Discounting of Delayed Monetary Losses:
Do Different Procedures and Measures Assess the Same Construct?

Haoran Wan, Leonard Green & Joel Myerson

Washington University in St. Louis

Introduction

The discounting of delayed losses has primarily been studied using an Adjusting-Amount procedure (Adj-Amt; e.g., Estle et al., 2006), and typically involves a large number of repeated choice trials.

Analogous to the Monetary Choice Questionnaire (Kirby, et al., 1999), Myerson et al. (2017) developed a brief, 27-item Delayed Losses Questionnaire (DLQ) that may be sufficient when time is a concern (e.g., online studies) or when theoretical models are not being evaluated.

The present study compared the two procedures, the Adj-Amt and the DLQ, for assessing the discounting of delayed losses. Specifically, *Do the Adj-Amt and DLQ both measure the same construct?*

Method

Participants: 431 Prolific participants completed both the Adj-Amt Procedure and the DLQ.

Adj-Amt Procedure:
Four Delays: 4, 18, 60, and 108 months.
*Three Delayed Amounts*: **$90, $240**, and $1,500.
Discounting Measures: Area under the curve (AuC) and log k (based on the simple hyperbola discounting model) were calculated for each participant for each amount.

DLQ:
The DLQ consisted of 27 questions, divided into three sets of delayed amounts: **$75-105**, $150-180, and **$225-255**.
*Discounting Measures*: The proportion of choices of the immediate payment and log k (using the method analogous to the one described by Kirby et al., 1999) were calculated for each participant for each amount.

Results
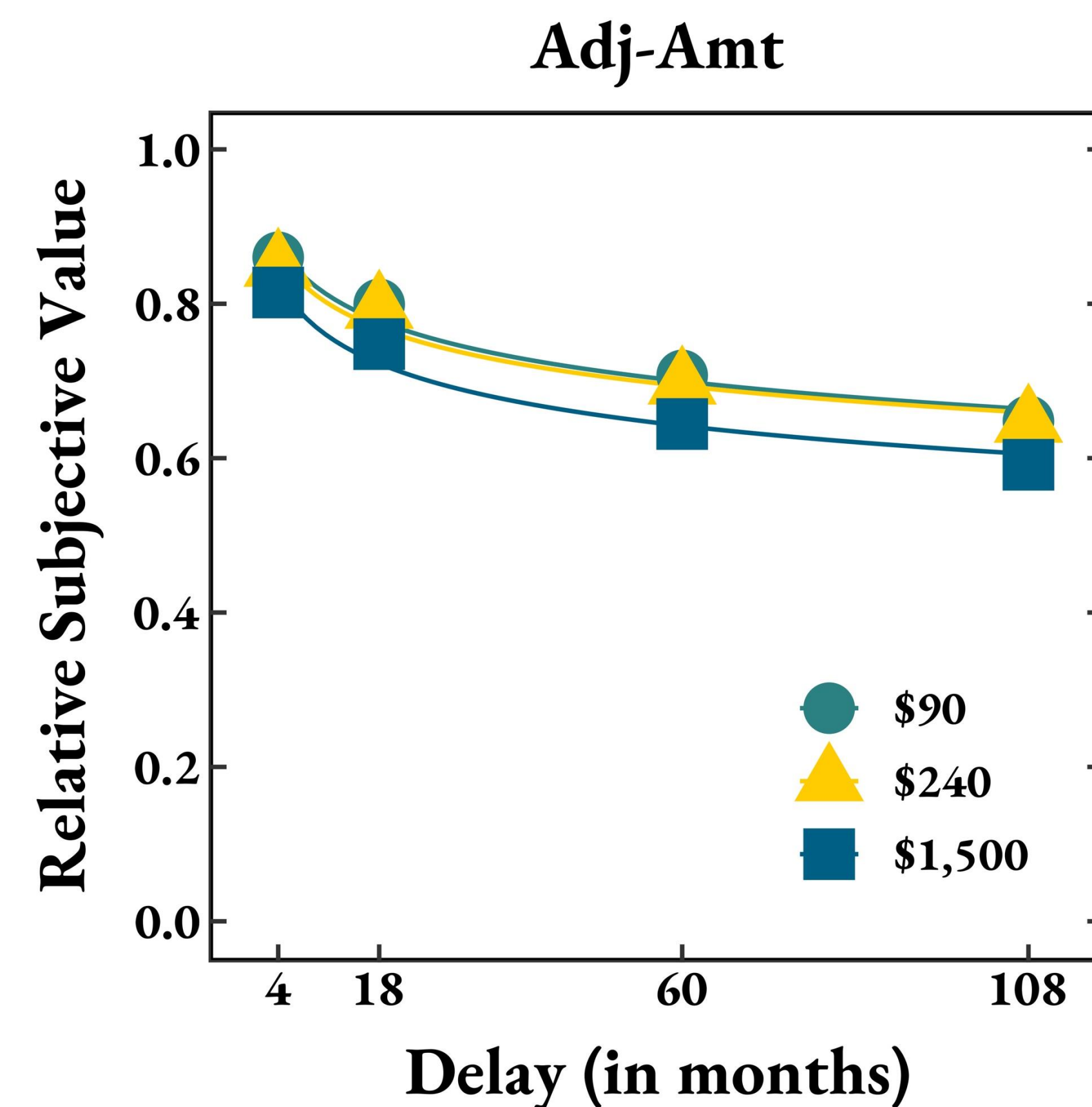
Adj-Amt (Left): Hyperboloid discounting functions: R^2s > .95. The correlations of AuC and the correlations of log k values with the three amounts were high and significant (rs >.62). Also, AuC was highly correlated with log k for each amount ($|r$s$|$>.96).

