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Reference Point Selection in Prospect Theory

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Abstract. Prospect theory evaluates outcomes relative to a reference point but provides no general selection rule, even though different benchmarks may classify the same outcome as a gain or a loss and generate different behavioral predictions. This review compares observable and latent benchmarks across investment behaviors, expectations, social comparison, and evaluation contexts, examining both their explanatory strengths and the difficulties of establishing which benchmark decision-makers actually use. Observable benchmarks permit advance specification but may lack psychological relevance, while latent benchmarks accommodate expectations and contextual variation but risk circularity when selected and validated by fitting the same choices. This study frames this tension as a reference-point paradox and proposes four requirements: constrained identification, independent discrimination among competing benchmarks, consistency with the scope of evaluation, and falsifiable predictions. Drawing on housing and investment examples, these requirements form a sequence for reference-point selection. Reference points may vary across decision settings, but identifying them requires independent evidence beyond fit to the behaviors they explain, preserving psychological flexibility while keeping the resulting predictions open to empirical testing.

Keywords: prospect theory, reference point selection, reference dependent

1. Introduction

Reference dependence has become an influential concept in economics since the early contributions of Kahneman and Tversky [1]. In most of the models, however, the reference point is specified externally, with relatively little attention paid to the process through which it emerges. This unresolved issue points to a broader reference-point selection problem. Although prospect theory establishes reference dependence as a central feature of decision-making, it does not provide a general rule for determining which reference point should apply across different decision settings. The choice of reference points is consequential because different plausible benchmarks may classify the same outcome differently as a gain or a loss, thereby generating different behavioral predictions. Reference-point specification is therefore not merely a modelling choice, but a central identification problem within prospect theory.

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This review organizes candidate reference points into two broad categories. Observable RPs can be specified from external records, whereas latent RPs require further evidence about expectations, social comparisons or the context of evaluation. This study first examines observable price benchmarks in financial research. Although they permit gains and losses to be classified before behavior is analyzed, their predictive success does not establish that investors actually use them or exclude alternative mechanisms such as attention. This study then examines latent accounts. Expectations offer a mechanism for RP formation, social comparison extends the possible source of the benchmark, and contextual research reveals the importance of the evaluation unit. Together, they improve psychological plausibility but leave the content, mechanism or scope of the operative RP uncertain.

Building on this comparison, the review frames the problem of selection as a paradox of reference points. Prospect theory needs an RP to predict choice, yet selecting that RP from the choice itself makes the explanation circular; specifying an observable RP in advance does not, by itself, establish psychological relevance. Therefore, rather than searching for a single benchmark applicable across all settings, this study synthesizes the literature to determine when theory and evidence justify different reference points. Drawing on housing and investment examples, this study develops a sequence for reference-point selection. It first narrows candidates on theoretical or empirical grounds, then uses independent evidence to distinguish them, matches the chosen benchmark to the relevant level of evaluation, and requires predictions that could be falsified. The overall conclusion is that RPs may vary across settings, but each selection must be justified by evidence independent of the behavior it explains.

The contribution of this report is that, rather than proposing any new reference points, it aims to provide a systematic framework for how to pick the most appropriate reference point under a given decision-making context. By doing so, this study seeks to bridge the gap between reference dependence, a core principle of prospect theory, and reference point selection as a theoretical and empirical issue.

2. Observable and latent reference point

2.1. Observable reference points

The purchase price is an intuitive benchmark for an investor considering whether to sell a stock. Odean [2] used average purchase prices to classify positions as gains or losses in brokerage accounts. The author found that investors realized gains more readily than losses. Comparing the proportions of gains and losses realized accounts for investors' opportunities to sell each. The purchase price provides a clear benchmark for measuring the disposition effect. Yuan [3] and Liao et al. [4] explicitly follow Odean when using an investor's average purchase price as a proxy for the reference point.

The 52-week high price offers a different kind of benchmark. It is public and easy to observe, unlike an individual's purchase price. George and Hwang [5] found that a stock's proximity to its recent high helps predict momentum returns. Their anchoring account suggests that investors underreact to news when they compare a current price with this historical high. Chen et al. [6] make a distinct prospect theory argument: proximity to the high is a proxy for whether shareholders are likely to be above or below their own purchase prices. They document a positive relation between risk and subsequent returns near the high and a negative relation far below it. Their evidence supports the proposed link at the stock level, while leaving individual reference points unobserved.

