Why is a Bird in the Hand Worth Two in the Bush?

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Abstract

We present a prescriptive model for selecting an acceptable option that is currently (but only temporarily) available over more attractive prospects whose availabilities are uncertain. We call this the "bird in the hand" dilemma, and compare it to other named phenomena in which time affects utility, including status quo bias, temporal discounting and optimal stopping. We consider both one-sided risky choices, such as buying a house, and two-sided choices, such as finding a mate. The model is adapted from a standard multi-attribute utility model, with added parameters that express the time limitation on the adequate option and the probabilities of better options becoming available. According to the model, as time passes and better offers do not eventuate, the current offer becomes increasingly more attractive. Satisficing occurs because superior offers are deemed unlikely to appear. Anticipated regret can asymmetrically decrease the value of the current option and the uncertain prospects.

(Model; Multi-attribute Utility; Regret; Risky Choice; Satisficing; Uncertainty)

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The classical approach to choosing among mutually exclusive alternatives calls for comparing the multi-attribute utilities of the various options, and selecting the one with the highest weighted sum. But many important choices do not permit simultaneous consideration of the options. We consider the case where an acceptable choice is available, but only for a limited time. Although the option is adequate, in the sense that its utility exceeds a threshold, the decision maker hopes for better prospects to become available before that time expires. Classical risky choice problems incorporate uncertainty via probabilistically weighted utilities, with pertinent information about all options treated as given or available through search. For "bird in the hand" dilemmas, only the available option is well specified. There is additional uncertainty regarding the availability of more desirable possibilities. Examples range from trivial, everyday decisions (should the tardy professor grab the only free space in sight as she enters the campus parking lot, or should she cruise to find a space closer to the classroom?) to momentous ones (should the basketball player accept the offer from the Lakers, or should he opt for free agency?)

Two conditions are necessary for bird in the hand dilemmas to arise: a preference ordering on offers and a time window during which the current option is available. We stipulate that only one offer can be accepted; and that once an offer is rejected, the opportunity to receive that option does not come again.

Two-Sided Choices

Suppose Janet, a currently unemployed recent college graduate, has applied for several positions, and that after evaluating the multi-attribute utilities she has been able to establish a preference order. The choice is two-sided, in that Janet has her preference order and so do the potential employers. If one of the positions that is not Janet's first choice is offered before the other firms have notified her about their decisions, a dilemma arises. The company requires a decision soon, so the offer is time-limited; Janet must accept or reject before knowing whether a more preferred position will be offered to her. Rejecting an acceptable offer entails the risk of unemployment, while accepting that offer may later cause her to regret what might have been. Let us exclude the ethically dubious choice of accepting the first offer while planning to quit immediately if a better option becomes available. Is an optimal strategy available, one that is superior to the satisficing rule: “select the first offer that surpasses the aspiration level, a defined threshold of acceptability” (Simon, 1982)?

We recognize that rejection is often followed by negotiation, a recursive process that may generate better offers[1]. We also recognize that the utility of the current option may be altered as a result of learning about the content of competing offers. To simplify the presentation, we consider only the final calculation of the utility attached to the final, best offer from a given source, a snapshot from what may be a movie.

In principle, a job seeker might adopt a sequential strategy, applying for positions one at a time and waiting for a decision before moving onward. However, other applicants are hunting as well, and the presence of competitors argues for casting a wider net to increase one’s chance of finding an acceptable job quickly.

A similar structure governs the human version of the mate choice problem that has intrigued biologists from Darwin (1871) until the present time (Bergstrom & Real 2000; Johnstone, Reynolds, & Deutsch, 1996). A person who wants to marry might hope for several proposals, but must determine whether to wed the suitor at hand before other offers come in. Declining the current proposal may enforce single status for an undesirable length of time, or may eventually lead to lowered standards. Assessing the likelihood of future superior offers is challenging. The judgment incorporates not only one's own mate value (Shanteau & Nagy, 1976), but also the availability of eligible prospects.

Note the advantage to the asker in these two-sided choices, who can propose to potential mates according to his or her preference order. The employer also enjoys the asker's advantage. Askers will not always get their first choice, because the candidate may prefer another offer, but the asker finds out before moving down the list. Therefore, the asker can always get the most desirable of the options that are still available.

One-Sided Choices

Bird in the hand considerations also apply to one-sided choices, where there is no concern about another party's decision. A tolerable option is available at the moment, but a superior option may become available in the future. The decision must be made without full knowledge of the composition of the set of options. What will be available in the future can only be foretold on the basis of past experience, either personal or vicarious. Some of the experiences one may draw upon might be analogous to the current dilemma, while others will be only tangentially relevant. Some domains feature more variability in outcome availability and features than others, and variability hampers predictability.

