

We see two further limitations in previous tax aversion research. First, possible learning effects are neglected. Labeling effects possibly only exist when people are confronted with a new choice for the first time. It is unlikely that the effect can still be observed when people become familiar with a decision and its payment impact. There is broad evidence that biases in financial decision making diminish and eventually disappear with increasing experience and learning (e.g. empirically List 2003, Feng and Seasholes 2005). There is also broad experimental evidence of learning with repetitive decisions (e.g., Haigh and List 2005, Sausgruber and Tyran 2005, Boylan and Frischmann 2006).

Learning effects are critical to understand how the negative attitude towards taxes results in a behavioral response to tax labels. One explanation is based on a heuristic: Some individuals react intuitively to the label tax rather than deciding based on exact calculations. McCaffery and Baron (2006) argue that several characteristics of taxation make tax heuristics likely: complexity, a low benefit to achieve full understanding and absence of any de-biasing mechanism. Individuals re-evaluate the use of a heuristic in repetitive choices before they apply it routinely (Gigerenzer 2008). This means, if tax aversion is based on a heuristic, learning will likely mitigate the behavioral response. An alternative explanation is based on specific, stable preferences for tax payments and savings relative to other payments, i.e., tax payments have different weights in the utility functions and tax aversion is thereby relatively constant and less affected by learning.

Despite this point, the current tax aversion studies offer mainly "one shot" evidence. Most financial decisions with a tax impact are, however, naturally re-ocurring and therefore include substantial chances to learn. Ignoring these learning opportunities bears the danger of strongly overrating the effects of labeling in the real world. For example, in the case of Hardisty et al. (2010), labeling an airline ticket surcharge as a carbon offset might not make a difference for frequent flyers.

The second limitation is a lack of research done on the potential difference of tax aversion between frames of receiving a tax exemption of earnings and a tax deduction of expenses. Research on reference point effects suggests that such a difference could exist.

Tversky and Kahneman (1991) show that losses have a greater impact on preferences than gains. In a finance context, Lozza et al. (2010) find that subjects assess the value of a fiscal bonus higher if it is framed as the reduction of a loss ("reduction in the amount of tax due") rather than as a gain ("increase in income") and that they are willing to save more money in the former case. However, Hundsdoerfer and Sichtmann (2009) do not find evidence regarding a tax reference point effect.[2]

In sum, research on tax aversion is rare. The few existing studies indicate a substantial percentage of tax-averse people. However, it is unclear

- whether tax aversion affects non-hypothetical investment and financing decisions.
- whether tax aversion remains effective if individuals have the opportunity to learn.
- if the degree of tax aversion depends on taxing a gain or a loss.

3 Model and hypotheses

In this section we briefly introduce the framework underlying our experimental design and derive our hypotheses. The framework is based on a simple economic model related to Miller's analysis of optimal capital structure (Miller 1977). We assume investors who maximize their utility function subject to a budget constraint M. C_0, C_1 denote the investors' consumption at time t=0,1. At t=0, the investors decide how much they consume today and whether they buy securities to finance their future consumption at t=1. We assume two differently-taxed riskless securities which we denominate for illustrative reasons equity and debt. The results can, however, be generalized for other types of differently taxed securities. Both securities are traded on a perfect capital market and promise a certain return R_D, R_E. The debt return is subject to a proportional income tax rate τ_i, with $0 \leq \tau_i < 1$. Income tax rates differ between investors. In contrast, the return of equity is tax exempt. The investors' optimization problem can be formalized as follows:

$$max U(C_1, C_2) \tag{1}$$

$$s.t.\ M = C_0 + n_E P_E + n_D P_D$$

[2]Note, that the results of Lozza et al. (2010) and Hundsdoerfer and Sichtmann (2009) can also be interpreted in the light of tax aversion. In the first case, tax aversion would imply that a tax reduction is perceived as more valuable than an equivalent increase in income. Moreover, tax aversion would lead to an overweighting of taxes in decision making (in the second case). However, because of the design of both studies, i.e. the use of tax terms only, it is impossible to identify whether their results are driven by tax aversion.

$$C_1 = n_E P_E(1 + R_E) + n_D P_D(1 + (1 - \alpha_i)\tau_i R_D)$$

where n_E, P_E, R_E (n_D, P_D, R_D) denote the number, the price, and the return of equity (debt). Note, that the tax rate τ_i is multiplied with a tax aversion parameter $\alpha_i \geq 0$. If $\alpha_i > 0$, taxes have a greater impact on utility than do other payments, i.e., the individual is tax-averse.

The solution of the corresponding Lagrange function results in the following first order conditions:

$$U'_{C_0} - \lambda = 0 \tag{2}$$

$$U'_{C_0} P_E(1 + R_E) - \lambda P_E = 0$$

$$U'_{C_0} P_D(1 + R_D) - (\lambda P_D(1 + R_D) - (1 - \alpha_i)\tau_i R_D) = 0$$

Rearranging (2) leads to:

$$R_D = \frac{R_E}{1 - (1 + \alpha_i)\tau_i} \tag{3}$$

As one can see from Equation (3), tax aversion ($\alpha_i > 0$) leads to a higher required debt return because investors demand a compensation not only for the tax burden itself, but also for the additional burden they perceive in paying taxes. Contrary to the original Miller model, the individual tax rate alone does not determine the investor clientele: Investors with different tax rates could both be marginal investors if the tax rate difference between them is outweighed by the tax aversion difference. The investors' optimum condition implies a specific relation between debt and equity return that can be fulfilled only for specific tuples of the tax aversion parameter and the income tax rate $(\alpha_i, \tau_i)^*$. Investors with $(\alpha_i, \tau_i)^*$ are called marginal investors; they are indifferent between debt and equity investments. Investors with a tax rate $(\alpha_i, \tau_i) < (\alpha_i, \tau_i)^*$ $[(\alpha_i, \tau_i) > (\alpha_i, \tau_i 0^*)]$ are inframarginal investors who solely purchase debt (equity).

