Delay d'ETRE: Explict Temporal Ratios Lead to Impatience

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Abstract

When selecting a shipping speed on Amazon we are faced with a choice between getting our package sooner but paying more money, or getting our package later and paying less money. This shipping decision is a subset of a larger class of decisions known as intertemporal choices – choices involving different points in time. Previous research on intertemporal framing has shown that displaying times as dates – January 23rd – as opposed to delays – 6 weeks – increases patience. The present research expands this finding. Across three experiments I show that making temporal ratios explict leads to differing levels to increase impatience in standard intertemporal choices framed as gains, intertemporal choices framed as losses, and for an explicit shipping scenario. Taken together these results suggest that framing delays as ratios leads to greater impatience.

1 Introduction

All of us have felt the itch to get the new purchase we made on Amazon as quickly as possible; sometimes leading us choosing expedited shipping, even at considerable cost. These shipping scenarios are a subset of a larger set of decisions known as intertemporal choices. Intertemporal choices "involve relative preferences and tradeoffs for costs and benefits that occur over time" (Urminsky & Zauberman, 2014, p. 2) Generally on Amazon we see shipping times as the number of days until you will receive your package, e.g. "Receive your package in 2 days". The shipping time could also be described as "Receive your package on December 17th". This reframing of delays – 2 days – into dates – December 17th – has been shown to increase patience (Read, Frederick, Orsel, & Rahman, 2005). Occasionally Amazon frames shipping times as dates, possibly to induce customers to be more patient and receive their items later.

However a firm may want consumers to be impatient and choose the expedited shipping option. If a firm's inventory is high they may want to nudge consumers to ship their items faster. It is important to understand what variables consumers are using and how they are making intertemporal choices to create robust and adaptive choice environments. Understanding how to optimally display information leads to novel predictions for how to frame shipping speeds.

How the monetary and temporal aspects of an intertemporal choice are framed lead to varying degrees of patience. Further, recent models of intertemporal choice have posited that people use ratios in intertemporal choices (Read, Frederick, & Scholten, 2013; Marzilli Ericson, White, Laibson, & Cohen, 2015). However, to the best of my knowledge, no study has investigated how explicitly framing time as a ratio can alter patience. Further although shipping

scenarios are a form of intertemporal choice, they differ from how most studies operationalize intertemporal choices.

Across 3 studies I show that by making ratios explicit people are more impatient in intertemporal choices. This result holds for intertemporal choices framed as gains, losses, and in an explicit shipping scenario. As opposed to other studies which showed that reframed times as dates increases patience, framing times as ratios decreases patience. Firms wanting to decrease patience in their consumers may want to frame intertemporal choices as ratios as opposed to delays.

2 Literature Review

In marketing and psychology, intertemporal preferences are generally measured by choices between a smaller sooner and larger later amounts of money (Urminsky & Zauberman, 2014). There are four general categories of research on intertemporal choices (see Read et al. (2013) for an overview). The first focuses on how magnitude of both time and money effects patience (Scholten & Read, 2006; Thaler & Shefrin, 1981) the current paper belongs to research investigating how patience is altered by option frames. The second stream focuses on how choices relate to real world behavior. Individual differences in imputed discount functions predict real world phenomenon such as credit card debt, mortgage choice, and smoking (MacKillop et al., 2011; Meier & Sprenger, 2009; Johnson, Payne, & Atlas, 2011). The third stream focuses on how emotional states can alter intertmporal preferences, e.g. being shown freshly baked bread (Li, 2008). The fourth stream investigates how the framing of options affects patience.

An example of option framing in intertemporal choice is the hidden zero effect – when the implicit zeros in intertemporal choices are made explicit people are more patient (Magen, Dweck, & Gross, 2008). For instance when a choice between "receiving $100 now" and "$110 in 6 months" is reframed to be "receiving $100 now *and nothing in six months*" and "$110 in 6 months *and nothing now*" people are more patient.

Additionally Read et al. (2013) show that making the ratio between amounts salient affects intertemporal choices. Specifically when the magnitude of amounts is small, reframing the amounts as interest rates leads to increased patience. Taking the above example, when reframed as an interest rate, e.g. a choice between "receive $100 now" and "receive 10% more in six months" people are more patient. Read et al. (2013) posit that interest framed amounts lead to an increased reliance on ratios of monetary amounts.