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Displayed price paths can also suggest reference prices. In their laboratory experiment, Nolte and Schneider [7] show participants price paths with different shapes, presented as either historical or simulated. They examine the initial, final, average, highest, and lowest prices as possible inputs into a reference price. Participants were given the same information about possible final outcomes, but different price paths still led to different investment amounts. In the historical treatment, their reported reference prices also changed with the shape of the path. This suggests that investors may form benchmarks partly from the price patterns they see. Nolte and Schneider [7] provide evidence that price charts can influence reference-point formation, although they do not estimate an aggregate investor cost basis using trading volume.

These examples show that observable reference points can play different roles across studies. Purchase prices identify gains and losses at the account level. The 52-week high instead works as a visible market benchmark and can also indicate whether investors are more likely to be in the gain or loss domain. Price paths provide another source of observable reference points by making certain historical prices more salient to investors.

2.2. Strengths and limitations of observable benchmarks

Observable benchmarks have several practical strengths. They are easy to measure and allow researchers to apply the same rule across different stocks and time periods [8]. These benchmarks are also convenient for large-sample studies because the same calculation can be applied again easily once the required data are available. They also make robustness checks easier, since researchers can replace the benchmark without making complicated changes.

However, these benchmarks also have several limitations. The main issue is that an observable price doesn't actually correspond to the benchmark that investors psychologically use. Researchers may select a price simply because it is easily accessible in the data, while investors could judge the same position using a different benchmark. In addition, a fixed purchase price would probably become less relevant over time. Investors could likely receive new information, revise their expectations, or pay more attention to recent prices or market conditions after the initial purchase. What's more, several observable points may all be reasonable candidates for the reference point, even though they can place the same outcome in different gain or loss domains.

These concerns have led researchers to study reference points that cannot be directly observed. Kőszegi and Rabin [9] relate the reference point to recent rational expectations, while Schmidt and Zank [10] infer these points from observed choices under particular conditions. In both cases, the benchmark is not directly visible in the data, which leads to the idea of latent reference points.

2.3. Latent reference points

A latent reference point is a benchmark for evaluating outcomes that cannot be identified from external records alone. A stock's purchase price records what an investor paid, but it does not establish whether a later sale is judged against that price, an expected return, or another investor's performance. The investor may also assess the stock alongside other holdings, changing the scope of gain–loss evaluation. The value of such accounts lies in considering standards that may genuinely matter. Latent RP accounts thus offer a way to examine how reference points form and why people may evaluate the same outcome differently.

Expectation-based research examines the formation of reference points. In Kőszegi and Rabin's [9] model, expectations held in the recent past determine whether an outcome is experienced as a gain or a loss. Abeler et al. [11] raise participants' expected pay before a real-effort task and find that

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they work longer and earn more; Ericson and Fuster [12] vary the probability of a future exchange and find that participants less likely to exchange an item are more inclined to keep it. By changing conditions that shape expectations before observing choices, these experiments provide stronger support for a formation mechanism than accounts that infer expectations from choices already made. Yet showing that expectations affect behaviour does not establish which expectation defines the boundary between gains and losses. Crawford and Meng [13] explain taxi drivers' stopping decisions using targets for both expected income and expected working hours, but construct those targets from proxies rather than measuring them independently. The model's explanatory success therefore cannot confirm which expectation drivers actually use or when each target governs their decisions. Without independent evidence that distinguishes among candidate expectations, fitting a choice with one of several targets does not identify the operative reference point.

Even when a candidate benchmark is specified in advance, researchers must establish that decision-makers use it to classify outcomes as gains or losses, rather than merely respond to it in another way. Social comparison offers a possible benchmark beyond personal expectations. Langtry's [14] model suggests that stronger social comparison may increase consumption while reducing welfare; Heimer [15] finds that exposure to an investment social network strengthens the disposition effect among some traders. Others' outcomes may therefore influence an individual's evaluation even when their own outcome is unchanged, while whether peers' outcomes define gains and losses remains to be established. The evidential difficulty is establishing how social contact affects behaviour. A trader might sell a stock on a friend's advice while continuing to judge its gain or loss against the purchase price. Social contact would then influence the trade without making the friend's outcome a reference point. Establishing a social-comparison reference point thus requires evidence that a particular peer's outcome changes the classification of gains and losses, rather than merely providing information, advice or behaviour to imitate.

