

When Is More Better?

On the Relationship Between Magnitude and Subjective Value

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ABSTRACT—We examine three determinants of the relationship between the magnitude of a stimulus and a person's subjective "value" of the stimulus: the process by which value is assessed (either by feeling or by calculation), the evaluability of the relevant magnitude variable (whether the desirability of a given level of that variable can be evaluated independently), and the mode of evaluation (whether stimuli are encountered and evaluated jointly or separately). Reliance on feeling, lack of evaluability, and single evaluation lead to insensitivity to magnitude. An analysis invoking these factors provides a novel account for why people typically become less sensitive to changes in the magnitude of a stimulus as the magnitude increases.

KEYWORDS—magnitude; affect; scope neglect; evaluability

To understand decision making and social judgment it is often necessary to understand how changes in the magnitude of a stimulus influence how people subjectively value that stimulus. For instance, would a consumer find a 10-ounce serving of ice cream more attractive than a 5-ounce serving? If so, by how much? Would an employee be more satisfied receiving a \$1,000 bonus than receiving a \$500 bonus? If so, by how much?

Many prominent theories address the relationship between magnitude and subjective value. In economics this relationship is represented by what are known as *utility functions*, and in prospect theory (a psychological theory by Kahneman and Tversky, 1979, on how people make decisions under risk) it is represented by *value functions*. Both terms refer to graphs depicting subjective value as a function of magnitude.

A fundamental behavioral observation about value (or utility) functions is that their shape is typically concave: Constant in-

crements of magnitude yield successively smaller increments of subjective value. For instance, a 10-ounce serving of ice cream is typically perceived as less than twice as good as a 5-ounce serving. The increase in subjective value created by the provision of the second 5 ounces is not as large as the subjective value of the initial 5.

Different analyses offer different explanations for this concavity. In economics, it is often attributed to satiation: The more units of a good that one consumes, the less one desires additional units of this good. A hungry person may crave a steak, but having eaten one steak, a second steak will be less appealing than the first one was.

In prospect theory, concavity is attributed to the closely related psychophysical notion of diminishing sensitivity, according to which the more units of a stimulus one is exposed to, the less one is sensitive to additional units. For example, ten candles do not seem twice as bright as five candles, and a 40-pound weight does not feel twice as heavy as a 20-pound weight. People may similarly become desensitized to value-bearing goods.

Although satiation and diminishing sensitivity are undoubtedly important, in what follows we outline a new theory that highlights three additional determinants of the magnitude–value relationship: the *process* by which value is assessed, the *evaluability* of the relevant magnitude variable, and the *mode* in which stimuli are encountered.

We propose that the degree of concavity of a value function depends on these factors. The least extreme case of concavity occurs when constant changes in magnitude yield nearly constant changes in value throughout the entire relevant range. We call such value functions magnitude sensitive. Curve MS of Figure 1 depicts such a value function; it is nearly linear. The most extreme case of concavity occurs when subjective value varies with the presence or absence of a stimulus (i.e., as magnitude jumps from zero to some positive amount), but does not show any sensitivity to further changes in magnitude. We call such value functions magnitude insensitive. Curve MI depicts

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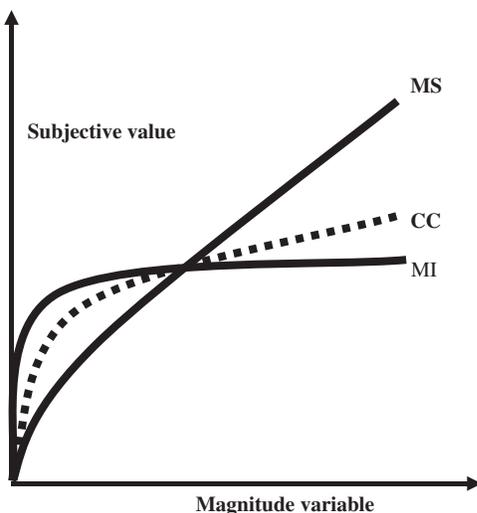


Fig. 1. Value (v) functions of a magnitude variable. The x-axis is a magnitude variable and the y-axis is (subjective) value. The function depicted by curve MS represents magnitude sensitivity; the function depicted by curve MI represents magnitude insensitivity; the function depicted by curve CC reflects a compromise between the two, and mimics the typical concave function seen in economics and prospect theory.

a magnitude-insensitive value function; it is nearly a step function (which rises initially and is flat afterwards).

