

# Loss Aversion and Gain Appetite in the Small and in the Large

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## Abstract

In their pioneering works on prospect theory Kahneman and Tversky (1979, 1992) propose the ground-breaking idea that in making decisions under risk individuals evaluate asymmetrically losses and gains against to a personal reference point. According to the Kahneman and Tversky (1979) statement “losses loom larger than gains”, individuals display loss aversion. However, Sacchi and Stanca (2014) argue that people may exhibit gain appetite that states that “gains loom larger than losses”. Although the prospect theory can be traced back of more than thirty years, how to formalize asymmetrical preferences to a reference point is still an open issue (see Abdellaoui et al., 2007; and Ghossoub, 2012). In this short note we set a preference-based definition for loss aversion, gain appetite and equally weighted preferences “in the small”, i.e. for outcomes around a given reference point; and “in the large”, i.e. for any outcome of the domain. The classical Kahneman and Tversky (1979, page 279) loss aversion definition follows as a special case.

**Keywords:** Loss-gain asymmetry, Preference-based definition of loss aversion and gain appetite; Multiple reference points

## 1 Introduction

Loss aversion, one of the pillar underlying prospect theory (see Kahneman and Tversky, 1979; 1992) is grounded on the idea that individuals do not react symmetrically to losses and gains, as measured from a given reference point.

How asymmetric perception of gains and losses impacts over individuals' decisions under risk has been investigated in the last thirty years in different fields, as behavioral finance, economic psychology, financial socio-analysis among other areas. Most theoretical and empirical research has focused on investigating the sentiment of the loss aversion, that human attitude described by Kahneman and Tversky (1979) with the statement "losses loom larger than gains". However, a recent stream of research has pinpointed how under specific circumstances individuals are more likely to feel the opposite sentiment of gain appetite i.e. that "gains loom larger than losses", or that "gains loom equal than losses" (see Sacchi and Stanca, 2014). Although more than thirty years have been passed from Kahneman and Tversky (1979)'s ground-breaking idea of loss aversion its definition is still a controversial issue (for an ample review see Abdellaoui et al., 2007; and Ghossoub, 2012).

In this short note we aim at formalizing the sentiments worded by the statements: (1) "losses loom larger than gains"; (2) "gains loom larger than losses" and (3) "losses loom equally than gains". Paraphrasing Pratt (1964)'s paper titled "Risk Aversion in the Small and in the Large", we propose definitions for asymmetrical preferences under risk "in the small", that is for outcomes around a given reference point; and "in the large", that is for any outcome belonging to the domain. Setting definitions "in the small" are motivated by the evidence that most individuals set multiple "preference turning points" in correspondence of which risk attitude switches from loss aversion to gain appetite or vice versa (see Tri-reference point theory, Wang and Johnson, 2012)

The structure of the paper is as follows. In Section 2, we introduce the definition of loss aversion and gain appetite. Section 3 concludes the article.

## 2. Loss aversion and gain appetite definitions

The Prospect Theory is based on two behavioral assumptions about the decision makers' attitude to risk: (1) that losses matter more than gains (loss aversion); and (2) that the perception of an incremental change in wealth flaws down with the distance from the reference point (diminishing sensitivity). A further third implicit assumption is that individuals set a singular individual reference point to discriminate outcomes as losses or gains. Kahneman and Tversky (1979) propose to describe these behavioral sentiments to the changes of wealth by a value function  $u$ .

Three salient characteristics distinguish this cardinal function  $u$ : (1)  $u$  is assumed to be concave above the reference point and convex below it; (2) departing from the reference point,  $u$  is steeper for losses than for gains; and (3) due to the assumption that the individual assumes a singular reference point,  $u$  results a S-shaped function,

where the reference point represents the concavity switching point of  $u$ . Traditionally, this singular reference point is assumed equal to the *status quo*, so that  $u(0) = 0$  (see Kahneman and Tversky, 1979).

In the literature there is no uniquely agreed-upon loss aversion definition (for an ample review of different definitions see Abdellaoui et al., 2007; Eeckhoudt et al., 2016; and Ghossoub, 2012). On the path of Bordley et al. (2017), we cast light on different risk preferences captured by the following statements:

- a) “*losses loom larger than gains*” (Kahneman and Tversky, 1979, p. 279). That refers to the tendency for people to strongly prefer avoiding losses than acquiring gains and it is called *loss aversion*;
- b) “*gains loom larger than losses*” (Sacchi and Stanca, 2014). That expresses the opposite tendency of loss aversion, i.e. it reflects the gain appetite<sup>1</sup>; and
- c) “*gains loom equal to losses*”, that describes *symmetrical loss-gain preferences*.