Even if a potential object of comparison can be identified, researchers must still determine whether the choice set or portfolio changes the scope of evaluation. Context-dependent reference-point research therefore examines whether decision-makers evaluate outcomes individually or as part of a larger whole. Ok et al. [16] derive endogenous reference alternatives from choice patterns; Hartzmark [17] finds that investors are more likely to sell their best- and worst-performing holdings; and An et al. [18] find that the disposition effect for an individual stock varies with the gain or loss position of the overall portfolio. These studies provide different forms of evidence. The first characterises possible reference alternatives from choice patterns; the second documents a rank effect on sales; and the third suggests that stock- and portfolio-level assessments may interact. These findings make a broader evaluation frame plausible, but contextual effects alone do not identify the reference point used in a particular trade. Context-dependent accounts must therefore establish which outcomes investors evaluate together, when stock- and portfolio-level assessments each matter, and whether contextual effects change gain–loss evaluation rather than merely directing attention or prompting rebalancing.

2.4. Limitations of latent reference points

Taken together, these three strands of research reveal an internal tension in latent reference-point accounts. Their strength lies in allowing benchmarks to vary with expectations, social comparisons and the scope of evaluation, potentially bringing them closer to how decision-makers actually assess outcomes. Yet the same flexibility creates three distinct identification tasks. Expectation-based accounts must distinguish among plausible targets; social-comparison accounts must establish whether peers' outcomes alter gain–loss classification rather than simply influencing trades; and

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contextual accounts must determine which outcomes are evaluated together. These tasks concern the content of the benchmark, the mechanism through which it affects choice, and the scope of the outcome being judged, respectively. Different specifications within each strand may accommodate the same observed behaviour, so explanatory fit alone cannot determine which benchmark actually operated. The challenge is to obtain evidence that discriminates among the relevant candidates.

2.5. Paradox

Drawing on the comparison between observable and latent reference-point approaches, this review formulates the identification difficulty they jointly reveal as the "reference-point paradox". The paradox is that prospect theory requires a reference point to classify outcomes as gains or losses and predict choice [1], yet the choices it seeks to explain cannot, by themselves, establish which reference point decision-makers actually use. Specifying an observable benchmark, such as the purchase price, in advance allows a model based on that benchmark to generate testable predictions, but observability alone does not establish the benchmark's psychological relevance. If researchers instead select a reference point from candidate expectations or social comparisons on the basis of observed choices, then treat its fit to those same choices as validation, identification and testing cease to be independent. Because changing the reference point can alter whether the same outcome is classified as a gain or a loss, behavior unexplained by the original specification may be accommodated by a different benchmark selected after the fact.

This scope for revising the benchmark after observing a choice turns the reference-point paradox into a problem of selection. Reference points may vary across decisions, but the grounds for selecting one must be established independently of the behavior it explains. The following discussion develops that requirement in stages.

3. Discussion: beyond fixed reference points

The reference point paradox leads to the question of how a reference point is to be selected. It does not seem that it is problematic for the reference point to change in different situations. The problem occurs when one selects a certain reference point because it explains the behavior and then uses this as an explanation of the behavior. Therefore, it would make more sense to impose some conditions on the selection of a reference point before assessing whether it can explain the behavior. This is what will be done in the following examples. They are supposed to show how the pool of possible reference points is reduced step by step.

3.1. Constrained identification of candidate reference points

Imagine a homeowner who purchased a house at the price of one million and is offered 0.95 million later. The initial purchase cost can be used as a point of reference since it does not depend on the current selling decision and the offer is a loss of $0.05 million. Studies of housing markets justify the significance of original purchase prices in seller decisions [19].

But the general message is not that the purchase price should be preferred. The plausible reference points can also be expectations and salient historical prices, and certain reference points cannot be directly seen. Experimental manipulation or independent elicitation of expectations is possible [11], whereas choice patterns may reflect the significance of the reference alternatives [16]. The first limitation thus relates to restricted identification as opposed to direct observability: a suggested reference point must have a theoretically or empirically limited foundation in being able

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to enter the candidate set. This does not include benchmarks selected due to their fit with the behavior that is being explained in retrospect.

3.2. Independent discrimination of competing reference points

A second issue is that there may be a number of candidates for the first requirement. Suppose an investor purchased a stock at 100 and believed that in future it will be worth 130. Now he sees the price as 115. He has made 15 on the purchase price, but he is 15 down on the expected price. The same result can be placed in different gain-loss categories depending on the reference point.