The standard model for deciding which apartment to rent (Elrod, Louviere, & Davey, 1992; Johnson & Meyer, 1984) calls for comparing the units on a fixed set of features, but this is not how home buying plays out in a hot real estate seller's market. When a desirable house becomes available, one must make an offer quickly or forego any chance of buying it. Although shoppers know that an even better house may appear next week, waiting may mean permanent apartment dweller status. However, in a buyer's market, in which there is an oversupply of homes, it is the seller who faces the dilemma. The seller does not have a preference order on buyers, and will happily sell to anyone who meets the listed price. But if offers are expected to be scarce, the seller (who does have a preference order on offers) has to decide whether to accept a disappointing current bid or to hope for a higher bid in the future.

The hunt for a better parking space has been considered by Thompson and Richardson (1998), who proposed a model that looks at the change in utility resulting from exploring another location compared to remaining at the current one. Although their model is somewhat specific to parking, they note, as we do, that uncertainty regarding the availability of spaces in unseen locations is affected by previous search experience.

The Time Window

As the time window is perceived to be closing, one's acceptance criteria might become less stringent. An offer that would have been rejected earlier may be accepted, because the chance of a better offer coming along decreases as time elapses; therefore, one is willing to go further down the preference hierarchy and accept the current option. One's changing state of need is the primary determinant of these time-linked criterion shifts, but personality variables also come into play[2]. Animals that forage for food of varying nutritional quality in an uncertain environment face the same decision problem (Dall & Johnstone, 2002).

The impact of the time window was demonstrated in an applied setting by Pennebaker et al. (1979), drawing upon a country-western song that suggests "the girls get prettier at closing time." Pennebaker et al. found that opposite-sex fellow bar patrons were rated as more physically attractive as the evening wore on, and proposed that these were perceptual changes inspired by alcohol. We prefer an explanation based on a judgmental principle: a current option becomes acceptable because superior options are deemed increasingly less likely to present themselves.

Pennebaker et al.’s (1979) empirical results have been challenged (Sprecher et al., 1984) but we believe the inconsistency was resolved by the demonstration (Madey et al., 1996) that the increase in attractiveness of one’s opposite-sex fellow patrons is felt only by those not in a relationship. People with a fallback position at home don’t feel the desperation as the time window closes; they will not be forced to spend the night alone. This perspective is strengthened by Gladue and Delaney’s (1990) replication of Pennebaker et al.’s (1979) results for ratings of opposite-sex bar patrons but not for ratings of photos of undergraduates who were not present. Since there is no chance of going home with a celluloid partner, there is no need to alter one’s criterion when evaluating pictures. Furthermore, Gladue and Delaney (1990) did not find that ratings increased with alcohol consumption.

A Utility Model

We build the uncertainty attributable to an unknown set of alternatives into a multi-attribute weighted utility model (Von Winterfeldt & Edwards, 1986). We add parameters that express the time window and the probability of each potential better option becoming available in the future. The model compares the utility of the currently available option to the weighted utility of the best of a family of uncertain prospects.

Expected utility is maximized if the current option is accepted when

$$\frac{1}{t}\sum_{i=1}^{n} p_i u(x_i) \geq \max_{j=1}^{k}\left(q_j \bullet \sum_{i=1}^{n} p_{ij} u(x_{ij})\right) \qquad (1)$$

where p_i and $u(x_i)$ are the probabilities and utilities attached to the n outcomes associated with an option. Utilities are attached to such outcomes as working conditions, fulfillment and financial prospects for a job option, or to location, price, and size for a house option. The left side of Eq. (1) refers to the currently available option, the bird in the hand. For that option, most of the probabilities and utilities are known, although there may be some aspects, such as whether coworkers are trustworthy or whether the home's climate control system is effective in all seasons, that can only be determined after acceptance of the offer. The shrinking time window is described by t, the amount of time remaining until the current option is no longer available. As time elapses without a superior competitor coming along, t continually decreases. With the bird in the hand threatening to fly away, the value of the left side of the equation increases. When no opportunity remains for better offers to come along, that value approaches infinity, capturing the intuition that the current offer (which was defined to be adequate) will be accepted when it is about to be withdrawn.

