LOSS AVERSION FOR TIME-SENSITIVE AND VALUE DEPRECIATING (TSVD) GOOD: AN INTRODUCTION OF LOSS AVERSION SENSITIVITY (LAS)

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Research Paper[2]

Abstract

In a market setting where trade of TSVD good such as the movie ticket is involved, consumers set selling price lower than buying price – a phenomenon known as the reversal of loss aversion. And uncertain information in an unknown (partial information) or known (full information) format has no influence on the prices the consumers set when it comes to TSVD good. We observed that consumers' decision making seems to be entirely shrouded by the overwhelming fear in losing out the opportunity to reclaim any monetary value back when full depreciation of the TSVD good is realized. This paper empirically tested four hypotheses and concluded that a revseral of loss aversion is observed regardless of the consumers' first undertaken role, or the extent of knowledge. To the end, the author seeks to introduce a model – the Loss Aversion Sensitivity – to explain the reversal of loss aversion.

Keywords: decision making, loss aversion, prospect theory, consumer choice.

1 Introduction

Consumers are loss aversive because losing is viewed as a separation from physical or psychological self. For example, losing a well-loved pen is attributed to a loss of a part of self arising from ownership detachment. The more consumers realize they lose something, the more averse they become when it comes to losing something. Numerous studies from the behavioral economics, law, marketing and decision making fields over the past five decades have shown that loss aversion explains consumers' irrational[3] preferences. To this date, loss aversion remains the most popular theory in explaining consumers' preferences and choices. This paper addresses three concerns: 1) across varying information providence, loss aversion is observable among consumers, 2) varying information providence impact tradable market good such as the Starbucks coffee mug but not time-sensitive, value depreciating (TSVD) good such as the movie ticket, and 3) loss aversion is inversed when the item used for trade is a TSVD good. TSVD good is defined as the non-unique and marketable good that has a time limit to it's utility due to the depreciation of its value. Some typical examples include movie ticket, airline ticket and household goods with an expiration date tagged to it.

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[3] It is irrational from the perspective of the Expected Utitlity Theory.

2 Review and Hypothesis

Loss aversion is defined as "*a manifestation of an asymmetry of value*" arising from the disutility of giving up an object and the utility associated with acquiring it. (Kahneman et al., 1991) It's a manifestation of the compensation demanded to give up an entitlement being far exceeded from the respondents' indicated willingness to pay to maintain it (Knetsch and Sinden, 1984), a "*seemingly ubiquitous phenomenon*" (Novemsky and Kahneman, 2005) and a result of the greater tendency to feel pain in perceived losses than its equivalent gain. It is primarily driven by the urgency in addressing pain more than pleasure. (Tversky and Kahneman, 1991) Loss aversion is also found in riskless and risky choices, with the magnitude of loss aversion being $\lambda^{riskless} = 1.73$ and $\lambda^{risky} \sim \{1.15, 1.50\}$[4] . (Gächter et al., 2022) Other explanations for the asymmetry of value includes lack of substitutability (*ibid.*), framing (Carmon and Ariely, 2000; Williamson et al., 2019), force-trading (Engelmann and Hollard, 2010), query theory (Johnson et al., 2007), morality (Boyce et al., 1992), cultural variance (Maddux et al., 2010) and similarities to ordinary market good. (Tsur, 2008) Explanations for loss aversion includes memory of past experiences (Walasek, 2014), valence vs. possession (Brenner et al., 2007), probability in risky choice scenarios (Kahneman and Tversky, 1979), choice order of goods (Thaler, 1985), partial vs. full relinquishment of goods (Schurr and Ritov, 2014) and emotions arising from uncertainty (Gal and Rucker, 2018). Over the past 5 decades, loss aversion has been the preferred explanation for the asymmetry of valuation gap.