Beyond amounts, times can also be reframed. The most famous example of temporal reframing is Lincoln's Gettysburg Address which made 87 years into the "Four score and seven years ago". Read et al. (2005) shows that how a times are framed in intertemporal choices can alter patience. Taking the above example, people are more patient when reframed it as a choice between "receive $100 now" and "receive $110 on June 15" – this is known as the delay/date effect. The delay/date effect demonstrates that perceived temporal distance is dependent on how delays are framed.

In other work on intertemporal choices, Marzilli Ericson et al. (2015) show that in intertemporal choices framed as "receiving $100 now" and "$110 in 6 months", people rely on both differences and ratios of the attributes of intertemporal choices – monetary amounts and times. Their model – the Intertemporal Choice Heuristic (ITCH) –

does better at predicting intertemporal choices than classic models, such as hyperbolic or exponential discounting. As seen in Equation 1 the functional form of the ITCH model with estimated parameters shows that an increased reliance on ratios in time leads to steeper discounting.

[What are they?]

$$P(LL) = L\left(\beta_I + \beta_{xA}(x_2 - x_1) + \beta_{xR}\frac{x_2 - x_1}{x^*} + \beta_{tA}(t_2 - t_1) + \beta_{tR}\frac{t_2 - t_1}{t^*}\right) \quad (1)$$

Although the majority of intertemporal choice studies involve choices between gains, temporal choices can also take the form of choices between losses (Hardisty, Appelt, & Weber, 2013; Hardisty & Pfeffer, 2015). Although losses have been shown to be a critical moderator of intertemporal preferences citeHardisty2013 few studies explore how loses affect intertemporal choices. Further all studies cited so far have only looked at framing effects of intertemporal choices framed as gains. Framing effects which are robust for gains, may have affect losses differently.

This work aims to demonstrate that the fourth research stream – that patience is affected by how options are framed – can affect real world phenomenon. Specifically, this paper combines the work of Read et al. (2013) – which shows that framing amounts as ratios alters patience – and Marzilli Ericson et al. (2015) – which shows that people rely on differences and ratios in standard intertemporal frame as well as the work of Read et al. (2005) which shows that how times are framed can alter patience.

Specifically, I focus on how framing times as ratios can decrease patience. When delays are sufficiently small, and when temporal ratios are made explicit, our attention will be focused on the ratio of how much *longer* we will wait. For instance reframing a choice between "receiving $100 in 1 day" and "$110 in 10 days" to being a choice between "receiving $100 in 1 day" and "$110 in 10 *times as long*", will focus participants on how much longer they will wait for $110 as opposed to receiving the $100 today. This increased focus on how long they will wait, leads to decreased patience when times are framed as ratios.

2.1 Hypothesis

2.1.1 Hypothesis 1

Given that people rely on differences and ratios between amounts and times in intertemporal choice, increasing the reliance on ratios for times with relatively small differences should lead to decreased patience.

Hypothesis 1: In gain intertemporal choices, when times are expressed as ratios, people will be more impatient than when expressed as delays.

2.1.2 Hypothesis 2

Similar to hypothesis 1 when framed as losses making temporal ratios explicit people will be more impatient.

Hypothesis 2: In loss intertemporal choices, when times are expressed as ratios, people will be more impatient than when expressed as delays.

2.1.3 Hypothesis 3

Related to hypothesis 2 when framed an intertemporal chioce is framed as a shipping scenario, making temporal ratios explicit people will induce less patience.

Hypothesis 3: In shipping scenarios, when times are expressed as ratios, people will be more impatient than when expressed as delays.

2.2 Summary of Studies

In this paper, I describe three studies investigating the explicit temporal ratio effect (ETRE). Study 1 shows that the explicit temporal ratios lead to less patience when intertemporal choices are framed as gains. Study 2 extends this effect to losses. Finally, Study 3 shows that in an explicit shipping scenario people are less patient when temporal ratios are made explicit.