We show that given predictable combinations of process, evaluability, and mode, value functions vary from being virtually magnitude insensitive to being highly magnitude sensitive. For example, depending on the particular constellation of process, evaluability, and mode, a person may find 10 ounces of ice cream about equally as attractive as 5 ounces (i.e., be magnitude insensitive, like curve MI in Fig. 1) or nearly twice as attractive (i.e., be highly magnitude sensitive, like curve MS in Fig. 1), or somewhere in between, like the concave curve CC in Figure 1. We next discuss each factor in detail. In concluding, we delineate the relationship among these three factors and present a formal model of their influence on subjective value.

PROCESS

Recent cognitive and social psychological research distinguishes deliberate, rule-based modes of thought from associative, affect-based modes of thought (e.g., Chaiken & Trope, 1999; Kahneman & Frederick, 2002; Sloman, 1996). Building on such dual-process models, we identify two processes by which people may assess value: *valuation by calculation* and *valuation by feeling*. Valuation by calculation draws on algorithms that take into account both the nature and magnitude of a stimulus. Valuation by feeling is based on one's emotional reactions to the nature of a stimulus (cf. Kahneman, Ritov, & Schkade, 1999; Slovic, Finucane, Peters, & MacGregor, 2002).

To illustrate, consider deciding how much to pay for a set of used Madonna CDs. Imagine two separate circumstances: The

set contains either 5 or 10 CDs. To decide how much to pay, one may consider the typical cost of a single used CD, say \$3, and then account for the number of CDs, perhaps arriving at a figure of \$15 as what one is willing to pay for the 5-CD set and a figure of \$30 as what one is willing to pay for the 10-CD set. This approach is an instance of valuation by calculation. Alternatively, one may decide how much to pay by examining one's affective reactions to Madonna. Because these feelings should be independent of the number of discs available, using one's feelings as a cue should yield roughly equal willingness-to-pay figures for either set. This approach is an instance of valuation by feeling. Of course, people typically will rely on some mix of calculation and feeling.

As the example suggests, under calculation, each increment in magnitude has a relatively constant influence on value; the resulting magnitude-sensitive value function is relatively steep and linear, resembling curve MS in Figure 1. In contrast, under feeling, value varies with the presence or absence of a stimulus, but not with further increments in magnitude; the resulting magnitude-insensitive value function is nearly a step function, resembling curve MI. Critically, when people rely on a mix of calculation and feeling, as is generally the case, the resulting value function will be a compromise between curves MS and MI, such as curve CC. Curve CC mimics the typical concave function seen in economics and prospect theory. Such compromises will become more concave, i.e., more magnitude insensitive beyond the initial rise, with greater weight to feeling.

We manipulated the tendency to rely on calculation or feeling and observed concomitant changes in the magnitude-value relationship (Hsee and Rottenstreich, 2004). Participants' valuation processes were influenced by an ostensibly unrelated task: Participants first either solved problems requiring calculation or reported their feelings towards several stimuli, which presumably facilitated reliance on either valuation by calculation or valuation by feeling. Participants were then asked how much they would pay for a set of either five or ten Madonna CDs. As predicted, those primed to calculate were willing to pay significantly more for the larger set than for the smaller one, whereas those primed to feel were willing to pay about the same amount for either set. Indeed, mean payments for five CDs were greater under feeling than under calculation, but mean payments for ten CDs were greater under calculation than under feeling.

