

Honours Year Project Report

**An Examination of Permanent Buy-out
Auction on the Internet**

By

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Abstract

Setting the buy price is perhaps one of the most challenging tasks faced by the Internet auction seller. A high buy price, if met, will fetch a generous profit, but the likelihood that the buy-out gets activated becomes miniscule; a low buy price, on the other hand may be attractive to most bidders, but may cause the seller to forfeit a possible higher profit. In this study, we shall interest ourselves to the framing of a permanent buy-out auction. Rather than searching for an optimum buy price, we explore the use of other seller adjustable variables of the auction to frame the buy-out. We observe that the buy price becomes attractive when the auction duration is long or when the gap between the current bid and the buy price is small; and sellers can expect higher profits by setting higher buy prices with a long auction duration. More interestingly, we manage to show that in a permanent buy-out setting, we can use the buy-out to frame a reserve price auction to achieve profit maximization.

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K.4.4. Electronic Commerce

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Auctions; Internet; Buy Price; Framing

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Table of Contents

Abstract.....	i
Acknowledgement	ii
Table of Contents.....	iii
1 Background.....	1
2 Introduction – Internet Auctions.....	3
2.1 Types of Goods Sold	3
2.2 Auctioneers’ Fees	3
2.3 Number of Bidders	4
2.4 Duration of Auctions	4
2.5 Reserve Price Auctions.....	4
2.6 Buy-out.....	5
3 Literature Review.....	7
3.1 Risk Aversion, Loss Aversion and Regret.....	7
3.2 Framing	8
3.3 Transaction Utility.....	9
3.4 Choice in Context – Extremeness Aversion	10
4 Research Model and Hypotheses	11
4.1 Framework.....	11
4.2 Model 1 – Buy-out Choice	14
4.2.1 Research Model	15
4.2.2 Hypotheses.....	15
4.3 Model 2 – Buy-out Auctions	16
4.3.1 Research Model	16
4.3.2 Hypotheses.....	17
4.4 Model 3 – Reserve Price Auctions with Buy-out	18
4.4.1 Research Model	18
4.4.2 Research Hypothesis.....	18
5 Research Methodology	19
5.1 Operationalization of a Period.....	19
5.2 Operationalization of Independent Variables	19
5.3 Operationalization of Dependent Variables.....	20
5.4 Experiment Design and Procedures.....	21
5.4.1 Task and Procedure.....	21
5.4.2 Auction Design	22
5.4.3 Rewards System.....	23
5.4.4 Subjects.....	23
6 Results.....	25
6.1 Data and Statistical Models	25
6.2 Data Analysis.....	26
6.2.1 Model 1.....	26
6.2.2 Model 2.....	27
6.2.3 Model 3.....	28
7 Discussions and Implications.....	30
7.1 Discussion of Findings	30

7.2	Implications for Practice.....	33
8	Conclusion	34
8.1	Limitations.....	34
8.2	Directions for Future Research.....	35
9	References.....	36
	Appendix A – Questionnaire.....	A1

List of Figures

Figure 4-1	Model 1: Buy-out Choice Model	15
Figure 4-2	Model 2: Buy-out Auction Profits Model	17
Figure 4-3	Model 3: Reserve Price Model.....	18

List of Tables

Table 4-1	Comparison of Yahoo! and eBay Auction Models	12
Table 5-1	Demographics Breakdown	24
Table 5-2	Risk Attitudes Summary.....	24
Table 6-1	Wald Statistic for Model 1.....	26
Table 6-2	Hosmer and Lemeshow Test Result for Model 1	26
Table 6-3	Frequency Statistic for Variable Buy-out Choice	26
Table 6-4	Coefficients Table for Model 2	27
Table 6-5	ANOVA Analysis for Model 2.....	27
Table 6-6	Model Summary for Model 2.....	27
Table 6-7	Coefficients Table for Model 3	28
Table 6-8	ANOVA Analysis for Model 3.....	28
Table 6-9	Model Summary for Model 3.....	28
Table 6-10	Hypotheses Testing Summary.....	29

1 Background

The ubiquity and widespread of the Internet has sparked the boom of e-commerce, creating totally new businesses and reinventing the way people engage in traditional trades and practices. Internet auction is a representative example of such a phenomenon, representing billions of dollars in transactions and growing at a rate of more than ten percent per month (Lucking-Reiley D. 2000). Several auction sites now vie for a share of this lucrative pie, each adopting its own business and auction model.