2.1 Observing Loss Aversion Across all Extent of Knowledge

Carmon and Ariely (2000) hypothesized that information integration has an impact on the disparity arising from loss aversion and concluded that "*evoking the role of a buyer or a seller actually causes products to be viewed differently, with each role drawing greater attention to the attributes that are to be given up.*" Apart from the roles that the consumers play in choice making, the action of and omission in choosing a choice has an impact of loss aversion too. Ritov and Baron (1995) tested the interaction effects of knowledge and "*action versus omission*" on several judgments and hypothetical decisions that lead to regret and concluded in discussion, "*without any knowledge, when people think about decisions, they may pay less attention to the feelings they would have about the outcomes associated with different options.*" Not only the roles (buyer vs. seller) of the consumers impact loss aversion, the information that is given to the consumers impacts oss aversion too. And when it comes to knowledge, consumers behave differently when they are constructing their preferences using knowledge as building blocks. Ariely and Simonson (2003) concluded in their research that the true valuation of goods "*has to be obtained through building on existing knowledge*". And the search for this knowledge during preference construction impacts loss aversion too. (Pachur and Scheibehenne, 2012) Assuming that loss aversion explains the valuation gap across all extent of knowledge:

H_0^1 → There is no significant difference between Willingness-to-Pay and Willingness-to-Accept across all extent of knowledge.

H_0^2 → The attribute of role (buyer and seller) has no effect with extent of knowledge when it comes to loss aversion.

2.2 Information Providence Not Impacting TVSD Goods

Consumers are not influenced by the varying level of information providence when it comes to goods that are time-sensitive and value depreciating, since they feel that loss (i.e. not able to regain any amount due to full depreciation) looms larger than forgone gain (i.e. not able to sell it to a millionaire).

[4] According to the authors, $\lambda^{riskless}$ and λ^{risky} is the individual-level loss aversion based on an individual's WTA/WTP ratio.

And the lack of substitutability in replacing the potential loss strengthens the effect of loss aversion. (Hanemann, 1991) While not being able to gain results to regret, the pain in losing an endowment due to forgone loss recovery is more salient as compared to losing a gain due to a probable chance. Simply put, consumers want to avoid losses when the loss is more probable as compared to the less probable gain. However, consumers are also influenced by varying level of information providence when it comes to trading of goods that exhibit the conventional loss aversion explanation (i.e. selling price is higher than buying price). Hence, an alternative hypothesis is accepted when the following null hypothesis is rejected:

H_0^3 → Varying level of information providence does not mediate WTA and WTP of the coffee mug.

H_1^3 → Varying level of information providence does not mediate WTA and WTP of the movie ticket.

2.3 Observing Loss Aversion for Trade of TVSD Goods

Sometimes gains loom larger than losses and the context in which the loss and gain is evaluated plays a role in reversing the loss aversion, (Gal and Rucker, 2018) especially when gains are evaluated as '*small*' (Harinck et al., 2008), and consumers '*shun calculating the net of gains and loss*'. (Aggarwal et al., 2006; Clark and Mils, 1993) To reconcile both the notions of 'gains loom larger than loss' and 'losses loom larger than gain', it is truly essential to consider the reference point in a wider contextualized evaluation. For example, consumers evaluate the inability to sell TSVD good as a loss, compelling them to lower their Willingness-to-Accept price. This observation is seen when the reference point is not the good but the value depreciation rate of the endowed good. And when this good expires or timeout, the value of it becomes zero. The nearer the expiry or timeout is, the lower the Willingness-to-Accept price is. Hence, to avoid the potential loss due to complete depreciation, consumers' are more willing to lower their Willingness-to-Accept price, so to motivate other buyers to purchase the good at the earliest time possible, knowing that the valued good is sold in compensation for the value depreciation between the purchase price of the good and the selling price of the good. This is also primarily driven by the potential pain in inaction resulting to regret, which is more urgent than pleasure in action that results to gain. A loss can sometimes be viewed as a gain in outcome if the alternative option leads to even worse outcome. (Ritov and Baron, 1995; Tversky and Kahneman, 1991) Assuming that loss loom larger than gain in a context where the disutility in not being able to sell the TSVD good:

H_0^4 → Goods that are time-sensitive and value depreciating has no relationship on the impact of loss aversion

With these four hypotheses, we want to investigate whether goods that are time-sensitive and value depreciating exhibit the conventional loss aversion as suggested by many researchers – which is, sellers' Willingness to Accept being higher than buyers' Willingness to Pay.