On the other side, there are financial managers of companies seeking financing means (sellers of securities) that aim to minimize their costs of capital. To this end, they can choose to sell either debt or equity securities. Whereas the costs of equity are non-deductible for tax purposes, the costs of debt are fully deductible. If τ_c presents the uniform income tax rate and $\alpha_c \geq 0$ denotes the financial managers' tax aversion parameter, the objective function is given by Equation (4):

$$Min[R_E; R_D - (1 + \alpha_c)\tau_c R_D] \tag{4}$$

If both equity and debt securities are traded on the capital market, equilibrium requires

$R_E = R_D - (1 + \alpha_C)\tau_c R_D)$. Otherwise, financial managers would sell either debt or equity, exclusively. Thus, it is obvious from Equation (4) that financial managers are paying the following return on debt:

$$R_D = \frac{R_E}{1 - (1 + \alpha_c)\tau_c} \tag{5}$$

From Equation (5), it becomes clear that tax aversion on the sellers' side (α_c>0) leads to higher yields for debt, as tax-averse financial managers perceive an additional utility by reducing their tax burden through debt financing. Thus, we see their willingness to pay for debt increases (compared to financial managers with no tax aversion, i.e., α_c=0). Contrary to the original Miller model, given a specific relation of R_D and R_E, the demand of financial managers is heterogeneous. The financial managers' optimum condition implies a specific relation between debt and equity return that can be fulfilled only for a specific tax aversion parameter α_c*. With $\alpha_c = \alpha_c$*, financial managers are indifferent between equity and debt. Financial managers with $\alpha_c > \alpha_c$* ($\alpha_c < \alpha_c$*) prefer solely debt (equity).

We obtain the following predictions: Tax aversion leads to a higher required debt return because investors demand a compensation not only for the tax burden itself, but also for the additional burden they perceive in paying taxes. On the other side, there are financial managers of companies seeking financing means (sellers of securities) that aim to minimize their costs of capital. To this end, they can choose to sell either debt or equity securities. Whereas the costs of equity are non-deductible for tax purposes, the costs of debt are fully deductible. Tax aversion on the sellers' side leads to higher yields for debt, as tax-averse financial managers perceive an additional utility by reducing their tax burden through debt financing. Thus, we see their willingness to pay for debt increases.

In sum, tax averse investors require a debt premium and tax averse sellers are willing to pay a debt premium. We formulate our first hypothesis (H1):

Hypothesis 1 *Tax aversion increases the debt return.*

Regarding reference point dependency, financing and investment are two sides of the same coin. They only differ in the algebraic sign of the related cash flow stream. From a traditional economic viewpoint, there exists no reason why different descriptions should matter ("descriptive invariance"). Taxation of a negative cash flow stream (financing) implies a reduction of a "loss", whereas taxation of a positive cash flow stream (investing) leads to a reduction of a gain. As noted in the previous section, research on reference

point effects suggests that losses have a greater impact on utility than gains. In this context, we expect a higher behavioral response to tax labels in case of a tax deduction of expenses than in the case of a tax exemption of earnings. To investigate reference point dependency, we formulate our second hypothesis (H2):

Hypothesis 2 *The effect of tax aversion is higher for a tax deduction of expenses than for a tax exemption of earnings.*

To investigate whether tax aversion will be reduced and eventually disappears as a result of learning effects and increasing experience in competitive markets, we formulate the third hypothesis (H3):

Hypothesis 3 *With sufficient opportunity to learn, the effect of tax aversion diminishes with increasing experience.*

4 Experiment 1

4.1 Sample and design

We conduct two lab experiments. The first experiment tests our three hypotheses employing an experimental market with trading of differently taxed and labeled securities. The second experiment uses a modified design to examine the importance of the competitive market feedback on the persistence of tax aversion with regard to learning effects.

In the first experiment, we use a 2x2 between-subject design. The observed variable is the rate of return for a security which we denominate debt for illustrative reasons. In the experiment, we avoid terms such as debt, equity or interest rates. Instead, we use the terms "yellow" and "blue" securities and security returns. The treatment variables are as follows: first, the label that we use to describe costs that occur with regard to financing/investment activities in the experiment and, second, the reference point. The label variable has two levels: "tax" and "transaction cost". Taxes are usually regarded as transaction costs in financial economics (Collins and Fabozzi 1991), and in our understanding, this term is best suited as a neutral term without any negative connotation for individuals. The complexity of calculating the tax burden / the transaction costs is identical in both treatments. Thus, we control for the argument made by Ang et al. (2010) that abnormally high yields of taxable securities could be due to the complexities of calculating the tax liabilities. Therefore, comparing the tax and transaction cost treatments allows for identifying whether the results are affected by the label "tax" because of tax aversion. The reference point variable has the levels "financing" and "investment",

which we use to study whether the degree of tax aversion depends on the algebraic sign of the cash flows. In the investment treatments, we differentiate three different income tax brackets to reproduce heterogeneity of investor taxation and the context of the Miller model.

The subjects, 110 undergraduate business and economics students of the European University Viadrina in Frankfurt (Oder), Germany, are randomly assigned to four separate treatments (see table 1). We conduct financing treatments in six sessions with five subjects, whereas we conduct investment treatments in three sessions with nine subjects (to have three specific tax rates with three subjects assigned to each).[3] The larger subject number in the investment treatments ensures competition within tax brackets.

[table 1 about here]

All sessions consist of three unrewarded training periods and seven rewarded market periods. We retain all variables and roles throughout the experiment. In each period, the subjects' task is to trade a risk-free debt security. The subjects choose the debt return and the number of debt securities traded during each period. Each subject in the investment (financing) treatment can purchase (sell) three (five) securities per period. If subjects decide to trade fewer units of debt than the maximum, an equity security will automatically be purchased (sold) at the end of each period. The equity return is given with 7% throughout all periods and is not subject to income tax in the investment treatments, and respectively, is not tax-deductible for income tax in the financing treatments. Subjects in the financing treatments are subject to an income tax rate of 30%. Participants in the investment treatments are randomly assigned to three tax brackets: 10%, 30% and 50%. The trading mechanism is a single auction, wherein subjects make their offers as integers that are contingently accepted by a pseudorandomized, computer-automated other party. The automated trading mechanism is pre-determined and implemented equally across all sessions to ensure comparability between treatments. It is programmed to accept bids after a short time lag, when an acceptation would give zero or positive profit. Subjects are not informed that they deal with an automated other party. To make the acceptation of bids unpredictable for subjects, a significant share of the acceptation levels is pseudorandomized with the addition of a disturbance term with

[3]Due to circumstances beyond the authors' control, only eight subjects participated in one tax and one transaction cost investment session and seven subjects participated in one tax investment session. We decreased the number of high tax investors to two subjects in this case. In the one case with seven subjects we decreased the number of low-tax investors to two subjects. This does not change the theoretical predictions and has been considered in the subsequent analysis. It had no significant effect on the experimental results and has not impaired the experimental design's ability to test our hypotheses.

zero mean.[4]

The experiment is computerized with the help of the experimental software Z-Tree, developed by Fischbacher (2007). Instructions and screenshots of the trading screen are provided in Appendix B. Subjects are rewarded according to their earned after-tax profit at the end of the experiment. To this end, subjects in the financing treatments are told that each of the securities sold is used to finance a real investment project with a pre-tax rate of return amounting to 20%. This real investment does not change the optimal consideration; however, it permits the yield of sold securities to be deducted from a positive base return. Doing this, minimization of financing costs maximizes at the same time the overall positive yield and subjects can be rewarded accordingly.