In another study, we manipulated people's valuation process by varying the manner in which stimuli were presented. Participants were asked how much they would donate to save either one or four endangered pandas. The number of pandas was depicted in a table that represented each panda either by a dot or by a cute panda picture. Pretesting indicated that pictures evoked more feelings than dots. As anticipated, respondents were magnitude sensitive when they were shown dots—donating significantly more to save four pandas than to save one—but were magnitude insensitive when shown pictures—donating no more to save four pandas than to save one. Mean donations for one panda were greater under feeling than under calculation, but

mean donations for four pandas were greater under calculation than under feeling.

EVALUABILITY

A second factor influencing the magnitude–value relationship is the evaluability of the relevant magnitude variable (Hsee, 1996; Hsee, Loewenstein, Blount, & Bazerman, 1999). A variable is evaluable if people can readily assess any given level of it as “good” or “bad” when that level is presented in isolation. Such judgments are possible when people can bring to mind the range, the average value, or other reference information for the variable. All else being equal, greater evaluability engenders greater magnitude sensitivity. Value functions approximate curve MS in Figure 1 when a variable is highly evaluable and curve MI when a variable is minimally evaluable.

Consider two Western tourists shopping for jade jewelry in Asia. First, assume these tourists know nothing about jade jewelry, such as how much it typically weighs and what weight is considered heavy or light. In that case, the weight of jade jewelry is inevaluable. If, isolated from each other, one tourist encounters a 10-carat jade and the other a 15-carat jade, they may provide similar valuations for the two stones. That is, these tourists will be magnitude insensitive.

Alternatively, assume the two tourists have extensive familiarity with the weights of jade jewelry. In such a case, the weight attribute is readily evaluable. Even isolated from one another, these individuals will value the 15-carat stone more highly than the 10-carat stone. They will be magnitude sensitive (see Hsee et al., 1999 for empirical evidence).

MODE

A third factor influencing the magnitude–value relationship is the mode in which stimuli are encountered. The valuation of any stimulus may proceed in one of two modes or some combination. In single-evaluation (SE) mode, only one stimulus is presented and people evaluate it in isolation. In joint-evaluation (JE) mode, two or more stimuli are juxtaposed and people evaluate these stimuli comparatively. Because JE facilitates cross-stimuli comparisons and SE does not, the two modes may yield different relationships between magnitude and value.

The research we have reviewed examined SE. For example, in our process experiments, each participant encountered just one magnitude level of a variable: either 5 or 10 CDs and either one or four pandas. Likewise, in our evaluability illustration, the tourists encountered either a 10- or 15-carat jade. What happens when an individual encounters multiple stimuli under JE and can directly compare different magnitudes? We propose that unless the magnitude variable is already highly evaluable under SE, people will be more magnitude sensitive under JE than under SE. Thus, the value function will approximate curve MS under JE and curve MI under SE.

Consider three tourists shopping for jade, who have little expertise with jade jewelry and know only that larger stones are better. Suppose one tourist only sees a 10-carat stone, the second only a 15-carat stone, and the third both stones. Once again, the first two tourists, who encounter the stones in SE, will be unable to evaluate the stones’ weight and will thus be magnitude insensitive—valuing the 10- and the 15-carat stones similarly. However, the third tourist, who encounters the stones in JE, will value the larger stone more favorably, even though he is as inexperienced as the first two. Mere juxtaposition of the stones engenders magnitude sensitivity.

Note that evaluation mode is a continuous rather than binary variable. For example, in assessing a job candidate, an employer may both compare her to another candidate (JE) and judge her on her own merits (SE). The value function that arises will thus be some compromise between curves MS and MI, such as curve CC.