Simply put, consumers do not exhibit significant loss aversion at the initial stage of purchase due to the perceived attenuation of likelihood in making a loss if the item is sold (since the item was bought not long ago and recovering any money close to the market price is more probable). Subsequently, loss aversion gradually increases to a constant state when the knowledge of the depreciation of good and the uncertainty of likelihood in making a loss if the item is sold become salient, which finally plateaus off when consumers know that they are at the mercy of the market force which attenuates their willingness to accept in selling the TSVD good that might lead to total loss when full depreciation is realized.

We will use WTA for Willingness-to-Accept and WTP for Willingness-to-Pay in subsequent sections.

3 Design

A 2 (buyer vs. seller) x 3 (no information, unknown uncertainty information, known uncertainty information) between-subject design and a 2 (buyer vs. seller) x 3 (no information, unknown uncertainty information, known uncertainty information) x 2 (time-sensitive, value depreciating vs. tradable good) within-subject design was implemented for a subject pool of $n = 180$ Singaporean Citizens or Singaporean Permanent Residents age 20 – 36 years old (the Millennial) coming from an online panel provided by pollfish.com[5]. Each subject was randomly sampled and assigned to each cell within the 2 (buyer vs. seller) x 3 (no information, unknown uncertainty information, known uncertainty information) matrix. In total, we were expecting at least six (6) possible factorial comparisons between and within subjects. This yielded a more representative sampling to the population under study.

Each cell in the sample matrix consisted sufficient sampling power to approximate a Gaussian distribution, with a margin of error at 0.08 and a confidence level at 0.95 for a population size of $N = 1.2M$ as of the year 2021. The Shapiro-Wilk test[6] was used to assess the fit of normality (Zeiler and Teitelbaum, 2018), assuming that the null hypothesis is the WTP and WTA variables in the sample and in the sampling from each experiment's matrix design *do* follow a Gaussian distribution (rejecting this null hypothesis lead to affirmation of non-normality). A heavily tailed or non-normal distribution such as a bimodal distribution results to dissimilarity to the Gaussian distribution. Violation of normality impacts the analytical tools used to reject hypotheses.

The research instrument was a survey with full anonymity. Two rounds of instrumentation testing were done by two independent educated individuals – the reviewers. Comments made by them were used – for most part of it – to improve on the research instrumentation. This includes the wording, sensing, structure, grammar, logic & flow, and intuitiveness. Then, a pre-testing was performed $n = 20$ to validate the reliability of the instrument. Minor changes such as the standardization on the use of pronouns and clarifying on the state of the coffee mug (such as using the word 'unused') were made.

Subjects first underwent two screening questions. They were asked to indicate their age and their current domicile status. As the subjects were independently and randomly sampled, they were not aware of the screen-out options. Hence, only valid subjects could proceed forward after indicating their answers to the screening questions. After which, the subjects were asked to indicate their Informed Consent (IC) agreement, in which they needed to agree on the following: 1) I would like to participate in this survey, 2) I acknowledge that I can withdraw from my participation in this survey, 3) This survey is completely anonymous and I agree to provide demographic data such as sex, age, household income and educational qualification. Indicating a "No" to any of the three IC questions resulted to a screen-out and termination of the survey.

Once the subjects had given their IC, an introduction by means of a scenario was given to them. Subjects were told that they wouldn't mind visiting the movie theater alone or they were very confident that someone would accompany them eventually. The name of the study was stated in the

[5] The data collection period started on 31st July 2022 and ended on 21st August 2022.