Using Pratt (1964)’s wording, to the best of our knowledge, existing definitions are focused on formalizing the only notion of asymmetrical preferences “in the large”. The need of having at disposal preference-based notions also “in the small” is motivated by the fact that most individuals display more than one “preference turning point”. As argued by Markowitz (1952) individuals endowed with a Friedman and Savage (1948) type utility function exhibit multiple concavity switching points in the “utility of wealth”. In the SP/A (security-potential/aspiration) theory (Lopes, 1996; and Lopes and Oden, 1999) the choice under risk entails the SP (security-potential) and the aspiration level, where the latter is analogous to Kahneman and Tversky’s *status quo*. In the Tri-Reference Theory (Wang and Johnson, 2012; and Koop and Johnson, 2012) individuals display three “preference turning points”, more specifically: (1) the minimum requirement value (MR); (2) the status quo (SQ), and (3) the goal (G). In correspondence of these “preference turning points” the utility function locally switches in concavity. On the path of Bordley et al. (2017), we formalize risk preferences “in the small” as follows.

**Definitions “in the small”.** Let  $u$  be an increasing cardinal utility function defined on the wealth domain and  $x_0$  a reference point, then if there exists a neighborhood  $I(x_0)$  belonging to the wealth domain, where

- a)  $u(x_0 + x) - u(x_0) \leq u(x_0) - u(x_0 - x)$  for all  $x \geq 0$ , then  $u$  exhibits *local loss aversion* respect to  $x_0$ ;
- b)  $u(x_0 + x) - u(x_0) \geq u(x_0) - u(x_0 - x)$  for all  $x \geq 0$ , then  $u$  exhibits *local gain appetite* respect to  $x_0$ ;

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<sup>1</sup> This corresponds to a reversed S-shaped utility function.

- c)  $u(x_0 + x) - u(x_0) = u(x_0) - u(x_0 - x)$  for all  $x \geq 0$ , then  $u$  exhibits *local symmetric loss-gain preferences* respect to  $x_0$ .

If the agent displays a singular reference point  $x_0$  and the above a), b) and c) definitions hold for all values of the wealth domain, then we get the definitions “in the large” (see Bordley et al., 2017). Let now consider the special case where there exists a singular reference point  $x_0 = 0$  and  $u(0) = 0$ . Conditions “in the large” follow:

- 1) if  $u(x) \leq -u(-x)$  for all  $x \geq 0$ , then  $u$  exhibits *loss aversion “in the large”* with reference point  $x_0 = 0$ ;
- 2) if  $u(x) \geq -u(-x)$  for all  $x \geq 0$ , then  $u$  exhibits *gain appetite “in the large”* with reference point  $x_0 = 0$ ;
- 3) if  $u(x) = -u(-x)$  for all  $x \geq 0$ , then  $u$  exhibits *symmetric loss-gain preferences “in the large”* with reference point  $x_0 = 0$ ;

It is worthwhile noting that condition 1) *just coincides* with the original definition of loss aversion introduced by Kahneman and Tversky (1979, p. 279) and, reformulated for differentiable cardinal utility functions by Tversky and Kahneman (1992, p. 303).

### 3 Conclusions and further research

The aim of this short note is to set preference-based definitions able to capture the sentiment described by the following aphorisms: a) “*losses loom larger than gains*” (see Kahneman and Tversky, 1979, p. 279) identifying the sentiment of loss aversion; b) “*gains loom larger than losses*” (see Sacchi and Stanca, 2014) identifying the sentiment of gain appetite; and c) “*gains loom equal to losses*” expressing symmetric loss-gain preferences.

Motivated by the fact that in decision making under risk individuals may exhibit more than one reference point (see Wang and Johnson, 2012; and Koop and Johnson, 2012) we give definitions that hold “in the small”. The correspondent definitions “in the large” can be intuitively derived. The seminal Kahneman and Tversky (1979, p. 279) definition “in the large” follows as a special case.

Our definitions of risk preferences “in the small” sheds light on practical implications in modelling decision-making processes. Knoller (2016) argue that the very gear for the presence of “cushion effect” in demand for principal-protected life annuities is the attitude to risk around personal reference points. Harris and Wu (2014) investigate the role of multiple reference points in making financial incentives to get efficiency in production. These applicative issues are left to future research.

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