The after-tax profit from the sale of one debt security with return R_D is 0.2(1 - 0.3) – R_D(1 – 0.3) and the profit from the sale of one equity security is 0.2(1 – 0.3) – 0.07. The after-tax profit from a purchase of one security is R_D (1 - τ_i) for debt or 0.07 for equity. The reward exchange rate is 2.50 euro each period, for an average profit of 0.10 in financing treatments, and for mid-taxed and high-taxed investors in the investment treatments, and is 2.00 euro for low-taxed investors.[5] The average reward is 13 euro for an experiment with a duration of 45 minutes. Trading rules follow the requirements to produce competitive market outcomes: Tax rates and reward exchange rates are private information of subjects; information of offers and trades are public information; and trading rules are an auction process as a market institution.

We provide written instructions before the experiment and subjects have the chance to discuss ambiguities privately with instructors. We request that all subjects fill out a computer-based questionnaire after each experiment in which subjects declare a sufficient degree of understanding of 4.4 points on a scale from 0 (no comprehension) to 7 (complete comprehension). Assigned roles are private; subjects do not have the chance

[4]Each period is divided in discrete sub-periods. During a period, the sub-periods start and end one after another. We determine an array of benchmark returns with a number of entries equal to the number of subperiods. The exact distribution of elements (benchmark returns) within the array is as follows: a benchmark return of 10% for 34% of elements; a benchmark return of 9% and 11% in 19% of elements; a benchmark return of 8% and 12% in 9% of elements; a benchmark return of 7% and 13% in 5% of elements. The average benchmark return equals the predicted level of return (10%). The elements are randomly allocated to the sub-periods. In each sub-period, the algorithm compares the most attractive return offered by the subjects with the benchmark return. A trade is initiated if the offered return is favorable or equal relative to the benchmark return, i.e. higher or equal in case of automatic investors and lower or equal in case of automatic financial managers. Otherwise, nothing is done at this point. After this comparison, the sub-periods end and the next sub-period starts.

[5]Exchange rates differ to ensure approximately equal expected rewards for all subjects. Debt is expected to be traded at a price premium determined by the tax rates of the marginal investor. If low tax investors purchase debt they generate a higher expected return than other tax bracket investors. Miller calls this benefit of individuals in low tax brackets the bondholder surplus.

to communicate with each other during the experiment. Private feedback regarding current gross and net profits is given after each trade at the computer screens. Returns and frequency of historical trades of other subjects are provided. In addition, all subjects receive extensive private feedback at their screens after each period. This includes the individual full profit statement, including net profit calculation and the calculation of the current status of their payment reward. Given this feedback, subjects are fully aware of the payment impact of their decisions and their corresponding after-tax profit, which permits control for low tax salience or tax complexity.[6]

4.2 Predicted outcomes

If subjects are rational, the expected equilibrium debt return will equal 10% in all settings. At 10%, the net return of debt equals the equity return. The implementation of the disturbance term including the partially irrational choices of the automated other party implies the possibility to generate favorably returns above (investment treatments) and below (financing treatments) 10%. With reference to our research hypothesis, in which we anticipate an increasing debt return because of tax aversion, we expect that the debt return in the tax treatments exceeds the return in the neutral ("transaction cost") treatments and is greater than 10%. Note that yields above 10% caused by tax aversion imply an extra profit for investors. In contrast to the financing side, the collective tax aversion of investors actually increases individual profits. However, each security purchased with a yield above 10% implies that each non-purchasing, low-taxed rational investor has foregone the opportunity to generate extra profit relative to doing nothing. Without tax aversion, a yield of 10% should therefore be ensured by competition between and within the tax brackets.

Regarding a reference point effect, we analyze the debt return premium difference between buyers and sellers. Consistent with our research hypothesis, we expect a higher return premium in the financing treatments than in the investment treatments. With respect to learning effects, we anticipate that the effect of tax aversion disappears over the course of the experiment and does not persist in a competitive setting with sufficient feedback. To test H3, we compare the results between the first three rewarded periods – periods with only low learning opportunity[7] – and the final three rewarded periods –

[6] Low tax salience and high tax complexity changes the predicted outcome. See for example Chetty, Looney, and Kroft (2008) in the case of tax salience and Boylan and Frischmann (2006) in the case of tax complexity.

[7] There have been in addition three trial periods held in each experiment which could be used by the subjects to get familiar with the experiment such that the first actual assessment period should already be considered in the interpretation of the results

those with high learning opportunity. According to Loewenstein (1999) different early and late results during stationary replication of decisions across several periods can both be representative of real economic behavior. The interpretation depends on the characteristics of related decisions in the real-life such that people can adopt their behavior over time. Since financial decisions are mostly re-occurring, we interpret the early results as how people decide in new situations and the late results as the common behavior of agents in financial markets.

4.3 Results

We first discuss the average results of the four separate treatments. Statistical tests are conducted if the average debt returns are different from the predicted levels. Then, we compare the results from the different treatments using parametric as well as non-parametric statistical tests. After that, we extend the analysis by discussing the results of a panel data regression model.

Table 2 presents the average return of debt for each treatment and the two-tailed p-values of a one sample t-test with the expected debt return of 10%. In addition, we present the p-values of two tailed two sample t-test for the equality of means between the tax label treatments and the transaction costs label treatments. Alternatively, we provide the p-values of non-parametric Mann-Whitney U-tests.