The right side describes the set of k other options under consideration; these competitors-in-waiting are indexed by j and weighted by the estimated probability that the option will become available, q_j. For Janet's job search, the k options are those possibilities (i.e., positions for which she has applied and has not yet been rejected) that she considers superior to the currently available option. As suggested by the additional subscript j, each of the k options has its own set of probabilities and utilities for potential outcomes.

If the decision maker has been able to examine the alternative options, the potential outcomes on the right side of the equation will have relatively well-specified parameters. In other circumstances, the options are poorly specified and the corresponding probabilities and utilities very uncertain. The model expressed in Eq. (1) simply proposes that expected utilities are used. For example, Janet might know that a position is available, and that she is likely to be offered the job; but the details of the position are vague. If the recruitment advertisement promised a "competitive salary", Janet would consider a distribution of possible stipends rather than a specific amount. The soundness of the information base underlying a choice plays a role in the affective side of the decision, to be discussed below.

The q_j's comprise a different set of probabilities, namely the probabilities that each of the k potential options will be available. Even if the quality of an option is well understood, there may be uncertainty about whether the option will be available. Janet can attempt to judge the likelihood of receiving a particular job offer by considering how well her qualifications match the employer's requirements, how the interview went, etc. Inevitably, there will be unknown elements in the computation, such as the number and suitability of other applicants. According to the model, the currently available option is accepted when its time-dependent utility is at least as great as the largest product of q_j multiplied by the utility of the corresponding j-th option.

For a one-sided choice in which the accepter simply gets what is chosen, q_j is 1 for all values of j. In these cases, the uncertainty is in the value of k, the number of superior options that will be available before time elapses. If Janet judges k to be small, she will appear to follow a satisficing rule, since she will not dare to wait for an unlikely better offer to come along[3]. Were time not a consideration (so that $1/t$ would not appear), Eq. (1) would reduce to the standard model for multi-attribute utility.

The model we present here was chosen for its simplicity and heuristic value. We have tried to incorporate the important elements of the decision, but are not firmly committed to the specific functional form given. For example, we have only intuition to defend the notion that the reciprocal of time operates linearly; asymptotic decay is plausible as well. We also assume that the utilities of the uncertain options on the right side of the equation do not change over time. Our aim is to initiate discussion while calling attention to the class of decision problems characterized by probabilistically specified options. We hope for more elaborated, testable models to be developed in the future.

Our model does not capture all of the uncertainty inherent in options whose availabilities are specified as probabilities. Some of the probability estimates may be based on relatively sound information. For example, Janet might have heard rumors about the applicant pool from a company insider. Other estimates may be pure guesses, as might occur if she answers a newspaper ad from a company she knows little about.

Emotional Utilities

The model can be made more descriptive by incorporating an additional utility, anticipated regret. Regret is an affective response that occurs post-decisionally, when the decision maker realizes that a different choice would have worked out better (Loomes & Sugden, 1982). The amount of regret one feels depends asymmetrically on the utility of the currently available option. If the decision maker accepted the present option, regret depends upon the summed differences between the value of that option and the values of the better options that ultimately became available. If the decision maker turned down the bird in hand, and ended up with nothing, regret depends on the value of the rejected offer. If the rejected current offer is not very attractive, then little regret will be experienced.

A projection of how one would feel if either of the two situations were to arise may be made prior to the decision, so these potential feelings ought to be incorporated into the decision calculations (Isen & Diamond, 1989). The amount of regret one expects to feel if a choice works out badly enters the equation as a utility with negative sign, subtracting from the overall value of the option.

Not everyone feels regret. A perfectly logical decision maker might argue that “I did the best I could given the information at hand, so I would not have changed my decision even though I now have knowledge of the outcome.” Someone who chose the bird in the hand and subsequently discovered that a superior option would have become available can ascribe the "error" to one of three possibilities: (1) the utilities or probabilities attached to the unknown option were underestimated. This might have happened because they were based on very sketchy information, and the best guesses turned out to be low. (2) the probability, *q*, that the option would be available was underestimated (3) the probability, *q*, that the option would be available, was correctly estimated to be low; but an unlikely event occurred. A logical purist[4] would not worry about the third possibility, a chance outcome beyond control. However, anyone might reasonably rue the judgmental deficiencies that underlie the first and second possibilities, and thereby regret the decision.