As with traditional auctions mechanisms, much have been researched on Internet auctions and the effects of buy prices. Existing literature on buy-out auctions however have primarily focused on expected profits of sellers with buy-out (Budish E.B. and Takeyama L.N. 2001), buy price pricing, bidders' attitudes towards the buy-price etc. Moreover, owing to the market leadership of eBay, majority of the literature were based on the eBay buy-out model. Research in the area of buy-out auction framing seems to be lacking, especially in the context of the permanent buy-out mechanism that is adopted by Yahoo! and Amazon.

In this paper, we attempt to look at the buy-out mechanism in a fresh perspective, focusing on the permanent buy-out mechanism. The objective of our study is to investigate how the buy-out mechanism can be used to maximize profits of the seller from the framing perspective. Specifically, we will address the following issues.

1. How the attractiveness of the buy-out is affected by the bid time and current bid of the auction.
2. How the framing of the buy-price affects the profits of the sellers.
3. How the buy-out can be used in conjunction with a secret reserve price to frame the auction “deal” to maximize seller profits.

The findings of our study are expected to be of good value to the academics and auction participants. Our research contributes to the existing pool of buy-out auction literature by investigating the effects of augmenting a buy price to an English auction from the price

framing perspective, and the impacts adopting a combination of the buy-out mechanism and the secret reserve price mechanism have on seller profits. Moreover, it helps to mitigate the disparity in research volume between the temporary buy-out mechanism and the under-researched permanent buy-out mechanism. For the layman, our study presents a whole new pricing strategy for the profit maximizing seller using Yahoo! Auction or Amazon Auction.

The paper will be organized as follows. Chapter 2 introduces the reader to the world of Internet auctions, and discusses issues of auctions such as fees, bidding trends, seller preferences etc. Chapter 3 consists of an analysis of applicable literature which serves to establish a platform for which our arguments will be based. We will then proceed to design our research model and hypotheses in Chapter 4. Chapter 5 will elaborate our experiment design in which the hypotheses will be tested. Chapter 6 will contain the results of our experiment. Chapter 7 will present our analyses of our data and discussions on some implications. Finally, we conclude this paper by discussing some limitations of our study and identify some directions for future research in Chapter 8.

2 Introduction – Internet Auctions

Despite the similarity in auction models to traditional auctions, Internet auctions sees a totally different group of participants, auctioning different types of goods, having different incentives and attitudes and possibly adopting a different set of heuristics in bidding.

2.1 Types of Goods Sold

Owing to the high costs of traditional auctions, only high priced objects tend to appear in auction houses, such as antiques, race horses, oil fields, properties etc. On the contrary, the low cost of employing the services of Internet auction providers brought new types of goods into e-auction houses, making Internet auctions more of a classified ads portal that facilitate negotiation of prices. This emergence is not coincidental as Internet auctions did in fact evolve from Internet newsgroups and email discussion lists (Lucking-Reiley D. 1999).

Internet auction items variety is rather impressive, ranging from computer software, sold-out concert tickets, mobiles phones, limited edition collectors' items etc. Expectedly, the majority of the items are used goods and typically those in limited supply where the demand is unknown to the seller. The Internet auction creates an ideal setting for sellers to determine the unknown market-clearing price.

2.2 Auctioneers' Fees

Internet auction services are either free or payable. An example of a free auction site is Yahoo! Singapore; and auction sites that charge fees include Yahoo! USA and eBay. Typically, the auctioneers' fees are paid by the seller with no buyer premium. There are two components to the fees – one being the listing fee and the other being the final value fee. An example of the fees structure can be found at the Yahoo! Auctions help site at <http://help.yahoo.com/help/us/auct/afee/afee-02.html> (valid as of 16 Jan 2004).

2.3 Number of Bidders

Unlike in a traditional English auction, where the number of bidders is fixed to only those present in the house, Internet auction bidder numbers are varied and unknown to the seller. Other than supply and demand factors, sellers have made use of properties of Internet auctions to manipulate the potential number of bidders. These strategies include manipulation of auction durations and the minimum bid price.

