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Test for the real option in consumer behavior ☆

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ABSTRACT

Consumers become indecisive when facing too many choices. Economic analysis suggests that when a decision involves uncertain outcome, can be delayed and is irreversible, there will be a real option in the *cost–benefit analysis*. For example, the option to keep alive a consumer's *purchasing decision* has a significant value. It allows the consumer to take advantage of any future advantageous deals while avoiding the bad choices. This renders the consumer more hesitant. When a consumer decides to exercise his buying decision, he demands a compensation for the loss of this option. Hence, the benefits of a purchase must be over and above its costs by a wide margin (the *option value*). Data from a survey at a Turkish university on hypothetical purchase decisions confirmed the existence of this real option. We conclude with marketing policy recommendations and future research directions. Connection to the *Prospect Theory* is briefly explored.

Note: Although the 3rd person singular pronoun *he*/*his* was used throughout to describe the consumer, *he* was intended to be gender-neutral.

1. Introduction

Consumers love variety. More choices increase the likelihood that a consumer will find one that suits his needs (Beckman and Rigby, 2003). However, recent studies have shown that when faced with a bewildering array of product offering varieties, customers simply refrain from making a purchase at all (Rust et al., 2006; Kahn and Wansink, 2004; Kahn and Morales, 2001). Traditionally, companies believed that assortment proliferation or more available product lines would better satisfy customers' diverse preferences. For example, richer variety ensures that customers will find something that satisfies their specific tastes and preferences, the so-called fat-tail phenomenon. This will increase satisfaction and decrease brand switching behavior and churn (Kahn and Lehmann, 1991; Broniarczyk et al., 1998; Hoch et al., 1999; Chernev, 2003; Kim and Drolet, 2003). Alternatively, consumers like to seek variety. They prefer products and services that have multiple varieties or assortment sizes (Huffman and Kahn, 1998; Chernev and McAllister, 2005).

Unfortunately, a large number of assortment sizes can present the problem of "overchoice" (Gourville and Soman, 2005). For instance, service options increase the customer's time and cost for searching for, acquiring, and processing product information (Payne et al., 1993). They also make a customer less likely to carry through a planned purchase (Dhar 1997; Tversky and Shafir, 1992). Various experiments have demonstrated this phenomenon (Iyengar and Lepper, 2000; Boatwright and Nunes, 2001; Chernev, 2003; Iyengaret al., 2004). Factors influencing the delay in technology products adoption were also discussed in Wang et al., (2008).

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A popular explanation for this uses the concept of product attribute alignability (*AA*). Several product varieties have an *AA* if they can be arranged on a linear vector. For example, memory size of a smartphone is an *AA* (e.g., 16 or 32 Gigabytes). The apps on a smartphone are, however, non-*AA*s (e.g., sat-nav, e-reader, camera, video recorder, etc.). Herrmann et al. (2009) use an experiment to demonstrate that increase in product varieties that are *AA* is conducive to purchase. On the contrary, increase in those that are non-*AA* is not. They then show how changing product varieties from non-*AA* to pseudo-*AA* can increase sales.

In this paper, we provide an alternative explanation. We use a recent advancement in economics to explain why consumers are reluctant to buy when confronted with increasing choices – the real option theory. The idea stems from the traditional cost benefit analysis (Silberberg and Suen, 2001). Suppose the benefits – discounted future cashflows from a project – are greater than the investment cost. Then the investment project is worth undertaking.

$$\text{benefits} \geq \text{costs} \tag{1}$$

Similarly, a consumer carries through on a purchase when the perceived benefits of the product are greater than its price. In the 1990s, two economists, Dixit and Pindyck (1994) made a significant discovery. Suppose the benefits and/or costs of a project are uncertain – can go up or down in the future. The project can be delayed (does not require immediate investment) and is irreversible (cannot be unwound should the project go wrong). Then the benefits must outweigh the costs by a wide margin to accommodate the value of a real option. This option refers to a project investor's ability to capture potential advantageous benefits and/or costs (option in the money). On the other hand, the investor can retain this option (does not need to exercise it) should the benefits/costs be disadvantageous (option out of money). The ability to do this has a significant value. However, this investment option vanishes once it is exercised. Therefore, potential investors demand a compensation. Future benefits must outweigh both the costs and the value of this real option for the project to be profitable.

$$\text{benefits} \geq \text{costs} + \text{option} \tag{2}$$

Note that the more uncertain the benefits/costs are, the more valuable this option is.

By analogy, suppose a consumer is confronted with potentially increasing product varieties. Suppose different varieties confer different benefits to the consumer. That means he is facing increasingly more uncertain benefits. He may also be facing potentially uncertain costs (e.g., future promotional offers). Therefore he develops a purchase option which can be very valuable should he be able to capture these advantageous benefits/costs. Note that this option only has value if the purchase is not urgent (can be delayed – hence option) and is irreversible (not refundable). If the purchase is reversible (refundable), there is no need to retain the purchase option to capture a potentially better deal. This is because even if you got a raw deal (e.g., bought a bad product or pay too much), you could always demand your money back and try again later until you get a better deal.

The concept of real option works well in theory. However, it has not been extensively tested empirically in economics, much less in marketing. This paper hopes to address this with the following layout: Section 2 describes the real option theory in more detail; Section 3 details the survey that we carried out to test the theory in a consumer behavior setting; Section 4 summaries the survey results and Section 5 carries out the statistical analysis. We conclude with some new insights in marketing research provided by this economic approach in Section 6.

2. The real option in a consumer behavior setting

Suppose a product or service will generate a benefit or enjoyment R in each period after the purchase. Then the total net present value (*NPV*) of the purchase is

$$NPV = R/r - C = B \tag{3}$$

where r is the discount rate, C is the purchase cost and B is the net benefit of the potential purchase. When *NPV* is positive, the consumer will go ahead with the purchase. Suppose now the purchase can be delayed but is non-refundable. Furthermore, there is a future promotional offer in which the consumer may get a hefty discount if he is lucky. Therefore, B is now uncertain. Assuming B evolves stochastically over time with a steady rate of change α, net benefit may increase steadily over time due to more proficient use of the product. However, B is also subject to an instantaneous standard deviation σ (promotional discount). To simplify our analysis, we assume B is continuous over time even though B can rise 15% abruptly if the consumer is lucky enough to get a discount. Then,

$$dB = \alpha B\, dt + \sigma B\, dz \tag{4}$$

where t is time. dt represents an infinitesimal period of time in differential calculus. dz follows a standard Wiener stochastic process. Eq. (4) is a geometric Brownian motion (Harrison, 1985) in B. It enters into the consumer's purchase calculus in the following way. When the net benefit $B \geq B^*$, a certain threshold to be determined later, the consumer carries through with the purchase. Otherwise he stays put (retains his purchase option). If he chooses the latter, he gives up the enjoyment stream R for the moment. However, he retains the option to buy should he hit the promotional jackpot. But this is uncertain (σ). On the other hand, if he buys now and realizes later there is a promotional sale, then he would miss out on the potential saving. The ability to retain his purchase option has an intrinsic value that should enter his *NPV* in Eq. (3). As with financial options, the larger the volatility σ in net benefit B, the higher the value of this option. Then it will be less likely for this