As expressed below in Eq. (2), the individual decision maker, *d*, has the propensity r_d to anticipate the feeling of regret. This model reduces to Eq. (1) if r_d is zero. Regret enters the equation after the other computations have been carried out. In the regret component on the left side of the equation, it is presumed that *k* better future options came through, so *t* and q_j are not present. When the decision maker anticipates regret, expected utility is maximized if the current option is accepted when:

$$\frac{1}{t}\sum_{i=1}^{n} p_i u(x_i) - r_d\left(\sum_{j=1}^{k}\sum_{i=1}^{n} p_{ij} u(x_{ij}) - \sum_{i=1}^{n} p_i u(x_i)\right) \geq \max_{j=1}^{k}\left(q_j \bullet \sum_{i=1}^{n} p_{ij} u(x_{ij})\right) - r_d\left(\frac{1}{t}\sum_{i=1}^{n} p_i u(x_i)\right) \quad (2)$$

Eq. (2) captures both of Janet's job acceptance concerns. In considering whether to accept the current option, she thinks about how she will feel if (the left side of the equation) she accepts the position and later finds out that she would have been offered *k* better jobs if she had still been available when the firm made its decision. The more superior options that were passed up, the more regret is felt. She also thinks about (the right side of the equation) how she will feel if she rejects the current option and ends up unemployed.

Maintenance

The spirit of the model extends to situations in which the available option is to maintain, rather than select, an available option. In medical settings, we can think of present quality of life as the bird in hand. The less attractive is that present quality, and the less likely that quality is to be maintained as time passes, the more willing the patient should be to accept a risky option such as a kidney transplant. The United Network for Organ Sharing system, in use in the U. S. since the 1980’s, employs a point system based on medical criteria to guide allocations of cadaver kidneys (Ahn & Hornberger, 1996). The likelihood that a transplant will fail depends on the degree of correspondence in blood chemistry between donor and recipient, and also on the health status of the recipient. Hornberger and Ahn (1997) argued that quality-adjusted life expectancy for patients with end-stage renal failure could be maximized if the patient could refuse an offered kidney when the likelihood of success was judged to be below a minimum standard, with that minimum dependent upon particulars of the patient. Setting a high criterion enhances the likelihood of long-term success with the transplant, but potentially prolongs waiting time; the high criterion might be appropriate for a patient doing well on dialysis. Conversely, a patient whose life on dialysis is poor has less to lose and would therefore be better off employing a lower criterion, although that yields a reduced chance of a successful transplant. A patient with favorable transplant characteristics (such as youth and relatively good health) can also afford to be selective, because the time window is wide open.

Discussion

Because the attractiveness of the currently available option changes as time passes, bird in the hand problems belong to the class of time-inconsistent preferences (Hoch & Loewenstein, 1991). Other identified phenomena included in the class are delayed gratification (Wertenbroch, 1998), procrastination (Ariely & Wertenbroch, 2002), temporal construal (Liberman & Trope, 1998), and temporal discounting (Ainslie & Haslam, 1992). Temporal discounting refers to a decrease in expected utility for consequences that occur in the future. For example, future dollars are worth less than present dollars, irrespective of the fact that the economic future is to some degree unpredictable, simply because present dollars can appreciate in value via investment. In the situation we are considering, the availability per se of future options can only be estimated.

This uncertainty regarding options is what distinguishes the bird in the hand phenomenon from temporal discounting. Expressed as q in our model equations, the uncertainty acts as a weighting factor that decreases the value of those possibilities, and thereby elevates the likelihood that a presently available option will be selected. As the complexity of the model suggests, evaluating better prospects requires cognitive effort, and waiting for those uncertain prospects to come through may generate considerable anxiety. It is not surprising that people often choose to satisfice, a simplifying strategy that terminates the decision process.

The focus on whether to extend a search through the space of options also places bird in the hand questions in the class of optimal stopping problems, of which the most celebrated is the "Secretary Problem" (Ferguson, 1989). In its canonical form, the issue is the strategy that should be employed by an employer who wishes to hire the best of k applicants for a position. The employer interviews applicants sequentially and is presumed to be able to assess their quality without error. A yes-no decision must be made immediately for each candidate, with no possibility of recalling one who has been previously rejected. This problem has a mathematically optimal solution, which is to look through a number of applicants, then choose the next one whose qualifications exceed those of everyone seen so far. The number to look through is $(k-1)/e$. For large values of k, the probability of selecting the best candidate is approximately .368.

Todd and Miller (1999) drew a light-hearted analogy between the secretary problem and mate search, suggesting that one can both ascertain one's own mate value and identify an acceptable partner after interrogating approximately twenty suitors. In terms of our model, the q_j's depend upon the differences between one's estimated mate value and those of the prospects.