2.4 Duration of Auctions

Traditional English auctions typically last only minutes, owing to the physical presence of all eligible bidders; whereas Internet auction durations can range from a few minutes to ten days. The length of Internet auction directly determines the number of bidders, which can in turn affect the financial outcome. When the auction is short and bidders are few, the end price is likely to be low. In an experiment of coin auctions, Lucking-Reiley et al. (1999) ascertains that longer auctions lead to higher prices. It is observed that lengthy auction durations may lead bidders' behavior to deviate from those studied in classical auction literature.

2.5 Reserve Price Auctions

It is typically believed that high public minimum bids tend to scare away potential bidders and may result in an auction failure. Lucking-Reiley (2001) proposed the notion of “bidding momentum”, stating that a low public minimum bid is superior to a high one as the low minimum bid will attract people to join in the bidding and “grease the wheels of bidding”.

Reserve price auctions allow the seller to specify a minimum acceptable bid amount for the auctioned item such that if this amount is not met at the end of the auction, the seller is not obliged to complete the sale. The usage of a reserve price allows the seller to set the minimum bid at a falsely low price to generate interest and build bidding momentum whilst protecting the seller from selling the good at a ridiculous discount.

As for the significance of the secrecy of the reserve price, Vincent (1995) argues that the announcement of the reserve price which may be above the bids of some bidders may break part of the linkage between the price paid and the value of the object; therefore by keeping the reserve price a secret, the linkage is restored and can induce greater participation, resulting in increased seller profits.

2.6 Buy-out

The idea of buy-out is not a new phenomenon. It has somewhat existed since pre-Internet days in the form of “\$100-or-best-offer” pricing mechanisms found in second-hand markets (Budish E.B. and Takeyama L.N. 2001). However, it has never been a formal auction mechanism in the brick-and-mortar auction houses.

As of March 2002, buy-outs auctions make up about 40 percent of eBay auctions and 66 percent of Yahoo! Auctions (Reynolds S.S. and Wooders J. 2002). President of LabX, Bob Kafato, indicates that in ten percent of the auctions where the buy-out is available, a bidder chooses to invoke the buy-out (Lucking-Reiley 2000). Buy-out mechanisms in Internet auctions exist in two variants – the first being the permanent buy-out, where the buy-out option remains available for the entire duration of the auction (e.g. Yahoo! and Amazon); and the second being the temporary buy-out, where the buy-out option will be withdrawn the moment a bid is placed (e.g. eBay). We will be studying the permanent buy-out in this paper.

Whilst a reserve price acts as a minimum bidding level, a buy-out price does just the opposite by setting a ceiling to which bids can go. This seemingly non-profit-maximizing and somewhat irrational strategy is in fact an attempt to address risk adversity issues. By setting a maximum bid, the bidder is insured against the risky prospect that other bidders have similarly high or higher valuations. Budish E.B. and Takeyama L.N. (2001) further asserts that by insuring the risk-averse bidders, sellers’ profits can be improved. The Budish and Takeyama study however adopts the eBay buy-out model and their assertion is generally not applicable to permanent buy-out auctions.

The major drawback of the buy-out is that the seller is deprived of possible higher bids than the buy price.

3 Literature Review

3.1 Risk Aversion, Loss Aversion and Regret

The Expected Utility Theory has long been the standard theory of individual choice in economics. Four axioms form the foundation of the theory – namely cancellation, transitivity, dominance and invariance. However, several counterexamples have evolved to lead theorists to abandon these principles (Tversky A. and Kahneman D. 2000).

In 1979, Tversky and Kahneman proposed the first version of their authoritative Prospect Theory as an alternative model to the standard theory. Prospect theory differs from the standard theory in that it interprets outcomes as gains and losses relative to a reference point, rather than as final states. The reference point typically refers to status quo. The theory asserts that individuals tend to be more affected by losses compared to gains of an equal magnitude, leading to a principle of loss aversion.

Through empirical studies, the authors establish that decision makers conform to a fourfold pattern of risk attitudes – they typically display risk aversion for gains and risk seeking for losses of high probability, and risk seeking for gains and risk aversion for losses of low probability. The risk attitudes model aptly captures the individuals' attitude towards lottery and insurance.