Much empirical work corroborates our assertion about mode and magnitude (in)sensitivity (e.g., Hsee et al., 1999; Kahneman, Ritov & Schkade, 1999). For example, Hsee and Zhang (2004) found that under JE participants responded more positively when reading 25 positively-valenced words than they did when reading 10, and responded more negatively when reading 25 negatively-valenced words than they did when reading 10. But under SE, participants responded equivalently to 10 and 25 positively-valenced words and to 10 and 25 negatively-valenced words. Thus, participants were sensitive to magnitude (word count) under JE but not under SE.

Hsee (1998) examined how much participants were willing to pay for either one or both of two servings of ice cream. One serving was a 5-ounce cup overfilled with 7 ounces of ice cream. The other was a 10-ounce cup underfilled with only 8 ounces of ice cream. In terms of the amount of ice cream, the underfilled serving was larger. But this magnitude variable was not readily evaluable in SE. Indeed, under SE, participants paid more for the smaller, overfilled serving. Evidently, participants in SE based their judgment on an easy-to-evaluate cue: whether the serving was underfilled or overfilled, and were insensitive to the actual amount of ice cream. However, under JE, participants paid more for the larger, underfilled serving, revealing greater magnitude sensitivity.

GENERAL DISCUSSION

Intuitively, one might assume that more of a desirable stimulus always yields more favorable valuations; for example, ice-cream lovers would always be willing to pay more for more ice cream, and employees would always be happier with larger bonuses. Our theory suggests that this is not always so, especially when valuation takes place under SE. Under SE, people are magnitude sensitive only if the relevant variable is evaluable and valuations proceed by calculation. When either the relevant variable is not evaluable or valuations depend on feelings, people become magnitude insensitive.

Put differently, though satiation and desensitization are surely important determinants of the relationship between magnitude and value, our theory suggests that this relationship also depends on process, evaluability, and mode, and will change as these variables change. That is, the concavity of a value function reflects the particular compromise arising between calculation and feeling, the prevailing level of evaluability, and the balance of JE and SE that obtains.

Connections Among the Three Factors

Although we have presented the three factors as if they were independent, mode may influence evaluability, which may in turn influence process. By facilitating comparisons of different magnitude levels, JE makes otherwise inevaluable variables evaluable, thereby encouraging valuation by calculation. Consider Hsee's (1998) ice-cream study. Under JE, people directly compare the 7- and 8-ounce servings and thus calculate that they should pay more for the larger serving.

In contrast, by inhibiting comparisons of different magnitude levels, SE leads people to rely on other cues. When these other cues are affective, SE thereby engenders valuation by feeling. In the ice-cream study, given the absence of direct comparison under SE, people neglect serving size and focus on whether a serving is overfilled or underfilled. Overfilling evokes positive feelings and underfilling negative feelings, and therefore people pay more for the overfilled, albeit smaller, serving. This finding also supports Slovic et al's (2002) "affect heuristic" notion: Purportedly rational judgment is often influenced by gut feelings.

The Pursuit of Happiness

People devote considerable effort to accumulating things they desire, believing that more is better. Our work specifies conditions under which more is experienced as better (calculation, high evaluability, JE) and conditions under which it is not (feeling, low evaluability, SE).

For example, consider the pursuit of monetary wealth. Most people believe that greater wealth yields greater happiness. Suppose someone must choose between a job paying \$60,000 and a second, more tedious job paying \$70,000. In choosing, this person will likely be sensitive to salary magnitude: The mode is JE, numbers promote calculation, and, in a comparison, salary is highly evaluable. The person may therefore opt for the higher-paying job, despite its tedium. Will this job make her happy? Probably not. At the job, she will likely encounter conditions promoting magnitude insensitivity. Compared with decision time, daily life will promote SE and feeling, and without comparison salary is not highly evaluable.

This example illustrates a general pattern: Decisions usually occur in JE, which involves high evaluability and calculation; yet life usually unfolds in SE, which involves low evaluability and feeling. Consequently, in decision making, more often seems better, yet in life, more often is not better.

Recommended Reading

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