Expectation-based models offer both theoretical and empirical justification for why expectations might function as reference points [9, 11], even in asset pricing contexts [20]. Yet the fact that an expectation exists does not demonstrate that it is the relevant reference point. The pertinent question is whether independent evidence can discriminate between the behavioural implications of alternative benchmarks. The second restriction is thus competing-reference-point discrimination: when there are various plausible reference points, their roles should be disentangled using independent evidence from the behaviour they attempt to explain.

3.3. Consistency with the relevant evaluation bracket

Once a psychologically relevant benchmark has been found, another question is the level at which outcomes are assessed. Take an example of an investor whose stock has decreased by 10 percent but the whole portfolio has risen by 10 percent. The assessment of individual position puts the investor in loss domain and the assessment of the portfolio puts the investor in gain domain.

Hartzmark [17] demonstrates that the ranking of positions in a portfolio is relative and affects trading, whereas An et al. [18] demonstrate that gains and losses at the level of the portfolio alter the stock-level disposition effect. These results indicate that reference dependence does not necessarily have to be applied on one constant level. The third limitation is thus consistency of bracketing: the reference point must be defined at the level where the decision maker considers the relevant outcome. There can be several reference points when there is independent evidence that supports multiple evaluation brackets but they should not be introduced merely because they enhance explanatory power.

These examples can be combined in order to form a sort of reference-point pluralism. It is possible that there are various references, and the same individual may have different reference points when making different decisions. But it should not be allowed to do so freely as it must be limited by the identification of these references, the existence of evidence of their competing benchmarks and consistency with the applicable evaluation bracket. Lastly, this specification has to make behavioral predictions which could potentially be denied; or else, the more flexibility will result in making any choice made an ex-post justification of the choice. Figure 1 represents these limitations in terms of sequential process of selection of the reference point.

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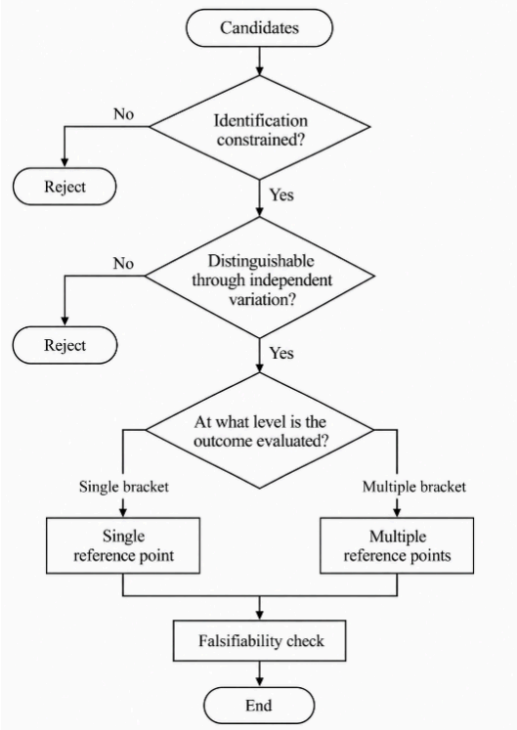


Figure 1. A sequential framework for reference-point selection

4. Conclusion

The issue of identification of the reference point is still unsolved at the core of prospect theory. The theory demands that outcomes be evaluated in comparison to a reference point, and no one standard can reasonably fulfill this purpose in all decision situations. Empirical tractability is offered by observable reference points but it might not represent the actual evaluation of the decision maker whereas latent and endogenous approaches are more psychologically flexible but result in greater problems of identification.

It does not favor either the observable or the latent reference points, but instead, it develops a sequential model that is depicted in Figure 1. The model of this framework is considered as a process of limited identification, differentiation between the different benchmarks and consistency with the relevant bracket of evaluation and falsifiability.

The value of this review does not lie in the suggestion of yet another universal reference point. Rather, it redefines the problem of reference-point as one of disciplined selection and restructures a scattered literature on this issue. The framework aims at maintaining the psychological realism of letting reference points to vary without losing the empirical discipline that renders prospect-theory predictions testable. Flexibility in reference-points should thus be allowed in decision environments only where independently constrained identification and discriminating evidence are provided instead of being introduced retrospectively to account for the observed behavior.

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