[6] The Shapiro-Wallis test is sensitive towards normality and under C.L.T., it is probable that normality may be observed when sufficiently large number of random samples from the same population is taken with replacement. However, scaling up to obtain more sample size to achieve normality (a contentious discourse due to the cost/benefit of scaling up) may not necessarily generate further insights as compared to smaller sample size that do represent the population at large.

introduction, as well as the good and the context of the transaction. A usual price[7] (U.P.) which was the market price was also given, so to align all subjects with the same reference point in terms of pricing. The subjects then proceeded to pick an option $c \subset C; C = \{A, B, C, D, E, F\}$. Each option assigned the subjects to each sampling matrix. Alphabets were used instead of numbers, so to avoid potential anchoring effect.

The subjects then proceeded to state their WTA or WTP for the movie ticket, depending on their assigned role from the sampling matrix, For the question with no information, subjects were given only the instruction to buy (sell) with an image of the movie ticket. For the question with unknown uncertainty information, subjects were given the same information as the subjects that were given no information, with an addition of a description stating that they could only buy (sell) the item through an auction site and there was only one ticket left. For the question with known uncertainty information, subjects who took on the role of a buyer were given the same information as the subjects who were given partial information, with the addition of one statement stating that the bidding process would end in 5 minutes. Uncertainty was observed when the bidding price might or might not be sufficiently high enough to buy the ticket. For the subjects who took on the role of a seller under the known uncertainty information scenario, they were given the same information as the subjects who were given the unknown uncertain information, with the addition of one statement stating that there was a 50% chance that a millionaire could buy the ticket from him/her. Similar structure of questions was asked in reverse for subjects who took on the role as a seller at the start.

After answering questions relating to the TSVD good, subjects were then given a similar introduction by means of a scenario but with a unique, collectible and unused Starbucks coffee mug. Similar questions that were asked for the TSVD good were also given to the subjects. Towards the end of the survey, all subjects within the sampling matrix were asked to indicate their loss aversion relative to gains in a set of five psychometric questions. A seven point Likert scale was given in view of the subjects' limitation in their capacity to process information. (Miller, 1994) Finally, the subjects were asked to indicate the following demographic information: sex, race, household income bracket per annum, and their most recent highest educational qualification. Upon completion, subjects exited the survey.

4 Study

Subjects who took on the role of a buyer will first indicate their WTP for TSVD good such as the movie ticket. Subjects who took on the role of a seller will first indicate their WTA in selling the movie ticket. Once the subjects had completed the questions on their WTA or WTP for the movie tickets, all subjects were then asked the same questions in similar context, except that the good was the unique, rare and unused collectible Starbucks coffee mug. Subjects who first buy-and-then-sell should have similar – if not identical - preferences as compared to the ones who first sell-and-then-buy. This should hold true for all three different information processing scenarios. A non-parametric analysis was deployed to assess the significance of the rank difference of the median values and the variation across all groups. The WTP and WTA were i.i.d variables and the respondents were sampled independently from each other.

[7] Although several researchers have taken the view of avoiding the anchoring effect, the authors believe that the anchor serves as a common reference point for all respondents, such that the inputs in surveys are a deviation – either more or less – from the usual price.

5 Result

There was sufficient evidence to conclude that normality was not observed for all in-cell sample from the 2 roles (buyer, seller) x 3 knowledge (no information, unknown uncertainty information, known uncertainty information), with all Shapiro-Wilk test's $p < 0.05$, pointing the direction of the analysis to be non-parametric. Using the Kruskal-Wallis test, we observed no statistical difference in WTA and WTP regardless of the role the respondents had undertaken, either as the starting role or the subsequent role.

Role	Scenario	Movie Ticket (median) (in Singapore Dollar)	Starbucks Coffee Mug (median) (in Singapore Dollar)
Buy	No information	WTP : $22.40 p > 0.10 (ns)	WTP : $90 p > 0.10 (ns)
	Unknown uncertainty information	WTP : $16 p > 0.10 (ns)	WTP : $110 p > 0.10 (ns)
	Known certainty information	WTP : $17.6 p > 0.10 (ns)	WTP : $105 p > 0.10 (ns)
Sell	No information	WTA : $12 p > 0.10 (ns)	WTA : $135 p > 0.10 (ns)
	Unknown uncertainty information	WTA : $12 p > 0.10 (ns)	WTA : $141.75 p > 0.10 (ns)
	Known certainty information	WTA : $13 p > 0.10 (ns)	WTA : $143.78 p > 0.10 (ns)

Table 1 – Kruskal-Wallis Test of Rank-Difference between Roles undertaken by Respondents

Hence, we did not have sufficient evidence to reject the null hypothesis H_0^2 and therefore concluded that consumers were consistent in their WTA and WTP regardless of their first undertaken role. This was an important step because we wanted to avoid the influence of role.