[table 2 about here]

As anticipated, the average debt return differs significantly from the expected value (10%) in both tax treatments in early periods. In contrast, the average debt returns in both transaction cost treatments do not significantly differ from the expected value. In later periods, the average debt return in the investment setting is significantly higher than the expected value of 10% for both labels. In the financing case, average debt returns for both labels are also advantageous relative to the expected level; they are below 10%. These results can most likely be attributed to the observation that subjects have learned sufficiently over the course of the experiment to take advantage of the automated mechanism to achieve a return premium.

In early periods, we observe a significant difference of the average debt returns between the two labels. This holds for the investment treatments as well as the financing treatments. In contrast, in later periods, we observe no longer a significant difference between the average return in the tax label and the transaction cost label. This result indicates that with low learning opportunity tax aversion results in significantly different debt returns between labels. In contrast, there is no such effect in later periods.

With regard to H2, we analyze the difference in the degree of tax aversion between the tax investment and tax financing treatments for the early periods. We only analyze the early periods, as we do not observe tax aversion induced price premiums in later periods. We use a two sample t-test to analyze the equality of means and alternatively calculate the non-parametric Mann-Whitney U-test. We observe a significantly higher debt premium in the tax/financing treatment than in the tax/investment treatment (t-test $p = 0.036$, U-test $p = 0.008$). This result indicates that in the early periods tax aversion is higher in the case of a tax deduction of an expense than in that of a tax exemption of earnings. To quantify the difference in tax aversion, we calculate the implied tax aversion parameters of average debt returns (as in equation 3 and 5). We obtain 19% in the financing treatments and 9% in the investment treatments. The degree of tax aversion with a tax deductibility of expenses is twice as high as with a tax reduction of earnings. This implies that a tax reduction of one Dollar is equivalent to a reduction amounting to \$1.19, whereas an additional tax expense of one Dollar is equivalent to a payment of \$1.09.

As anticipated, we observe significant tax clienteles. The share of debt among securities purchased in the first three periods was 86% for low-tax buyers and 17% for high-tax buyers in the tax treatments and, respectively, 96% and 15% in the transaction cost treatments. Tax clienteles are more pronounced in the high learning condition. The share of debt among purchased securities increased to 92% for the low-tax clientele and decreased to 0% for the high-tax clientele. The shares in the transaction cost treatments are 95% and 1%, respectively. We do not observe any difference in the number of debt securities sold between the financing/tax label treatment and the financing/neutral label treatment.

4.4 Econometric analysis

We turn to econometric analysis at the individual level to confirm the indications from the aggregate data. This permits an estimation of the effects of the treatment variables on the debt return while holding other relevant factors constant. Note, that our experimental design and the treatment variables are constant across and within periods. Each subject is assigned a label and reference point and the roles are retained throughout the experiment. Pooled panel models are employed. To control for time effects, the model includes a dummy variable for late periods as well as an interaction term of treatment variables and late periods. We control for various individual characteristics of subjects.

We estimate two different econometric models. The first model tests for the effect

of labels and is conducted separately for the two reference points "investments" and "financing". The second model tests for the effects of reference points and is conducted with a stratified sample of the two tax label treatments. The dependent variable is the observed return of debt. We use the two following specifications:

$$Y_{i,t,n} = \beta_0 + \beta_1 Label_i + \beta_2 Late_t + \beta_3 Label_i \times Late_t + \beta_4 X_{i,j} \tag{6}$$

$$Y_{i,t,n} = \beta_0 + \beta_1 RP_i + \beta_2 Late_t + \beta_3 RP_i \times Late_t + \beta_4 X_{i,j} \tag{7}$$

where the dependent variable $Y_{i,t,n}$ denotes the debt return of subject i at period t trading the n-th security within period t. In (6), a dummy variable for the treatment variable label is included as independent variable $Label_i$ (tax = 1, transaction costs = 0). In (7), a dummy variable for the treatment variable reference point is included as independent variable RP_i (financing = 1, investment = 0). $Late_t$ is a dummy variable that captures the learning condition. Its value depends on the experimental period when the respective debt security is purchased/sold (first three periods = 0, other periods = 1). $X_{i,j}$ captures a vector of additional individual characteristics. We control in particular for demographic variables of subjects (sex, male = 1, female = 0; year of university studies, 1 to 4). We also include an individual tax knowledge parameter that is calculated with six tax related questions in post-experimental questionnaire (the parameter is calculated as the number of correct answers multiplied with 1/6). Table 3 presents the regression coefficients and p-values. The variable Label has a strong and significant positive effect on the debt return. This result confirms the results of the aggregate data. This supports hypothesis 1.

[table 3 about here]

Regarding learning effects, we find that the later periods significantly affect the debt return. The interaction terms are significant for both reference points. Late periods positively affect the return in the investment treatments and negatively affect the return in the financing treatments. Both effects are favorable regarding subjects' profits. Therefore, the results indicate that subjects achieve higher profits with learning. For the financing treatment, the results strongly support that learning effects diminish the tax aversion bias. For the investment treatment, the effects of achieving higher returns due to learning and a tax aversion effect have the same direction. However, the positive coefficient of the high learning categorical variable with a negative coefficient of the interaction term indicates a combination of both, higher debt returns due to learning and a reduction

of the tax aversion effect in later periods. Therefore, we can assert that learning effects significantly diminish the tax aversion bias. This supports hypothesis 3.

Regarding the other independent variables, in the investment treatments, the demographic variables sex and tax knowledge have no significant effect while the effect of student years on the debt returns is significant. In the financing treatments, male subjects sell debt securities at significant lower debt returns than female students. Additional student years have also a significant effect. Tax knowledge has again no significant influence. With regard to H2, the results from estimating (7) confirm the initial results from the aggregate data. There is a positive effect of the reference point financing in the tax label treatments, even though the effect is only significant at a 10% level. These results support hypothesis 2 that tax aversion is stronger in the case of tax deduction of expenses than in the case of a tax exemption of earnings. The reference point effect disappears in later periods. The demographic variables sex and years of study have also a significant effect.

5 Experiment 2

5.1 Motivation

We find in experiment 1 that subjects display tax aversion in early periods but the effect completely disappears in later periods. We conclude that the disappearance is due to subjects' learning in the course of periods with stationary replication of the decisions problem and the receiving of regular feedback. For a more fine-grained analysis of hypothesis 3, we conduct an additional experiment 2 to study the importance of the competitive market feedback on the persistence of tax aversion and learning.

