# Internet Appendix for “History-Dependent Risk Preferences: Evidence from Individual Choices and Implications for the Disposition Effect”

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This Internet Appendix presents additional results on stock-market participation and the disposition effect that supplement those in the paper. Specifically, in the portfolio problem studied in Section 4 of the paper, probability weighting ($\gamma \neq 1$ and/or $\kappa \neq 1$) and/or a reference point that is not perfectly sticky ($\delta < 1$) generate a time inconsistency: the optimal investment level at $t = 1$ from the $t = 0$ perspective is different from that from the $t = 1$ perspective. In the paper, we solve the model for each individual in the sample using our posterior mean estimates for his preference parameters, focusing on the behavior of agents who are sophisticated in that they can foresee the aforementioned time inconsistency but who cannot commit to an investment plan. Here, we present results under alternative assumptions for behavior relating to this time inconsistency.

In Section IA.1, we set the probability-weighting curvature $\gamma$ and elevation $\kappa$ equal to 1, which corresponds to no probability weighting and therefore eliminates one source of time inconsistency. In Section IA.2, we use the estimated $\gamma$ and $\kappa$ as in Section 4 of the paper, but we consider two alternative assumptions for behavior: first, agents who are naive, i.e., they cannot foresee the time inconsistency, and second agents who are sophisticated and can resolve the time inconsistency by committing to an investment plan. In both cases, we present results for the more realistic case of no borrowing; results for the case with borrowing are very similar.

## IA.1 Participation and disposition effect with no probability weighting

In Table IA.1, we present results on stock market participation and the disposition effect when there is no probability weighting. We present, for several values of the equity risk premium $\mu$, the proportions of individuals who buy the stock at $t = 0$ and the proportions of individuals who exhibit the disposition effect (DE) conditional on having bought the stock at $t = 0$.

Regarding both participation and the DE, the level as well as the trend (increasing with $\mu$ for participation and decreasing with $\mu$ for the DE) are similar to the case with probability weighting, shown in Table 7 of the paper. This is not surprising, since the probability of each outcome is either 25% (from the $t = 0$ perspective) or 50% (form the $t = 1$ perspective), hence probability overweighting is relatively mild. Participation does appear to be consistently a little lower with than without probability weighting. This may be because, when individuals overweight small probabilities, they are more averse to the possibility that the stock will depreciate twice.

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Table IA.1: Participation and disposition effect assuming no probability weighting

In this table, we present additional results on stock-market participation and the disposition effect for the two-period portfolio problem presented in Section 4 of the paper. We solve the model for each individual in the sample using our posterior mean estimates of his preference parameters (see Section 3) for the value-function curvature $\alpha$ and loss aversion $\lambda$ and for the memory decay parameter $\delta$, but we set the probability-weighting curvature $\gamma$ and elevation $\kappa$ equal to 1, which corresponds to no probability weighting. We present, for several values of the equity risk premium $\mu$ (expressed as an annual percentage), the proportions of individuals who buy the stock at $t = 0$ and the proportions of individuals who exhibit the disposition effect (DE) conditional on having bought the stock at $t = 0$. An individual exhibits the DE if he optimally decreases (increases or maintains) his stock position at $t = 1$ after realizing gains (losses) in the first period.

| $\mu$ | **Stock buyers** | **Conditional DE** |
|---|---|---|
| 3% | 45.54% | 72.55% |
| 4% | 57.14% | 74.48% |
| 5% | 64.88% | 68.35% |
| 6% | 74.70% | 52.99% |
| 7% | 82.74% | 47.12% |
| 8% | 88.99% | 43.48% |
| 9% | 91.37% | 34.20% |
| 10% | 91.96% | 34.30% |
| 11% | 93.45% | 31.21% |
| 12% | 94.05% | 25.32% |
| 13% | 94.94% | 18.81% |

## IA.2 Participation and disposition effect for naives and for sophisticates with commitment

In Table IA.2, we present results on stock market participation and the disposition effect, focusing on the behavior of agents who are naive and of agents who are sophisticated and can commit to an action plan. We present, for several values of the equity risk premium $\mu$, the proportions of individuals who buy the stock at $t = 0$ and the proportions of individuals who exhibit the disposition effect (DE) conditional on having bought the stock at $t = 0$.

