Week 12 Practice Problem Set - Intertemporal Choice

1 Module 2 Practice Questions Cont. (100 points)

Formal assessment covering the Discounted Utility (DU) Model with Exponential Discounting, EU Anomalies, and Behavioral Models of Intertemporal Choice

1.1 Structure and Instructions

Format:

- Part A: Multiple choice questions (20 points)
- Part B: Short answer questions (50 points)
- Part C: Problem-solving and application (30 points)
- Closed book; notes prohibited; calculator allowed

Coverage: Weeks 10-12 materials

- Week 10: Standard Intertemporal Choice - Exponential Discounting
- Week 11: DU Anomalies and Intertemporal Choice - Hyperbolic Discounting
- Week 12: Measuring time preferences with Multiple Price Lists (MPL)

1.2 Part A: Multiple-choice questions (20 points)

1.2.1 Question A1: the optimality condition in the two-period model (2 points)

In the standard two-period model of intertemporal choice, what does the condition

$$\frac{u'(c_0)}{\delta u'(c_1)} = 1 + r$$

represent at the optimum?

A. The marginal rate of substitution equals the market trade-off

B. Lifetime utility is minimized to avoid borrowing costs

C. The consumer is indifferent between saving and borrowing regardless of wealth

D. The subjective discount factor is equal to the market interest rate

1.2.2 Question A2: discount rate and discount factor (2 points)

If an individual has a subjective discount rate of $\rho = 0.25$, what is their corresponding subjective discount factor *delta*?

A. 0.75

B. 1.25

C. 0.80

D. 0.25

1.2.3 Question A3: exponential discounting and time consistency (2 points)

Which property of exponential discounting is primarily responsible for ensuring time-consistent preferences?

A. The discount function approaching zero as time goes to infinity

B. Placing full weight on the present period ($D(0) = 1$)

C. Constant per-period discounting

D. Diminishing marginal utility of consumption

1.2.4 Question A4: DU anomalies - the sign effect (2 points)

Under the "sign effect" anomaly, how do individuals typically discount future gains compared to future losses?

A. Gains are discounted more heavily than losses

B. Losses are discounted more heavily than gains

C. Only gains are discounted, while losses maintain their full value

D. Gains and losses are discounted at the same constant rate

1.2.5 Question A5: Assumptions of the standard intertemporal choice model (2 points)

What does the "integration" assumption in standard intertemporal choice imply about how a new investment is evaluated?

A. It is evaluated based on its impact on the entire lifetime budget and consumption plan

B. It is evaluated based on the emotional satisfaction of the purchase rather than financial logic

C. It is evaluated independently of any previous savings or future income expectations

D. It is evaluated solely on whether the future cash flow is nominally larger than the initial cost

1.2.6 Question A6: hyperbolic discounting (2 points)

How does hyperbolic discounting help explain the phenomenon of procrastination?

A. Individuals overweight immediate costs relative to future costs

B. Individuals assume their future utility function will be more concave

C. The discount rate is constant, making any time for the task equally attractive

D. Individuals value memory utility more than anticipation utility

1.2.7 Question A7: memory vs. anticipation utility (2 points)

In the context of anticipation utility, why might a person prefer to delay a kiss from a movie star for three days rather than receiving it immediately?

A. The person is exhibiting extreme present bias

B. Memory utility is only generated if the event is delayed

C. The utility gained from "savoring" the upcoming event exceeds the cost of delay

D. The person expects their subjective discount factor δ to increase over those three days

1.2.8 Question A8: DU anomalies - the magnitude effect (2 points)

What is the "magnitude effect" in intertemporal choice?

A. The absolute difference between two rewards matters more than their ratio

B. Large dollar amounts are discounted at lower rates than small dollar amounts

C. The discount rate increases as total wealth increases

D. Individuals are unable to distinguish between very large future values

1.2.9 Question A9: DU anomalies - subadditive discounting (2 points)

Subadditive discounting suggests that an individual will be more impatient if

A. The interest rate is compounded continuously rather than annually

B. A long delay is divided into several shorter intervals

C. The total amount to be received is paid in one lump sum at the end

D. The delay is sped up rather than postponed

1.2.10 Question A10: Assumptions of the standard intertemporal choice model (2 points)

The assumption of "Comsumption Independence" is violated if

A. The interest rate is higher than your subjective discount rate

B. Your total utility is the sum of discounted per-period utilities

C. Eating a specific food today makes you want it less tomorrow

D. You prefer a smooth consumption path over an extreme one

1.3 Part B: Short Answer Questions (50 points)

1.3.1 Problem B1: Definition and examples of intertemporal choices (4 points)

In the context of economics, what is intertemporal choice and what core trade-off does it study?