We observed statistical difference between WTA and WTP for both products across different level of information providence.

Role	Scenario	Movie Ticket (median) (in Singapore Dollar)	Starbucks Coffee Mug (median) (in Singapore Dollar)
Buy-then-Sell	No information	WTP : $20.80 WTA : $12 p < 0.05	WTP : $75 WTA : $114.75 p < 0.05
	Unknown uncertainty information	WTP : $16	WTP : $100

		WTA : $12	WTA : $135
		p < 0.05	**p < 0.10**
	Known certainty information	WTP : $16	WTP : $105
		WTA : $14	WTA : $141.75
		p < 0.05	**p < 0.10**
	No information	WTP : $22.40	WTP : $100
		WTA : $14	WTA : $135
		p < 0.05	p < 0.05
	Unknown uncertainty information	WTP : $19.20	WTP : $110
Sell-then-Buy		WTA : $14.50	WTA : $145.13
		p < 0.05	p < 0.05
	Known certainty information	WTP : $19.20	WTP : $105
		WTA : $10	WTA : $145.80
		p < 0.05	**p < 0.10**

Table 2 – Kruskal-Wallis Test of Rank-Difference between Roles undertaken by Respondents

We had sufficient evidence to reject the null hypotheses H_0^1, H_0^4 and concluded that there was indeed a statistical difference between what consumers pay for when it comes to buying and what consumers accept due to the varying level of information providence.

Now that we had observed loss aversion for the trade of movie ticket and the Starbucks coffee mug, we wanted to identify whether the level of information providence impacts loss aversion for both the movie ticket and the coffee mug.

Role	**Movie Ticket (median) (in Singapore Dollar)**	**Starbucks Coffee Mug (median) (in Singapore Dollar)**
Buy	WTP : $19.20	WTP : $100
	p > 0.10 (ns)	p < 0.05
Sell	WTA : $12	WTA : $135
	p > 0.10 (ns)	**p < 0.10**

Table 3 – Kruskal-Wallis Test of Rank-Difference of the Impact of Varying Information Providence on WTA and WTP

We observed statistical difference in median for WTP and WTA of the coffee mug but not the movie ticket. We had sufficient evidence to reject the null hypothesis H_0^3 (accepting the alternate hypothesis) and concluded that respondents' input in WTA and WTP did not differ significantly for TSVD good, but differed significantly when it comes to tradable market good such as the coffee mug.

Finally, based on demographics of the respondents, there was no statistical difference in respondents' input of WTA and WTP for race $(p_{kw} > 0.05\ (ns))$, annual household income $(p_{kw} > 0.05\ (ns))$, and latest educational qualification $(p_{kw} > 0.05\ (ns))$[8].

6 Loss Aversion Sensitivity

Consumers maximize utility and minimize regrets in decision making, (Bettman et al., 1998) such that:

$$\max_{0 \le x \le n} \delta . U(x \mid \alpha_1 x_1 + \alpha_2 x_2 \dots \alpha_n x_n) + \varepsilon\ ;\ \varepsilon \sim N(1,0);\ \delta, \alpha \in \mathbb{R}; n \in \mathbb{Z}^+;\ x \subset \{x_1, x_2 \dots x_n\} \tag{1}$$

$$\min_{0 \le x \le n} \tau . R(x \mid \beta_1 x_1 + \beta_2 x_2 \dots \beta_n x_n) + \varepsilon\ ;\ \varepsilon \sim N(1,0);\ \tau, \beta \in \mathbb{R};\ n \in \mathbb{Z}^+;\ x \subset \{x_1, x_2 \dots x_n\} \tag{2}$$