Table IA.2: Participation and disposition effect for naives and for sophisticates with commitment

In this table, we present additional results on stock-market participation and the disposition effect for the two-period portfolio problem presented in Section 4 of the paper. We solve the model for each individual in the sample using our posterior mean estimates of his preference parameters (see Section 3). In Panel A, we present results for the case in which individuals are naive, and in Panel B we present results for the case in which they are sophisticated and commitment is possible. In each panel we present, for several values of the equity risk premium $\mu$ (expressed as an annual percentage), the proportions of individuals who buy the stock at $t = 0$ and the proportions of individuals who exhibit the disposition effect (DE) conditional on having bought the stock at $t = 0$. An individual exhibits the DE if he optimally decreases (increases or maintains) his stock position at $t = 1$ after realizing gains (losses) in the first period.

| | **Panel A : Naives** | | **Panel B : Sophisticates with commitment** | |
|---|---|---|---|---|
| $\mu$ | **Stock buyers** | **Conditional DE** | **Stock buyers** | **Conditional DE** |
| 3% | 45.54% | 64.05% | 45.54% | 84.97% |
| 4% | 58.33% | 65.82% | 58.33% | 85.71% |
| 5% | 67.26% | 65.93% | 67.26% | 59.29% |
| 6% | 76.19% | 57.03% | 76.19% | 18.75% |
| 7% | 86.61% | 48.80% | 86.61% | 5.15% |
| 8% | 91.37% | 45.28% | 91.37% | 1.95% |
| 9% | 93.75% | 42.22% | 93.75% | 1.27% |
| 10% | 94.64% | 36.79% | 94.64% | 0.31% |
| 11% | 95.54% | 32.40% | 95.54% | 0.00% |
| 12% | 96.13% | 26.32% | 96.13% | 0.00% |
| 13% | 97.92% | 18.24% | 97.92% | 0.00% |

First, comparing the first column in each panel of Table IA.2, we see that the participation decision is the same for both naive and commitment-aided sophisticates. This is because, at $t = 0$, the optimal decision is the same for both types of agents, i.e., they both choose the same dynamic trading strategy. Their difference lies in that naives do not foresee that they will not follow through with this plan, while commitment-aided sophisticates commit to follow this plan as they foresee that they would not otherwise.

Second, comparing the participation proportions in this table with those in Table 7 of the paper, we see that they are very similar but slightly higher. To see why this is the case, notice that, at $t = 0$, the choice set of a no-commitment sophisticate is more restricted than that of a naive or a commitment-aided sophisticate (both of whom face the same choice set), since the former needs to impose the condition that his choice at $t = 1$ is optimal from the $t = 1$ perspective. Now consider an individual with some arbitrary preference parameters. If this individual is a no-commitment sophisticate and finds it optimal to participate in the market, then he would still find it optimal to do so if he were naive or a commitment-aided sophisticate, as his choice set is less restricted. Similarly, if this individual is a no-commitment sophisticate and finds it optimal not to participate in the market, then it might be optimal to participate if he were naive or a commitment-aided sophisticate, because the latter face a less restricted choice set. For example, assuming a sufficiently convex value function over losses, on the one hand a no-commitment sophisticate may not participate at $t = 0$ because he foresees that if the stock depreciates, then at $t = 1$ he may take more risk leading to unpleasant negative skewness from the $t = 0$ perspective. On the other hand, a naive will not foresee this while a commitment-aided sophisticate will foresee it but commit not to take this additional risk at $t = 1$, hence they will both participate at $t = 0$.

Third, looking at the prevalence of the DE among naives (see Panel A, Table IA.2) we see that it follows a pattern across values of the equity risk premium $\mu$ that is very similar to that among no-commitment sophisticates (see Table 7 of the paper): the prevalence of the DE decreases as $\mu$ increases. As we have already discussed in Section 4 of the paper, this is because the larger the potential gains relative to the potential losses, the likelier it is that after gains the individual moves to a region of the value function in which concavity is mild relative to loss aversion and so the prospect of holding on to the stock is more appealing than that of buying the stock in the first place. This intuition holds the same, both for naives and for no-commitment sophisticates.

Finally, looking at the prevalence of the DE among commitment-aided sophisticates (see Panel B, Table IA.2), we see that for low $\mu$ it is much higher than for no-commitment sophisticates (see Table 7 of the paper), but it drops off very quickly, to the point that it is almost 0 for mid to large $\mu$ (i.e., from $\mu$ above 7%). The reason for this is that commitment-aided sophisticates commit to buy at $t = 1$ the portfolio that is optimal from the $t = 0$ perspective, which is as if the reference point is completely sticky ($\delta = 1$). We have already seen (see Panel (b) of Figure 9 of the paper) and discussed why (essentially the BX intuition; see Section 4 of the paper) $\delta = 1$ implies this pattern of behavior: high prevalence of DE for low $\mu$ and very low to no DE for high $\mu$.