Supporting the Prospect Theory, the Regret Theory offers a more intuitive explanation to violations of the basic axioms of classical decision theory. Regret theory assumes that many people experience sensations of regret and rejoicing, and that in making decisions under uncertainty, they will try to anticipate and take into account these sensations. The theory incorporates the concepts of regret and rejoicing by means of a modified utility function. It proposes that a rational individual will seek to maximize the expected modified utility. A weakness in the Regret Theory is its inadequateness in capturing an individual's capacity to anticipate feelings of regret and rejoicing. (Loomes G. and Sugden R. 1982)

Knetsch and Sinden (1984) conducted an experiment to demonstrate an effect which was known as the endowment effect, identified by Thaler R. in 1980. Endowment effect reveals that individuals tend to over-value items they already possess. A consequence of this effect is the discrepancy between bargaining habits between buyers and sellers, such that buyers always understate their true willingness to pay and sellers overstating their minimum acceptable price. The endowment effect can be used to explain seller behaviors in setting the various prices for their auctions. Loss aversion is a direct consequence of the endowment effect.

Risk aversion and regret play a major role in deciding bidders' reference points and their corresponding willingness to pay. The buy-out mechanism capitalizes on these risk attitudes to offer bidders some form of insurance at a premium, making a supposedly irrational strategy a potentially revenue amplifying one.

3.2 Framing

In their 1986 publication, Tversky and Kahneman conducted an experiment to violate the principle of dominance. 88 subjects were first given two lotteries A and B to choose from whereby option B easily dominates option A. The subjects were then given another two lotteries C and D that are stochastically equivalent to A and B, except that colors yielding the same outcome are combined. The framing of the second set of lotteries simplified the options but masked the relationship of dominance. The results show that 58 percent of the subjects chose the dominated option C which in the corresponding lotteries of A and B, was the lesser of the two options. This result signifies that a decision maker may behave irrationally (not being profit maximizing) under the influence of the context.

Kahneman and Tversky (1981) defined a decision frame as 'the decision-maker's conception of the act, outcomes and contingencies associated with a particular choice'. Framing is concerned with influencing this decision frame by altering the formulation of an option or problem such that decision makers will perceive the option as attractive.

In practice, marketers have used the concept of framing to enhance the attractiveness of their offers. Common tactics include product bundling (Dolan R.J. 1987) – such as travel packages or bundled music system complete with amplifiers and speakers – and product discounts. Such tactics create the impression to consumers that the bundle or discounted product is in fact cheaper than the consolidated separate price or original price by emphasizing these prices to coax consumers to register them as their reference point, so that consumers will see the offer as a gain. Rabin M. (1998) suggests the notion that framing effects can be viewed as heuristics errors as the presentation of a choice draws the individual to attention different aspects of a problem, leading the individual to deviate from his or her true, underlying preference.

In a typical Internet auction, the seller has the autonomy to set the following attributes – starting bid, buy price (optional), secret reserve price (optional) and auction duration. Sellers can attempt to maximize their profits by framing the deal (as opposed to the value of the item) using these attributes. A method of framing this deal is through the framing of the buy-out. The seller can set a reasonably high buy price and frame this price by manipulating other attributes to make this price attractive to bidders.

3.3 Transaction Utility

Consumers typically get two kinds of utility from a purchase: acquisition utility and transaction utility (Thaler R.H. 1999). Whilst acquisition utility is the measure of the value of the good obtained relative to its price, transaction utility measures the perceived value of the “deal”. Transaction utility is defined as “the difference between the amount paid and the ‘reference price’ for the good, that is, the regular price that the consumer expects to pay for this product.” In an empirical study (1985), Thaler establishes that consumers typically set different reference price for the same product in different contexts. Puto C. (1987) further ascertains that buyers are typically capable of improving their initial reference point with inputs from the environment.

There exist four reference points in which buyers can frame their price – namely minimum bid/current bid, buy-out price, reserve price and market price (or previous closing bids of similar items). The market price is dependent on the demand and supply of the item on auction and is the level sellers typically frame their value of their item. This value is external to the auction and not seller controllable, and hence will be outside the context of our research. We will only concern ourselves with the internal reference points of the auction. We expect that a sound framing strategy can have impacts on these reference points and increase bidders' willingness to pay.

3.4 Choice in Context – Extremeness Aversion

In the classical economic theory of the consumer – where the consumer selects the alternative with the highest value – preference between alternatives is independent of context. In their 1992 publication, Simonson and Tversky challenged this implication of value maximization by proposing a theory of Choice in Context, where consumer choice will be influenced by context, defined by the set of alternatives under consideration.