3 Study 1

Study 1 shows that the explicit temporal ratios lead to less patience when intertemporal choices are framed as gains. Participants chose between smaller sooner and larger later options. These options were displayed in one of two frames: implicit temporal ratios and explicit temporal ratios. Study 1 tests Hypothesis 1: In gain intertemporal choices, when times are expressed as ratios, people will be more impatient than when expressed as delays.

3.1 Method

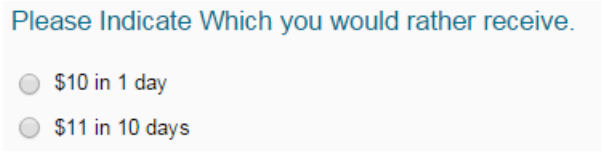
Two hundred participants from Amazon Mechanical turk we recruited to take part in a "Decision Making Survey". Although the validity of Mechanical Turk has been called into question, Paolacci, Chandler, and Ipeirotis (2010) finds that classic effects in decision making replicate. Further, participants who have less than 50 HITs accepted or who have less than 95% of their HITs accepted were not allowed to participate in the study. Additionally only participants who passed an attention check were included in the final analysis. These precautions were taken to ensure that participants were paying attention to the study

Participants completed informed consent, then were given a test to ensure they understood the paradigm. Next they were assigned to one of the two conditions: implicit ratio or explicit ratio. They then were shown the five intertemporal choices in from the Study 1 section of Table 1. Choices were displayed in a randomized order

Table 1: Amounts and times of Stimuli for Studies 1-3

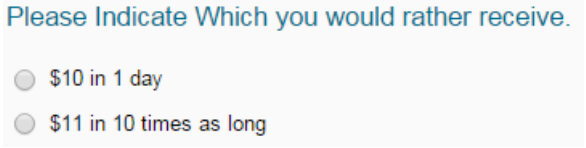
	A		B		C		D		E	
Question	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
Study 1 (Gains)										
Amount Gained	$10	$11	$9	$12	$4	$6	$5	$6	$14	$15
Delay (Days)	1 day	10 days	2 days	6 days	3 days	9 days	4 days	8 days	4 days	12 days
Delay (Ratio)	1 day	10 times as long	2 days	3 times as long	3 days	3 times as long	4 days	2 times as long	4 days	3 times as long
Study 2 (Losses)										
Amount Paid	($10)	($11)	($9)	($12)	($4)	($6)	($5)	($6)	($14)	($15)
Delay (Days)	1 day	5 days	2 days	8 days	2 days	12 days	3 days	9 days	3 days	12 days
Delay (Ratio)	1 day	5 times as long	2 days	4 times as long	3 days	6 times as long	3 days	3 times as long	3 days	4 times as long
Study 3 (Shipping)										
Shipping Cost	($14)	($5)	($11)	($8)	($8)	($5)	($9)	($7)	($8)	($3)
Shipping Time Days	1 day	5 days	2 days	8 days	2 days	12 days	3 days	9 days	3 days	12 days
Shipping Time Ratios	1 day	5 times as long	2 days	4 times as long	3 days	6 times as long	3 days	3 times as long	3 days	4 times as long

For the implicit time ratio condition, intertemporal choice A was displayed as follows:



Choices B-E were displayed in the identical format.

In the explicit time ratio condition, intertemporal choice A was displayed as follows:



Choices B-E were displayed in the identical format.

Further each choice was displayed in a random order to each participant. After completing their choices participants completed demographic information.

3.2 Results

Following Read et al. (2005) and Hardisty and Pfeffer (2015), the dependent variable was the number of times the participant chose sooner reward (option 1 in Table 1). As seen the Table 2 (note I did not actually collect data for this study I just put sample data down for illustrative purposes) there is a strong effect of explicit intertemporal ratios. Nearly twice as many people choose the sooner option when temporal ratios are explicit.

Table 2: Proposed Percent of choices for the sooner option given different temporal ratios

	Temporal Frame	
	Implict Ratio	Explicit Ratio
A (%)	30	60
B (%)	40	65
C (%)	42	70
D (%)	37	68
E (%)	39	66
Mean (%)	38	65.8
N	100	100

Statistical significance of the difference between explicit and implicit temporal ratios was tested via a Kruskal-Wallis tests. Overall the effect of ratio was significant. To confirm these results, I ran a robust logistic regression which allowed for correlated errors within participants. The dependent variable was choice (0 later option chosen, 1 sooner option chosen) and the independent variable was ratio frame. This regression confirmed the results of the Kruskal-Wallis test, namely that participants were more impatient when temporal ratios are make explicit.