There is broad experimental evidence in other contexts that small changes in feedback have a strong effect on experimental results (e.g. Brandts and Cooper 2006, Haigh and List 2005). In experiment 1, there are a least three available opportunities to learn over the course of the experiment. First, even without any feedback, subjects can calculate their individual marginal return of debt and subsequently only trade debt if the return is advantageous. Second, they can adjust their behavior according to the received private feedback on their individual performance ("profit and tax feedback"). Finally, subjects can observe the public information of competitive market prices from trades of other participants. This way, a subject could imitate the prices of other subjects and trade only at prices they observe at the market. We refer to this as "market feedback".

It is important to disentangle the effects of market feedback and profit and tax

feedback for the following reasons. First, the tax legislator can influence the form and degree of given private profit and tax feedback, e.g., by obliging commercial banks to provide their clients with tax statements concerning their capital market transactions. However, the legislator cannot directly influence competitive market prices. Second, it is important to understand the extent to which individuals rely on market feedback because the usefulness of market feedback depends on the rationality of other market participants. If market partners behave irrationally, competitive prices reflect behavioral biases. Subjects can no longer achieve rational behavior by imitating the behavior of others. This potentially explains the results of Ang et al. (2010) that market prices of taxable municipal bonds significantly differ from the expected level. To comprehend the learning effects and the role of feedback in experiment 1, we investigate the related questions of the post-experimental questionnaire. Interestingly, only 17% of subjects are able to calculate net profits and tax burdens correctly in an example given after the experiment. Most subjects apparently do not rely in their decision making on calculating after-tax returns. In contrast, subjects give high credit to the private profit and tax feedback: On a discrete scale from zero (not useful) to seven (very useful), the rating of the after-tax return after each trade is 4.8; the rating of the payment information after each trading period is 5.5; and the rating of the profit and loss statement after each trading period is 5.2. The low importance of calculating the net financial position and the learning effects point toward explaining tax aversion as a heuristic.

5.2 Sample and design

In experiment 2, we decrease the reliability and quality of the market feedback. This is achieved by selecting an experimental design of a double auction with trading of securities between investors and financial managers. This way, competitive market prices are less predictable than in the previous experiment: The loss of one party is balanced with the gain of another party, depending on the individual degree of tax aversion, prices can equilibrate to levels that differ from the predicted level and are attractive for both parties. We classify this as a reduction in the quality and level of "market feedback". Subjects are, however, still provided with the same level of "profit and tax feedback". Thus, in comparison to experiment 1, we change the quality and level of market feedback, whereas the profit and tax feedback remains unchanged.

We conduct only one treatment; the results are compared to experiment 1. An automated party is no longer employed, since the experiment employs buyers and sellers of securities simultaneously: Each trade of debt securities requires the offer of an investor

and subsequently the acceptance of the offer by a financial manager or vice versa. Optimal considerations are unchanged to the prior experiment; the given return of equity is 7% for buyers as well as sellers. The predicted return of debt is 10% for buyers as well as sellers. The same private feedback is given: a full profit statement, including gross and net profit calculation and the calculation of the current status of the payment reward. Therefore, subjects are still fully aware of the payment impact of their decisions and their corresponding after-tax profit.

We conduct experiment 2 in two separate sessions with 28 subjects – undergraduate business and economic student from the European University Viadrina in Frankfurt (Oder), Germany. In both sessions we randomly assign nine individuals as buyers and five individuals as sellers. The sessions are conducted separately from experiment 1; all subjects did not participate in the previous experiment. We use a modified version of the experimental z-Tree program of experiment 1; all experimental characteristics not described are kept unchanged. Number and length of periods as well as the experimental rewards are unchanged.

5.3 Results

Results are presented in table 4. The observed average debt return significantly exceeds the expected level of 10% in the early periods. As in experiment 1, this result supports hypothesis 1. Because of the combined design, we do not measure different prices for buyers and sellers. It is therefore not possible to test for reference point differences (H2).

[table 4 about here]

The observed average debt return is significantly lower in the high learning condition than in the low learning condition (two sample t-test, $p = .000$). As in experiment 1, we observe that with increasing experience in the experiment, the average debt returns decrease and converge towards the predicted level. In general, this provides evidence of learning effects and supports hypothesis 3. However, the reduction of the return premium over the course of the experiment is substantially slower in experiment 2 than in experiment 1, such that debt trades in all experimental periods with a significant return premium. We observe that subjects still learn substantially, albeit more slowly, with increasing experience. In the post-experimental questionnaire, 50% of subjects were able to calculate their marginal returns correctly. The substantial increase compared to experiment 1 is in line with our expectations. We conclude that a decreasing quality

of market feedback motivates subjects to calculate their after-tax returns. We interpret differences between experiment 1 and 2 as evidence that tax aversion quickly disappears given appropriate profit and tax feedback and the opportunity to observe competitive market returns that approximately represent the rational level. However, if such observation opportunities are limited, the tax aversion bias is more persistent. This implies that the tax aversion bias is most pronounced in infrequent financial decisions with non-existing competitive market prices. Examples include investments in illiquid securities such as closed-end funds and life insurances.

6 Discussion

The paper conducts two market experiments to study tax aversion behavior in the trading of differently taxed securities. Our results show an initial overvaluation of tax payments in early experimental periods. People not only dislike paying taxes, to reduce tax payments, they sometimes make financial choices that reduce their overall wealth. We also find evidence of reference point dependency; the effect of tax aversion is higher with tax deductibility of expenses relative to the case of taxation of investment returns. The overweighting of taxes is overcome when experience in the experiment is gained. If people become familiar with a decision and its impact on net payments, they would be no longer willing to pay a return premium. This result depends on appropriate feedback and the availability of observable competitive prices that reflect the considerations of near-rational market participants. When reducing this availability, we find a more persistent overvaluation.

This paper contributes to the understanding of behavioral responses to taxes in financial markets. We enhance the existing literature with evidence that individuals account differently for taxes and identical payments with neutral labels in a market experiment with appropriate rewards. This supports the proposal of Ang et al. (2010) that tax aversion can be an explanation of the yield premiums of tax disfavored securities. However, evidence of tax aversion is limited to specific learning environments and feedback characteristics. With repeated decisions and opportunities to learn, tax aversion is not present. The learning effect and the low share of subjects calculating the exact financial position provide evidence of explaining behavioral responses to tax labels as a heuristic rather than a form of non-standard preferences.