DLQ (Right): Logistic growth functions: R^2s > .97. The correlations of proportion of choices of the immediate payment and the correlations of log k values with the three amounts were high and significant (rs > .74). Also, immediate-choice proportion was highly correlated with log k for each amount ($|r$s$|$>.97).
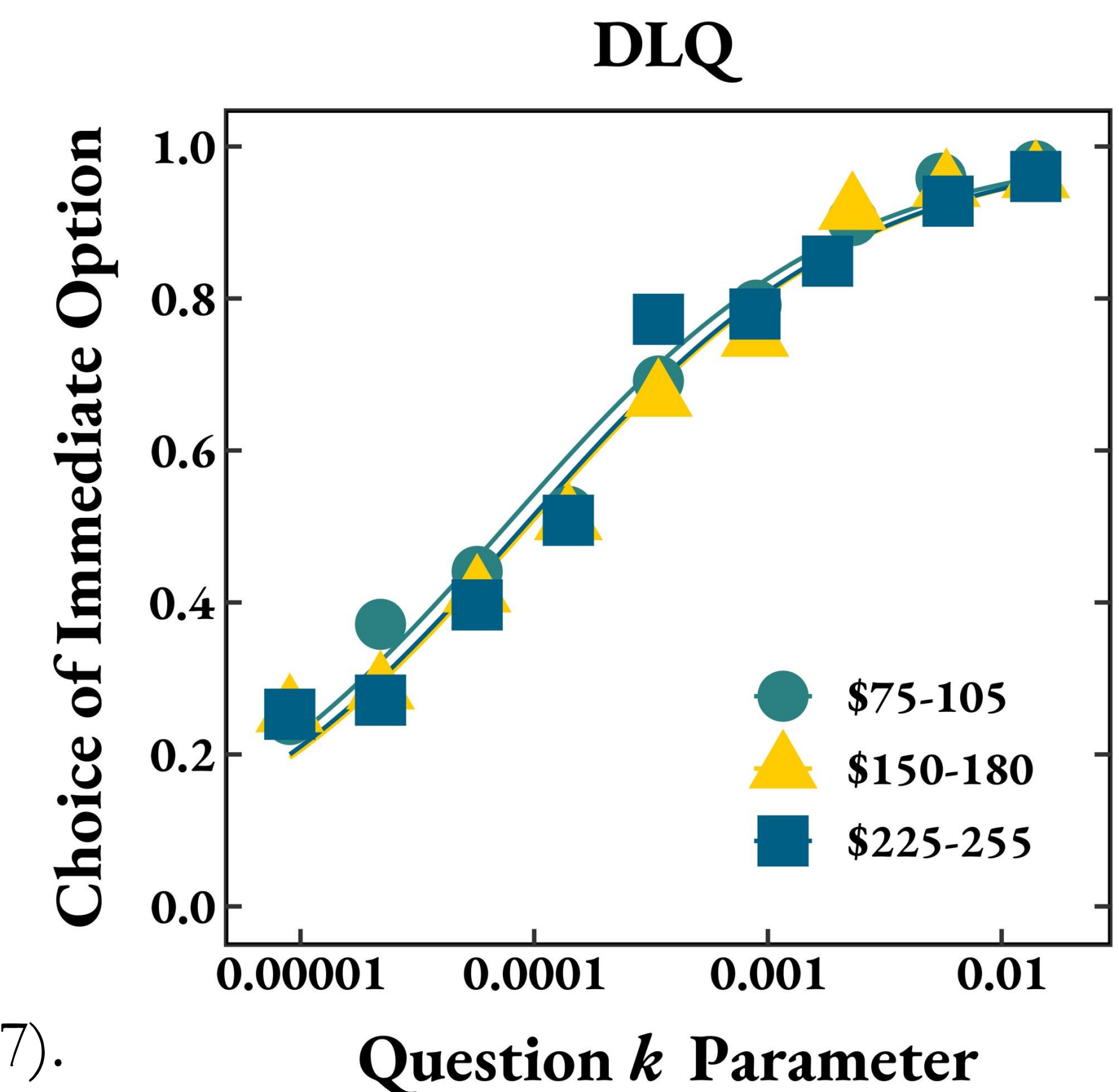
To address the major issue of the current study, namely, *Do the Adj-Amt and the DLQ both measure the same construct,* two sets of analyses were conducted:

➢ **Correlation between Discounting Procedures**

All correlations between the atheoretical measures (AuCs and immediate-choice proportions) were high and significant for each of the two common amounts ($r_{\$90}$ = .73, $r_{\$240}$ = .78), as were the correlations between the two log k measures ($r_{\$90}$ = .73, $r_{\$240}$ = .77).

➢ **Individual Discounting Patterns**

Although most participants increasingly discounted the delayed losses with increases in its delay (Adj-Amt: 75.6%; DLQ: 82.1%), almost all remaining participants did not discount delayed losses (Adj-Amt: 16.5%; DLQ: 15.6%).

Most participants (87.2%) who showed one type of discounting pattern on one procedure also showed the same discounting pattern on the other procedure.

Of the participants who did not discount, but always chose the smaller, immediate option in the DLQ, most (83.6%) also always chose the smaller, immediate option in the Adj-Amt procedure ($X^2[1]$ = 183.2, p < .001).

Conclusions

With both procedures, individuals tended to discount delayed losses systematically with increases in their delay, and the hyperboloid function (Adj-Amt procedure) and the logistic growth function (DLQ) provided very good descriptions of discounting, consistent with prior research (Green et al., 2014). Also consistent with prior studies, there was little or no effect of amount on the degree of discounting the delayed losses.

The present findings of both quantitative and qualitative equivalence provide strong support for the hypothesis that the same discounting process underlies behavior on both procedures, and that individual differences in discounting can be assessed with the different discounting measures.