3.3 Discussion

Study 1 demonstrated that explicit temporal ratios lead to greater impatience.

4 Study 2

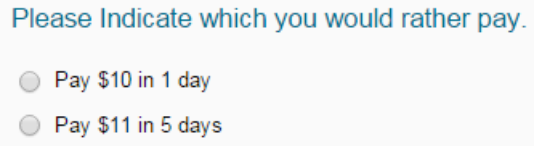
Study 2 extends the results of Study 1 to losses. Although most intertemporal choice studies use gains, a large number of real world intertemporal choices involve losses (Hardisty et al., 2013). For instance waiting to pay off your credit card incurs greater losses if you wait – the compounding interest – than if pay it off immediately. Intertemporal choices framed as losses measured in the lab take the form of choices between "Pay $100 immediately" and "Pay $110 in 6 months" (Hardisty & Pfeffer, 2015).

4.1 Method

Two hundred participants from Amazon Mechanical turk we recruited to take part in a "Decision Making Survey". Participants who have less than 50 HITs accepted or who have less than 95% of their HITs accepted were not allowed to participate in the study. Additionally only participants who passed an attention check were included in the final analysis. These precautions were taken to ensure that the sample included qualtiy participants who were paying attention to the study.

Participants completed informed consent, then were given a test to ensure they understood the paradigm. Next they were assigned to one of the two conditions: implicit ratio or explicit ratio. Participants read the instruction "Please imagine you face a set of choices about paying a bill at a short time from now, or another bill later" They then were shown the five intertemporal choices in from the Study 2 section of Table 1. Choices were displayed in a randomized order

For the implicit time ratio condition, intertemporal choice A was displayed as follows:



Choices B-E were displayed in the identical format.

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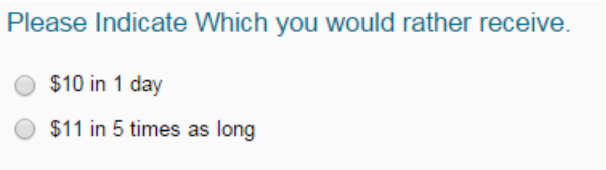


Choices B-E were displayed in the identical format.

Further each choice was displayed in a random order to each participant. After completing their choices participants completed demographic information.

4.2 Results

As with Study 1, the dependent variable was the number of times the participant chose sooner reward (option 1 in Table 1). As seen the Table 3 (note I did not actually collect data for this study I just put sample data down for illustrative purposes) there is a strong effect of explicit intertemporal ratios. Nearly twice as many people choose the sooner option when temporal ratios are explicit.

Table 3: Proposed Percent of choices in Losses for the sooner option in different temporal ratios

	Temporal Frame	
	Implict Ratio	Explicit Ratio
A (%)	20	48
B (%)	25	50
C (%)	27	57
D (%)	28	54
E (%)	24	58
Mean (%)	38	65.8
N	100	100

Statistical significance of the difference between explicit and implicit temporal ratios was tested via a Kruskal-Wallis tests. Overall the effect of ratio was significant. To confirm these results, I ran a robust logistic regression which allowed for correlated errors within participants. The dependent variable was choice (0 later option chosen, 1 sooner option chosen) and the independent variable was ratio frame. This regression confirmed the results of the Kruskal-Wallis test, namely that participants were more impatient when temporal ratios are make explicit.

4.3 Discussion

Study 2 replicated the ETRE – explicit temporal ratios yeild more impatience – for intertemporal losses.