In financial markets, most trades are done by professional and sophisticated investors. Even inexperienced, private investors have mostly good chances of learning to avoid tax aversion behavior. For example, individual investors often hold several stocks and bonds

in their financial portfolios over periods of several years and increase the size of their portfolio over time to save for their retirements. During these periods, they regularly receive feedback in the form of written reports from their banks that inform them about the tax impact of their decisions, and yearly tax filing is compulsory. Our findings show that tax aversion is probably less apparent for this kind of investment. We, therefore, presume no unspecific tax aversion behavior. However, tax aversion may impact decisions regarding taxed securities that are made irregularly and infrequently. We believe that tax aversion behavior may be pronounced for "once in a lifetime" decisions of inexperienced investors without observable competitive market prices that have a significant tax component and for which people may not be aware of the correct after-tax optimization strategy.

In our view, there are three main implications of our findings. First, individuals should become aware that excessive tax minimization behavior may harm their overall wealth. Such behavior implies an important role for investment advisors, who should inform their clients of the irrationality of excessive tax-averse decision making. Second, our findings about reference point dependency have important implications for economic policy. If politicians decide to grant temporary tax incentives, they should choose increased deductibility of expenses for tax purposes rather than tax relief measures or making incomes partially tax free. This way, the incentive effect may be increased because of tax aversion. However, please note that our conclusions concerning the reference point dependency are based on a comparison between financing and investment treatments. Due to the replication of the Miller context the differences between these treatments go beyond a simple framing difference, for example regarding the tax clienteles on the investors' side. Although this does not change the tested predictions future research should examine if the reference point dependency of tax aversion also holds in other decision contexts. Finally, our results concerning the role of feedback and the learning environment imply that tax labeling may not make a sustainable difference, as is partly implied in the existing literature. Although people may initially prefer taxes with non-tax labels, under conditions of appropriate feedback, they most likely do not pay a tax aversion-induced premium in the long run.

A limitation of our approach is that we cannot easily draw conclusions from our experiment for the decision making of professional investors and even institutions. Our experimental findings are based on a very simplified capital market with critical sensitivity to context and decision framing. It surely would be useful for a better understanding to test for tax aversion in different settings, in more treatments and with different forms of feedback. Conclusions are also limited in that we use university students to test de-

cisions that are often performed by well-trained and experienced professionals in the real world. The motivation of using this subject pool is to analyze tax aversion effects among inexperienced decision makers rather than researching pre-learned behavior patterns. Recent studies that repeat experiments with different subject pools of university students and investment professionals favorably regard the use of students as subjects. Abbink and Rockenbach (2006) presume that professionals choose a more intuitive and less analytic pattern of behavior than students. Fréchette (2010) reviews experimental studies which compare the result of students and professional in the laboratory. He reports that the majority of studies finds no difference between different subject types. Only one among thirteen studies finds behavior of professionals which is closer to the prediction of the theory. We are therefore confident that our results would be repeated with different subject pools.

Tax aversion is difficult to measure in existing data on security yields because of the difficulty of obtaining full information on various incontrollable factors involved, such as appropriate risk adjustments, present and future tax rate uncertainty and the non-observability of personal tax rates on equity income. Because of this difficulty of empirically testing tax aversion, it would be useful to conduct further experiments. Further tests could be done for different kinds of decisions, e.g., other types of securities or real investments. Future research should also be done on the causes of tax aversion, the contexts in which it is most applicable and whether or not there exist intercultural differences in the individual degree of tax aversion.

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Table 1: Experiment 1 - Design and sample

The table shows the characteristics of subjects that participate in experiment 1. The experiment is conducted in a 2x2 between-subject design. LABEL and REFERENCE POINT refer to the two treatment variables. The label "Tax" refers to treatments in which the loaded term tax is used. The label "Transaction Costs" refers to treatments in which the neutral term transaction costs is used rather than the tax term. The reference point "Investment" refers to treatments in which subjects are assigned the role of investors which are buying securities. The reference point "Financing" refers to treatments in which subjects are assigned the role of financial managers which are selling securities. The four different treatments are conducted separately and are non-competing. The four quadrants summarize the subject characteristics by treatment.

Experiment 1 - Design and sample

			LABEL	
			Tax	**Transaction Costs**
REFERENCE POINT	**Investment**	Number of subjects	24	26
		Share of females	50%	50%
		Average years of study	2.5	2.5
	Financing	Number of subjects	30	30
		Share of females	57%	43%
		Average years of study	2.2	1.8

Table 2: Experiment 1 – Results

The table reports the debt returns [percent] observed in the four different treatments in experiment 1 and their significance.
In the upper part of the table, the first number in the cells reports the average debt return. The second number in parentheses reports the p-value of a two-tailed one sample t-test that compares the observed debt returns with the predicted level of 10%. The first two columns report the investment treatments. The last two columns report the financing treatments. The first and the third column report the tax label treatments. The second and the last column report the transaction cost treatments. The first line represents the results of the low learning condition which summarizes the results of the first three experimental periods. The second line represents the results of the high learning condition which summarizes the results of the last three experimental periods. The lines afterwards represent the detailed results by period.
In the lower part of the table, the first two columns report the p-values of two sample tests of observed debt returns between different labeled treatments. We use parametric two-sample t-tests for the equality of means (the left column) as well as non-parametric Mann-Whitney U-tests (the right column). The first line represents the results of the low learning condition which summarizes the results of the first three experimental periods. The second line represents the results of the high learning condition which summarizes the results of the last three experimental periods. The lines afterwards represent the detailed results by period.