They proposed two principles – tradeoff contrast and extremeness aversion. The tradeoff contrast hypothesis suggests that the choice between two options is influenced by other implied tradeoffs in the set of options under consideration. Following the principle of loss aversion, extremeness aversion suggests that an option is more attractive to the respondent if it is an intermediate option in a choice set and that attractiveness is lower for extreme options.

This principle suggests that sellers can attempt to add a third option to the auctions to relief bidders of their dilemma and frame the auction in a way that is desired by them.

4 Research Model and Hypotheses

4.1 Framework

At the very macro level, we establish that buyers are generally risk averse (of not winning the auction) and loss averse (overpaying for item); whilst sellers are profit maximizing. We derive at two reasons why a buyer may choose to activate the buy-out (Reynolds S.S. and Wooders J. 2002). The first reason is that bidders may be averse towards the risk of losing the auction when another bidder accepts the buy price. The buy-out helps to reduce the extent of uncertainty by offering some form of insurance to the buyer.

The second reason is that the buy-out allows bidders to end the auction immediately to gain possession of the item possibly several days earlier than if they were to wait for the auction to end. The main determinant of the private value of bidders is the value/importance of the item to that bidder. A high private value signifies a high desire to acquire the item; hence we can safely deduce that reduced waiting time to acquire the item is generally preferred by high value bidders if not mandatory. As such, the time reduction due to the buy-out option may raise bidders' willingness to pay relative to their willingness to pay if they were to compete in the ascending bid auction.

A third reason may exist for eBay bidders. eBay bidders are averse to “overpaying” for the item when the current bid exceeds the buy price and the buy-out is no longer available. Regret Theory suggests that the individual will try to anticipate feelings of rejoice and regret and take them into account when making a decision under uncertainty (Loomes G. and Sugden R. 1982), hence eBay bidders have more incentive to activate the buy-out if they anticipate the ending bid to be high and result in regret.

The following table highlights the differences in the auction models of Yahoo! and eBay.

	Yahoo! Auction	eBay
Buy-out Mechanism	Permanent	Temporary
Buy-out option availability	Throughout auction duration	Depends on presence of reserve price
Non-reserve price auctions	Buy-out option available throughout auction duration	Buy-out option available until first bid is placed
Reserve price auctions	Buy-out option available throughout auction duration	Buy-out option available until reserve price is met

Table 4-1 Comparison of Yahoo! and eBay Auction Models

It would have been ideal for us to design a single model to explain the relations between the buy-out framing, buy price attractiveness and seller profits. Unfortunately, the nature of the permanent buy-out mechanism is such that there do not exist a clear link between the buy-out attractiveness and the auction outcome, particularly the seller profits; and hence the inability for us to construct a single complete model to explain these relations. This is due to the fact that the buy-out attractiveness in a Yahoo! auction is an ever-changing attribute throughout the duration of the auction i.e. the attractiveness of the buy-out may be different at start, at the mid and towards the end of an auction. Therefore, there do not exist a direct relationship between buy-out attractiveness and auction outcome, as the ending of an auction with a buy-out is not suggestive that the buy-out is an attractive option for the auction; rather, the buy-out is deemed attractive at that point in time of the auction when it is activated. For example, in an auction with the minimum bid price set at \$100 below the buy price, the buy-out may be activated only when the current bid has reached \$10 below the buy price, thereby demonstrating that the attractiveness of the buy-out at the start of the auction and the point which it is activated are different. It is equally inappropriate to draw a conclusion that the buy-out is attractive and hence is activated, because of the sellers' framing of the buy-price.

Unlike the case of eBay auctions where the decision to opt for buy-out is a one time affair i.e. the modeling of buy-out attractiveness with the buy-out framing and auction outcome would have been possible, Yahoo! auction bidders are presented with a “second chance”

to activate the buy-out should the risk of losing the auction elevates due to increased attractiveness of the buy-out. Unlike the eBay bidder who may risk losing the auction due to buy-out by another bidder or overpaying for the item by not buying out, Yahoo! bidders' concern lie only at the risk of losing the auction, and hence have less incentive to opt for the buy-out at any point during the auction. In addition, the ability of bidders to anticipate regrets of overpaying by buying out when the current bid has in fact already hit the private value of the second-highest bidder, may deter Yahoo! bidders to activate the buy-out. Therefore buy-out rates or buy-out attractiveness should be defined differently for both buy-out mechanisms. We can define buy-out rates and buy-out attractiveness in terms of the frequency of auctions with the buy-out activated in eBay auctions, but not for Yahoo! auctions and generally all permanent buy-out auctions.