where x is the choice among nth good(s), the functions $U(x)$ and $R(x)$ are the utility and regret functions respectively, and the α and β are the respective weights or coefficients applied to the good(s), and the δ and τ are the probabilistic coefficients applied to the respective functions. We want the regret function to be reduced, as consumers want to avoid regrets as much as possible, (Ritov and Baron, 1995) but maximize their utility using some form of mental accounting (Thaler, 1985) that construct their choices based on available options. (Bettman et al., 1998) For that reason, consumers choose to avoid trade-offs (Hogarth, 1987) as trade-offs require higher level of cognitive function in decision making, along with sacrifices that may result to regrets and a reluctance to consider alternatives by remaining with the status quo. (Luce, 1998) At the point where $R(x)$ is dominating, much effort is needed to reduce regret, assuming that the utility function and regret function increases and decreases monotonically (this assumption must hold, so that the near inflection points are concave and convex respectively). This 'effort' can sometimes be so overwhelmingly dominating simply because loss aversion becomes more sensitive in the domain of regret. Hence, it is by no surprise that consumers who – at the last minute – decide to sell used furniture do so at a very low price before moving out of the apartment. The inability to sell and the potential regret arising from not selling it make loss aversion even more salient. Notice that the weights are applied to each function, and at times the β weight is entirely dominating, such that consumers make spontaneous decisions in light of disparate equality in both weights. We call this the pronounced Loss Aversion. Consequently, as consumers process and integrate more information, the α weight becomes dominating, resulting to parity in both weights. Hence, with a pronounced loss aversion where consumers display a cognitive dissonance when they consider what they can gain back and what they might lose when full depreciation is nearing to full realization. In this paper, Loss Aversion Sensitivity (LAS) – which is denoted as ϕ - explains such phenomenon and it is first introduced as an introductory concept in understanding consumers' sensitivity in loss aversion for time sensitive and value depreciating goods.

[8] The statistical test using demographic variables as factors served as a confirmatory analysis. If there is statistical difference in respondents' input of WTA and WTP, loss aversion could potentially be explained by the demographic factors. We did not observe such difference across demographic variables.

The LAS is the differential of the WTA over time.

$$\phi(\theta) = \frac{d\alpha}{dt} \tag{3}$$

where θ is the consumer, ϕ is the LAS function at the consumer level, α is the WTA and t is the time in which WTA is determined. Assuming that the differential is computed by a linear function:

$$\phi(\gamma, t) = \Delta \left(\gamma_{t_1} t_1 + k_{t_0}\right) dt \; \forall \; k_{t_1} > k_{t_2} \; ; \gamma, k \in \mathbb{R} \; ; \; t > 0 \tag{4}$$

where k_{t_0} is the market price, γ_{t_1} is the weight at time t_1, and t_1 is the time factor at the point of trade. This is to obtain the gradient of the slope as an indicator of the loss aversion sensitivity. A linear slope indicates consistent and rational loss aversion sensitivity.

We have so far assumed that the loss aversion sensitivity decreases in a linear fashion. However, loss aversion is observed to be non-linear, whereby the exponential rate of decrease plateaus at the bottom of the function. Hence, a sight modification to equation (4):

$$\phi(\gamma, t) = \Delta \left(k_{t_0} * e^{(-b_{t_1} * t_1)}\right) dt \; \forall \; k_{t_0} > k_{t_1} > k_{t_2} \; ; k \in \mathbb{R} \; ; t, b > 0 \tag{5}$$

where b is the parameter for the growth rate of the loss aversion sensitivity. At the start, consumers view the possession of the item as a gain. However, as time increases, possession of the item becomes a loss when full depreciation of the good is nearing. Forgoing the item without selling it when the value of the good has fully depreciated constitutes a total loss. To account for this convexity, the parameter b is modified:

$$\phi(\gamma, t) = \Delta \left(k_{t_0} * e^{-ek_{t_0}^{-\frac{b}{\sqrt{t_1}}} * t_1}\right) dt \; \forall \; k_{t_0} > k_{t_1} > k_{t_2} \; ; k \in \mathbb{R} \; ; t, b > 0 \tag{6}$$