1.3.2 Problem B2: Understanding the trade-offs in intertemporal choices (6 points)

Describe the force of diminishing marginal utility and how it leads to the "consumption smoothing" behavior observed in the two-period model. Use a figure to illustrate the idea if you can.

1.3.3 Problem B3: Subjective Discount Rate vs. Factor (4 points)

Define the relationship between the subjective discount factor (δ) and the subjective discount rate (ρ). How do their values characterize the degree of impatient of a decision maker?

1.3.4 Problem B4: exponential discounting and time-consistency (6 points)

Define time consistency and explain why exponential discounting ($D(t) = \delta^t$) generates this property. Show it with a numerical example if you can.

1.3.5 Problem B5: Standard Model Assumptions: (4 points)

Briefly explain the assumptions of Integration and Consumption Independence within the standard intertemporal choice model.

1.3.6 Problem B6: Time inconsistency (6 points)

Provide a definition of dynamic (time) inconsistency and explain how it differs from a simple change in preference due to new information.

1.3.7 Problem B7: Preference Reversal (4 points)

Describe a scenario where an individual might experience a preference reversal regarding work or money as an outcome becomes immediate.

1.3.8 Problem B8: Hyperbolic Discounting (6 points)

How do discount rates behave over time in a hyperbolic discounting model compared to the standard exponential model?

1.3.9 Problem B9: Delay/Speed-Up Asymmetry (4 points)

Why do individuals typically demand a higher premium to delay a reward than they are willing to pay to speed up a future reward?

1.3.10 Problem B10: Multiple Price Lists (MPL) (6 points)

Describe how a Multiple Price List is structured and what the "switching point" reveals about a subject's level of patience.

1.4 Part C: Problem-solving and application (30 points)

Tables 1 and 2 summarize the results of a multiple price list (MPL) experiment designed to measure time preferences and present bias among 36 finance undergraduate students in an Investment Behavior course. Both tables present choices between a fixed smaller-sooner (SS) reward of $100 and a larger-later (LL) reward that increases across questions, with the key difference being the timing of the options.

Table 1: Time Preference Choices: Today vs. 1 Month Later (Questions 1–10)

Question	Choice A: Today	Choice B: 1 Month Later	Choose A ($n = 36$)	Choose B ($n = 36$)	Percentage B
1	$100 today	$101 in 1 month	36	0	0.00%
2	$100 today	$103 in 1 month	36	0	0.00%
3	$100 today	$105 in 1 month	30	6	16.67%
4	$100 today	$107 in 1 month	27	9	25.00%
5	$100 today	$110 in 1 month	20	16	44.44%
6	$100 today	$115 in 1 month	16	20	55.56%
7	$100 today	$120 in 1 month	6	30	83.33%
8	$100 today	$125 in 1 month	5	31	86.11%
9	$100 today	$130 in 1 month	3	33	91.67%
10	$100 today	$140 in 1 month	3	33	91.67%

Table 2: Time Preference Choices: 6 Months vs. 7 Months Later (Questions 11–20)

Question	Choice A: 6 Months Later	Choice B: 7 Months Later	Choose A ($n = 36$)	Choose B ($n = 36$)	Percentage B
11	$100 in 6 months	$101 in 7 months	32	4	11.11%
12	$100 in 6 months	$103 in 7 months	29	7	19.44%
13	$100 in 6 months	$105 in 7 months	24	12	33.33%
14	$100 in 6 months	$107 in 7 months	22	14	38.89%
15	$100 in 6 months	$110 in 7 months	16	20	55.56%
16	$100 in 6 months	$115 in 7 months	10	26	72.22%
17	$100 in 6 months	$120 in 7 months	3	33	91.67%
18	$100 in 6 months	$125 in 7 months	3	33	91.67%
19	$100 in 6 months	$130 in 7 months	2	34	94.44%
20	$100 in 6 months	$140 in 7 months	2	34	94.44%

Table 1 displays choices between "$100 available immediately" and a larger payment available in one month, where the later amount rises gradually from $101 to $140.

Table 2 displays structurally identical choices, but both options are in the future: $100 in six months versus a larger payment in seven months (again from $101 to 140).

1.4.1 Problem C1: Evidence of Present Bias from MPL (10 points)

Does the data from the two multiple price lists show evidence of present bias? Why or why not?

1.4.2 Problem C2: Measuring discount discounts using MPL (10 points)

Suppose in Table 1, Penny switches from choosing A to choosing B in Row 3, while Iris switches from choosing A to choosing B in Row 9. Who is more patient, and why?

1.4.3 Problem C3: Using MPL to measure time preferences (10 points)

1. Estimate the discount rates of Penny and Iris.
2. Can you produce precise estimates for their discount rates? Why or why not?
3. How would you improve upon the MPL method in order to get closer to an accurate estimate for a person's discount rate?