Seale and Rapoport (1997, 2000) have investigated whether the mathematically optimal solution describes the laboratory behavior of subjects performing the secretary problem with a large, fixed number of applicants. Their empirical result is that humans stop the search earlier than is optimal, a finding the authors account for by postulating an endogenous cost of searching. An alternative interpretation of the observed sub-optimality is that people cannot fully appreciate the size of the applicant pool. In everyday life, people do not encounter situations with the structure of the secretary problem, but they do encounter bird in the hand problems. In real cases, the number of future prospects is generally small. If participants see a connection between the laboratory challenge and the more familiar dilemmas, it may be difficult to induce them to wait as long as optimality demands.

Samuelson and Zeckhauser (1988) identified a status-quo bias in decision making. Their observation, supported by elegant demonstrations, is that people prefer to stick with what they already have rather than move to alternatives that they would have chosen had the decision been made from scratch. One reason is that switching usually has costs of various kinds, not the least of which is the effort involved in exploring and invoking alternatives. Also, there is an effect of commitment; if I made a choice, it must have been for a good reason, so why change? Commitment to the status quo can be couched in terms of sunk costs (Arkes & Blumer, 1985), omission bias (Baron & Ritov, 2004) or cognitive dissonance (Brehm, 1956). Loss aversion

(Kahneman & Tversky, 1984) is another possible explanatory mechanism; a variant of loss aversion, the endowment effect (Thaler, 1980), can also be seen as an instance of status quo bias.

Two features distinguish bird in the hand problems from Samuelson and Zeckhauser's (1988) status quo examples. While status quo considerations may apply to residents considering emigration or to patients considering a medical procedure, for most of the cases we have discussed, there is no status quo option. For the job applicants, apartment seekers, and suitors, there is no added utility for the entrenched, because none of the choices has been experienced. Furthermore, in the status quo examples examined by Samuelson and Zeckhauser (1988), the alternatives are clearly laid out. A crucial aspect of bird in the hand dilemmas is that both the number and quality of future prospects is uncertain.

When complete information about options is available, a decision as expressed in our model reduces to selecting the choice with the highest multi-attribute utility. If the process is two-sided, each party tries to pick a choice as high as possible on its preference hierarchy. From an economic point of view, one might view an efficient market as one in which both parties come as close as possible to following their preference hierarchies. If the available choices are unknown, preference orders cannot be followed. Therefore, considerable energy has been devoted to establishing market schemes that eliminate the unknown.

The basic resolution for two-sided matching markets involves forcing all parties to extend their offers simultaneously. This requirement enables the decision makers to evaluate all of their options, and they can then select in accord with their preference orders. Inducing employers to adopt uniform acceptance dates for hiring entry-level professionals can produce markets in which both employers and employees can come as close to following their preference orders as the extent of mutual matches permits (Roth, 1984; Roth & Xing, 1997). A very similar analysis has been applied to the process by which university women join sororities (Mongell & Roth, 1991).

Knowledge regarding future options alleviates bird in the hand problems. If we have to make decisions in an unfamiliar domain, where can we find the detailed information we will need? One reason for the popularity of books about people with life-threatening illnesses (e.g., Quindlen, 1995; Rosenbaum, 1988) is that literary accounts provide a much richer description than is provided by medical professionals.

Only when there is realistic hope that superior options are coming through in the future is it sensible for people to risk surrendering what they've already lined up. The more unsatisfactory the present situation seems, the more willing one should be to undertake that risk.

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Footnote

1. The possibility of negotiation implies that the time window may not really be closing. Strategic considerations come into play, removing the decision from the take-it-or-leave-it situations we analyze here. Stakeholders may disagree on the likelihood that negotiation will take place. Plea bargain and settlement proposals lose their force if the decision maker does not believe that an offer will truly expire. Lippman and McCardle (2004) analyzed a notorious paternity suit from both a decision perspective and a Nash bargaining perspective, and showed that the two models yielded dramatically different valuations.

2. The inter-individual differences we envision are analogous to Lopes's (1987) variations in security-mindedness. Just as there are people who are biased in favor of a sure thing, even when the expected value of the risky alternative is much higher, so there are pessimists who will settle for a barely acceptable option now rather than rely upon future prospects.

3. People do not like to run out of options (Shin & Ariely, 2004), and if the situation permits they may try to get more possibilities before the time window closes. Additionally, they may try to extend the time window. Our model does not accommodate these changes.

4. Howard (1992) views regret as "a bad thought that arises when I think about futures I might have received instead of the future I did receive". We suspect that only a small minority of people, most of whom are trained decision analysts, can keep emotion out of their decision processes.