Recall that the base raised to a power is the product of the base by the number of times indicated by the power. In LAS formulation, when the power is 1, $f(x)$ increases by e. And if power is 2, $f(x)$ is *twice* the product of e from the origin, and so on. In LAS, the multiplier is formulated as $-ek_{t_0}^{-\frac{b}{\sqrt{t_1}}} * t_1$. Now, observe that the multiplier is an inverse exponential function, leading to a decrease at an exponential rate. However, we want the exponential decrease to happen at the market price where $f(t) = k_{t_0} * t_1$. Hence, the LAS function effectively pass through $f(t) = k_{t_0}$ when $x = 0$. Finally, the modifier $(-\frac{b}{\sqrt{t_1}})$ is adjusted by a function of the b parameter being controlled by $\sqrt{t}$. Simply put, as t increases, split the b parameter by $\sqrt{t}$. The modifier is not dependent on t but the multiplier is dependent on both the market price k_{t_0} and t. The parameter t has to be non-negative and

non-zero real number, allowing the modifier not to be indeterminate. The axiomatic reason behind such assumption is that the good or services takes on a dichotomous coefficient, whereby consumers either own the good when it is endowed with, or not own the good when it leaves their endowment. It is untenable for t to take on $t = 0$ when the consumer owns or possesses the good, either psychologically or physiologically. However, b parameter can take on negative real number, although in this LAS formulation, b parameter is restricted to $b \in \mathbb{R}; b > 0$.

To illustrate this equation in a graphical form:

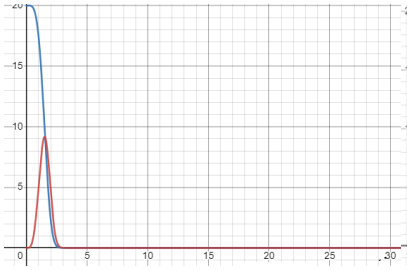

Figure 1 – $b = 1$

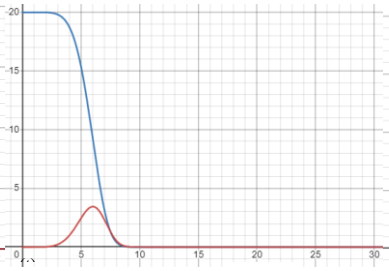

Figure 2 – $b = 4$

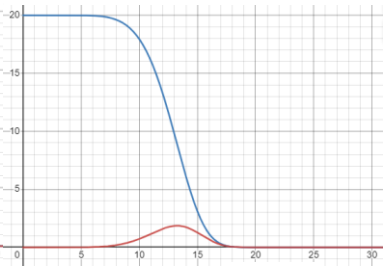

Figure 3 – $b = 10$

The blue curve is the WTA estimation and the red curve is LAS with the x-axis as time. At the same price, different LAS can be accounted for. For example, consumers may feel more sensitive toward loss if the rate in realizing the full depreciation of the good A becomes steeper as compared to good B. Good A is characterized by the $LAS(b) = 1$ whereas good B is characterized by the $LAS(b) = \{4,10\}$, depending on the level of endowment the consumers have toward the good and the time to expiration.

We assume that b is distributed in some form of a distribution. Since it's the sensitivity rate of the psychological impact arising from loss aversion, it is likely that the parameter b is taken from a Gaussian distribution For example, most people may exhibit similar b when it comes to movie ticket, gift vouchers, used items and cars[9]. In follow up papers, we shall attempt to explain and establish the LAS function.

7 Discussion

The first hypothesis was tested and there was truly a significant difference in median values[10] across all extent of knowledge. This was a fundamental test to make sure that loss aversion was observed. To tease out the role undertaken by the respondents being an impact on loss aversion, the second hypothesis was tested and we concluded that regardless of the role which the respondents undertook, there was no significant difference in their WTP and WTA. In other words, there was no significant influence of role on loss aversion.