Experiment 1 - Average debt return by treatment and period and significance of results

	REFERENCE POINT							
	Investment				Financing			
	LABEL				**LABEL**			
	Tax		Transaction Costs		Tax		Transaction Costs	
Low Learning	10.41	(.006)	9.83	(.179)	10.89	(.000)	10.06	(.367)
High learning	10.39	(.011)	10.50	(.000)	9.76	(.000)	9.70	(.000)
Period 1	10.34	(.300)	9.60	(.041)	11.42	(.000)	10.39	(.003)
Period 2	10.52	(.017)	9.67	(.239)	10.88	(.000)	10.14	(.323)
Period 3	10.37	(.111)	10.31	(.027)	10.36	(.074)	9.63	(.000)
Period 4	10.48	(.000)	10.17	(.415)	9.67	(.002)	9.89	(.267)
Period 5	10.26	(.433)	10.32	(.132)	9.66	(.000)	9.68	(.000)
Period 6	10.43	(.068)	10.50	(.000)	9.86	(.171)	9.77	(.002)
Period 7	10.47	(.045)	10.69	(.000)	9.76	(.063)	9.65	(.000)

	Investment treatments: Two-sample significance tests between labels		Financing treatments: Two sample significance test between labels	
	t-test	U-test	t-test	U-test
Low learning	.000	.000	.000	.000
High learning	.627	.151	.409	.464
Period 1	.053	.000	.000	.008
Period 2	.016	.001	.004	.017
Period 3	.811	.207	.001	.031
Period 4	.184	.434	.114	.048
Period 5	.868	.260	.876	.549
Period 6	.782	.348	.491	.919
Period 7	.352	.773	.451	.548

Table 3 – Regression estimates for the observed debt return

The table reports the coefficients and in parentheses the p-values of independent variables of two regressions (6) and (7). (6) includes the treatment variable LABEL as independent variable (tax = 1, transaction costs = 0). (7) includes the treatment variable REFERENCE POINT as independent variable (financing = 1, investment = 0). (6) is estimated for two samples. The first sample uses the data from the investment treatments. The second sample uses the data from the financing treatments. (7) is estimated with a sample using data from the tax treatments. The dependent variable is the observed return of debt. Further independent variables are characteristics of subjects, SEX (1 = male, 0 = female), and YEAR OF STUDY. The independent variables TAX KNOWLEDGE measures the share of correctly answered tax questions of a respective subject in the post-experimental questionnaire. The independent variable HIGH LEARNING measures if a purchase/sale of debt is observed outside of the first three periods (yes = 1, no = 0). HIGH LEARNING*LABEL is an interaction variable of HIGH LEARNING and LABEL. HIGH LEARNING*REFERENCE POINT is an interaction variable of HIGH LEARNING and REFERENCE POINT.

Experiment 1 – Regression estimates for the observed debt return

	Pooled OLS coefficients (p-value) Dependent variable: Debt return					
	Label (Equation 6)				Reference point (Equation 7)	
	Sample				**Sample**	
Independent variables	Investment		Financing		Tax	
INTERCEPT	10.536	(.000)	10.931	(.000)	11.944	(.000)
LABEL	.578	(.001)	.849	(.000)	-	-
REFERENCE POINT	-	-	-	-	.306	(.083)
SEX	.049	(.680)	-.483	(.000)	-.350	(.002)
YEAR OF STUDY	-.246	(.005)	-.317	(.000)	-.563	(.000)
TAX KNOWLEDGE	-.378	(.112)	-.149	(.311)	-.144	(.000)
HIGH LEARNING	.566	(.000)	-.315	(.002)	.010	(.961)
HIGH LEARNING*LABEL	-.567	(.014)	-.821	(.000)	-	-
HIGH LEARNING* REFERENCE POINT	-	-	-	-	-1.146	(.000)
F-statistic	4.85	(.000)	39.69	(.000)	22.24	(.000)
Adj. R^2	.033		0.129		.105	

Table 4 - Experiment 2 – Results

The table reports the debt returns [percent] observed in experiment 2. The first number reported is the average debt return. The second number in parentheses reports the p-value of a two-tailed one sample t-test that compares the observed debt returns with the predicted level of 10%. The first line represents the results of the low learning condition which summarizes the results of the first three experimental periods. The second line represents the results of the high learning condition which summarizes the results of the last three experimental periods. The lines afterwards represent the detailed results by period.

Experiment 2 – Average debt return by period and significance of results		
	LABEL	
	Tax	
Low learning	12.83	(.000)
High learning	11.11	(.000)
Period1	13.67	(.000)
Period2	12.86	(.000)
Period3	11.92	(.000)
Period4	12.14	(.000)
Period5	11.08	(.006)
Period6	11.32	(.000)
Period7	10.91	(.002)

Instructions and experimental program (Experiment 1)

This is the English translation of the instructions that were given to the subjects – instructions differ between investment and financing treatments as well as between tax label / transaction cost treatments.

Instructions given in the financing treatment (tax label)

You are representing a financial manager of a company. You would like to invest in five projects during this period with 20% return of investment each. To finance these projects, you have to sell securities. Therefore, you are active on a capital market in which you can sell blue securities to investors. There are in addition several other companies active on this market that are also able to sell blue securities.

The return of each blue security (your financing cost) has to be bargained with investors in the capital market in the form of an auction. For this, you are able to make offers to the investors as also all other companies.

If you sell less than five blue securities during a period, there will be an automatic sale of yellow securities to the investors at the end of the period to match the missing financing. For these yellow securities you have to pay a return of 7%.

Your tax rate is 30%. Taxation depends on the kind of security you have sold for financing.

(1) Sale of blue securities: You have to pay taxes on the return of investment of the project **deducting** your financing expenses.
(2) Automatic sale of yellow securities: You have to pay taxes on the return of investment of the project **without deducting** financing expenses.

You are rewarded for your participation in this experiment. Your reward in each period relates to your average return of investment of the project deducting financing expenses and taxes (your economic return). For each percentage point of economic return, you receive 20 Cents. This means, the higher your economic return, the higher is your reward.

There are in total ten periods. The first three periods are test periods for practicing without rewards. The following periods one to seven are payable periods in which you play for money.

Instructions given to investors (tax label):

You are an investor active on a capital market in which you can buy blue securities. You have to bargain the return of each security on the capital market with companies from whom you buy the securities. There are in addition several other investors active on this market that are also able to buy blue securities.

In order to buy a blue security you can make offers in the auction as also other investors do. After each offer, the companies have the opportunity to accept it.

If you buy less than three blue securities during a period, there will be an automatic purchase of yellow securities from the companies at the end of the period. For these yellow securities you receive a return of 7%.

The taxation of the return of the blue and yellow securities is different

(1) Purchase of blue securities: You have to pay taxes on the return of 10% / 30% / 50%.

(2) Automatic purchase of yellow securities: The return is tax-free.