5 Study 3

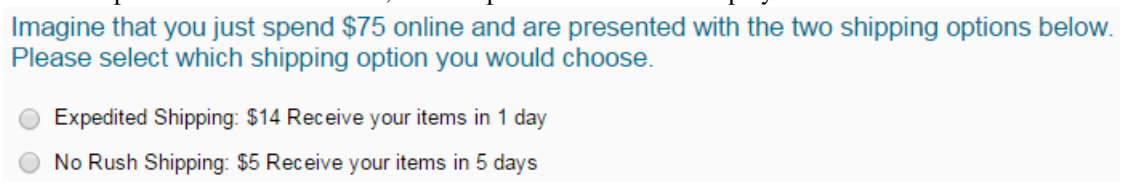
Study 3 extends the results from Study 1 and Study 2 to intertemporal choices explicitly framed as shipping scenarios. Shipping scenarios are typically displayed as a choice between "Receive your items in 2 days and pay $8" and "Receive your items in 10 days and pay $4" Although choosing a shipping speed is similar to the intertemporal choices shown in Studies 1 and 2 there is a subtle, yet possibly significant difference between the two. Shipping decisions can be thought of as *paying more now to receive an item sooner* whereas the intertemporal choices shown in Study 2 can be thought of as *paying something smaller now to avoid paying something larger later*.

5.1 Method

Two hundred participants from Amazon Mechanical turk we recruited to take part in a "Decision Making Survey". Participants who have less than 50 HITs accepted or who have less than 95% of their HITs accepted were not allowed to participate in the study. Additionally only participants who passed an attention check were included in the final analysis. These precautions were taken to ensure that the sample included qualtiy participants who were paying attention to the study.

Participants completed informed consent, then were given a test to ensure they understood the paradigm. Next they were assigned to one of the two conditions: implicit ratio or explicit ratio. Participants read the instruction "Imagine that you have just spent $75 dollars shopping online. None of your purchases are absolutely necessary to have, but you would enjoy having all of them. You are about to check out and are presented with two shipping options." They then were shown the five intertemporal choices in from the Study 3 section of Table 1. Choices were displayed in a randomized order

For the implicit time ratio condition, intertemporal choice A was displayed as follows:



Choices B-E were displayed in the identical format.

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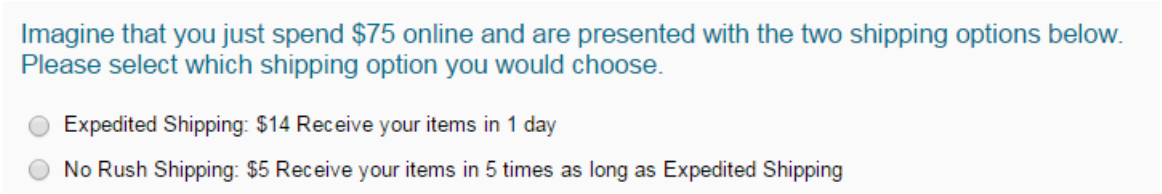

Choices B-E were displayed in the identical format.

Further each choice was displayed in a random order to each participant. After completing their choices participants completed demographic information.

5.2 Results

As with Studies 1 and 2, the dependent variable was the number of times the participant chose sooner reward (option 1 in Table 1). As seen the Table 4 (note I did not actually collect data for this study I just put sample data down for illustrative purposes) there is a strong effect of explicit intertemporal ratios. Nearly twice as many people choose to expedite their shipping temporal ratios are explicit.

Statistical significance of the difference between explicit and implicit temporal ratios was tested via a Kruskal-Wallis tests. Overall the effect of ratio was significant. To confirm these results, I ran a robust logistic regression which allowed for correlated errors within participants. The dependent variable was choice (0 No Rush Shipping

Table 4: Proposed Percent of choices in Losses for the sooner option in different temporal ratios

	Temporal Frame	
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A (%)	20	48
B (%)	25	50
C (%)	27	57
D (%)	28	54
E (%)	24	58
Mean (%)	38	65.8
N	100	100

Chosen, 1 Expedited Shipping Chosen) and the independent variable was ratio frame. This regression confirmed the results of the Kruskal-Wallis test, namely that participants were more impatient when temporal ratios are make explicit.

5.3 Discussion

Study 3 replicated the ETRE – explicit temporal ratios yield more impatience – for intertemporal choices explicitly framed as shipping.

6 General Discussion

Across three studies we demontrate that the Explicit Temporal Ratio Effect (ETRE) – making temporal ratios explicit – yields greater patience. This importance has been understated by previous models of intertemporal choice, and by explicitly expressing temporal ratios people are more impatient.

7 Limitations and Future Directions

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