We wanted to understand whether loss aversion was observed in both the TSVD good and the tradable Starbucks coffee mug. And we observed a significant difference in median value of WTA and WTP for TSVD good when it comes to loss aversion. Finally, we did not find any significant difference in

[9] It is very unlikely that a used car can be sold much higher than the original price. Moreover, in Singapore's context where certificate of entitlement (COE) - an entitlement to own a car within the society – exists, cars can only be owned for a certain period of time before going to the scrap yard. Cars fall in the same category as the movie ticket, albeit a more expensive and affective item.

[10] The Kruskal-Wallis test is a rank-test of median values.

loss aversion across the extent of knowledge for TSVD good. We tested this by rejecting the third hypothesis and accepted the alternate hypothesis.

We can conclude that there truly exists an impact on loss aversion based on the type of information given to the respondents for the coffee mug but not the TSVD good (e.g. movie ticket). While loss aversion was observed across all scenarios, it is noteworthy to know that the loss aversion ratio is less than 1 when it comes to the movie ticket (i.e. selling price is lower than buying price). We observed such a reversed loss aversion due to the proposed loss aversion sensitivity effect as modeled in this paper. If consumers want to maximize utility but yet do not want to experience complete loss, selling price will be lower than buying price since the prospect of losing all is more painful than gaining something from the trade. And based on the loss aversion sensitivity, the nearer the good reaches the full depreciation, expiry or timeout, the lower is the selling price due to the pain from the prospect of losing all due to inaction in selling the item when full depreciation is realized. Hence, to avoid such prospect and potential regret, consumers tend to sell the good at a lower price, with a hope to reclaim whatever that is remaining back.

8 Assumptions and Limitations

Several assumptions were made in this research paper. First, we have assumed that respondents have the intention to buy (sell) the goods. Future study can incorporate the element of Purchase Intention (PI) prior to the field experiment. Second, we have assumed that respondents treated the inputs in the surveys as real as it could get, to the point that it represented their actual decision making. In subsequent studies, researchers may conduct this field experiment in a real-world controlled setting such as lab testing. Third, we have assumed that the incentives provided by pollfish.com were sufficient to motivate the respondents to participate in survey. This was a valid assumption as the attrition rate (respondents who did not accept the IC) was less than 10%. We were assuming that, should the incentives be not attractive, the respondents would not have participated in the survey. Fourth, we have assumed that the rarity of the Starbucks coffee mug better represented a more valued good as compared to other consumables or daily goods. Fifth, we have assumed that normality was not observed and that normality *might* be observed should more data was obtained. Nonetheless, preliminary analysis using F-Test showed the statistical results not differing significantly from the non-parametric Kruskal-Wallis Test. Lastly, we have assumed – and limited to availability in financial support – that the sample size gives a good indication of the reversed loss aversion for TSVD Good. In this regard, future study may look at increasing the sample size to improve the statistical power and effect size in rejecting the hypotheses or design the experiments such that rejecting the hypothesis become seemingly impossible and hence, 'inverting the impossible' (see Edward Jenner's work on vaccination and smallpox) [11].

9 Summary

LAS suggests that loss aversion for TSVD good is reversed, whereas the conventional loss aversion is observed for tradable market good such as the collectible and rare Starbucks coffee mug. And the varying extent of information providence impacts the coffee mug and not the TSVD good (e.g. movie ticket). We can postulate that there are different types of loss aversion across different types of goods in the market. For some goods such as the TSVD good and goods with very small gains (Harinck et al., 2008), we can expect a reversal of loss aversion. And for tradable market goods, the conventional loss aversion can be expected. Researchers may further develop the LAS postulation and utilize the

[11] To derive truth in shape, it is imperative to build on this existing form that this paper offers. While truth in shape is a matter of a noble intellectual pursuit, at times, the form of it provides a clear indication of the general validity of the concept on which the shape is built on.

beta parameter to form clusters of goods in the market, such that businesses are better informed in consumers' psychological state in loss aversion across different types of goods that are TSVD.

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