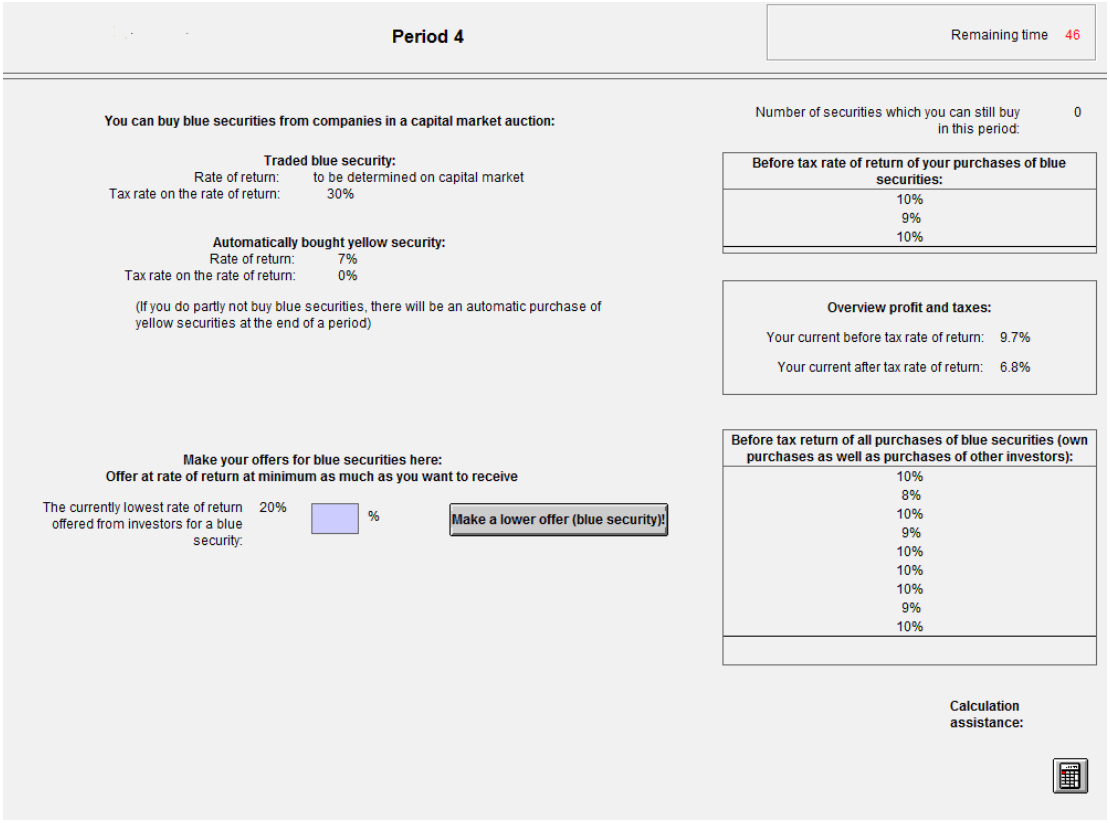
You are rewarded for your participation in this experiment. Your reward in each period relates to your average security return deducting taxes (your economic return). For each percentage point of economic return, you receive 20 / 25 Cents. This means, the higher your economic return, the higher is your reward.

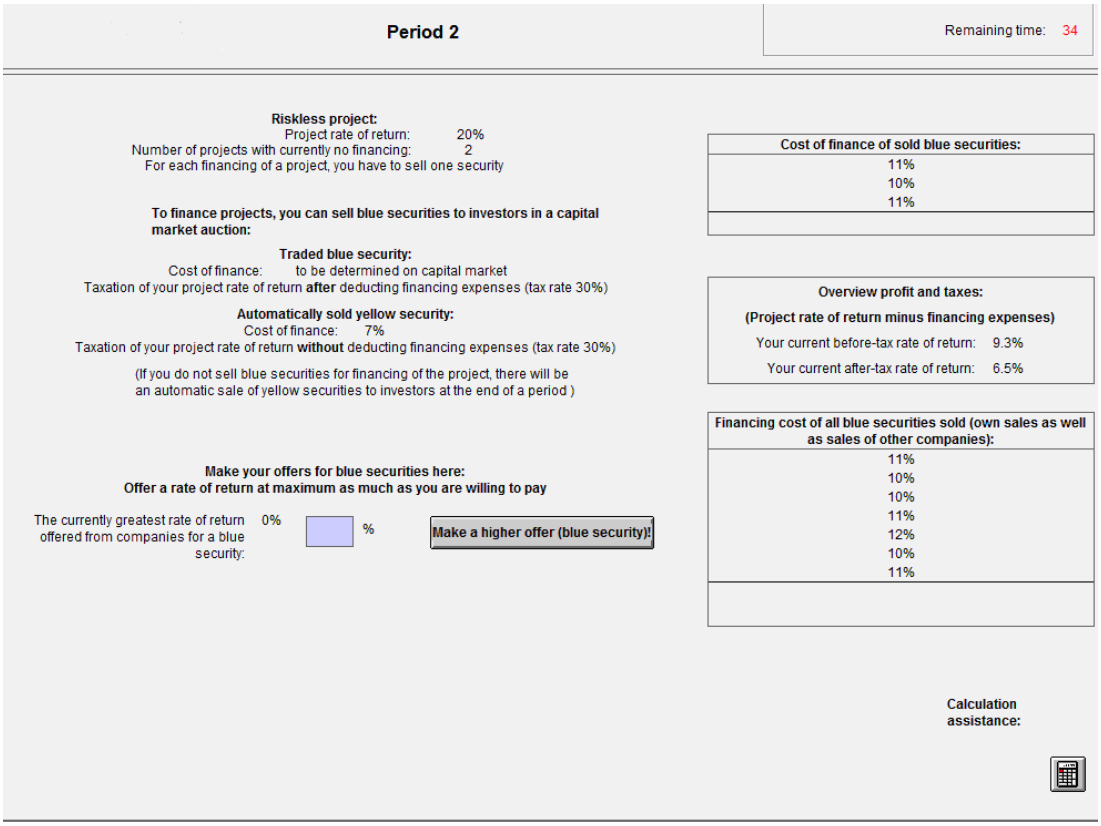
There are in total ten periods. The first three periods are test periods for practicing without rewards. The following periods one to seven are payable periods in which you play for money.

Instructions (transaction cost label):

Instructions were completely identical except that we exchanged the terms taxation / tax with the term transaction costs

Example screenshots of the main screen (translated from the original version)





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