Owing to the mechanism of permanent buy-out auctions, we expect the presence of the secret reserve price to have no significant impact on the bidders' risk attitudes. In the eBay model, sellers could augment a secret reserve price to a buy-out auction and give the bidders more incentive to exercise the buy-out. At any point in time before the reserve price is met, eBay bidders are faced with two negative possibilities. Firstly, there is the possibility that the next bid placed by the bidder will meet the reserve price and remove the buy-out. This implies that there is a likelihood that the bidder will lose the second chance of deciding whether or not to buy-out, unlike in the Yahoo! model where bidders will always have this second chance to change their mind as long as the auction has not ended. Secondly, there is a possibility that bidding momentum will develop after the reserve price is met and cause the bids to rocket and exceed the buy price. The consequence of such an outcome would be reduced transaction utility for the bidder, which is not desirable. Intuitively, the bidders' anticipation of probable regret from these two possibilities will increase the attractiveness of the buy-out, implying that the eBay seller can effectively use the secret reserve price to frame a high buy price.

However, in the Yahoo! auction model, the buy-out option is always available even with the reserve price. The presence of the reserve price has no significant impacts on the risk attitudes of the bidders. The risks associated to choosing to bid remains the same as

bidders are absolutely certain that the reserve price will be sandwiched between the current bid (if the reserve price is not met yet) and the buy price, because any bid equaling the buy price will end the auction. The probability of reduced transaction utility due to the presence of the reserve price is zero. Should bidders choose to bid, their dominant strategy will still be to remain in the auction until the current bid equals their private value. With or without the reserve price, the bidders only stand to lose the auction. Under Regret Theory, the bidder of a Yahoo! auction has less to regret as the consequences are less dreadful compared to an eBay bidder. Therefore, the study of reserve price presence in a permanent buy-out auction is not of great value.

However, we speculate that profit maximization can be achieved through using a buy price to frame a reserve price auction. We therefore included this research as part of our study of buy-out auction profits.

Owing to these limitations inherent in the permanent buy-out auction mechanism, not permitting a single model to be developed, the nature of our study is to be detached and layered. Our study consists of three parts. The first two parts examine the effects of minimum/current bid pricing and auction duration on buy-out choice and seller profits; and the third part examines the effects of buy-out presence on seller profits in reserve price auctions.

4.2 Model 1 – Buy-out Choice

A long auction gives bidders the time to monitor market trends and make estimates of rival bidders' private values, hence resulting in a possible higher participation rate. In his 1987 publication, Puto C.P. proposed a model of buying decision framing process whereby a decision maker is capable of improving his or her initial reference point with inputs from the environment. Bidders are believed to be capable of learning the auction trends and making necessary adjustments to their strategies.

4.2.1 Research Model

In this part of our research, we will examine the bidding habits of bidders through the auction. Our aim is to examine the choice of bidders to buy-out at every decision making stage of the auction. This model attempts to capture the heuristics of bidders throughout the auction.

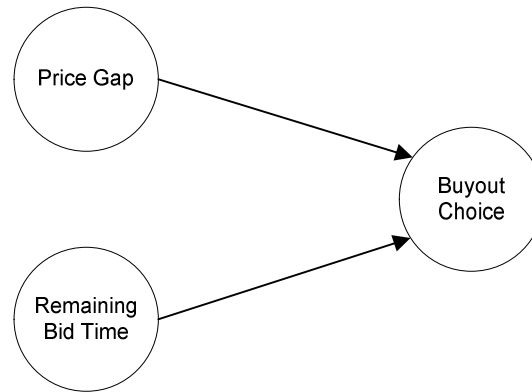


Figure 4-1 Model 1: Buy-out Choice Model

4.2.2 Hypotheses

Under the Choice in Context principle, bidders' preferences are dependent on the context. They are capable of analyzing market trends, predicting private values of rival bidders and adjusting their reference point accordingly (Puto C.P. 1987). We predict that bidders will change their strategy of increasing their bids and opt for the buy-out when the current bid draws close to the buy-out. As the current bid draws close, the differences in “gain/loss” between the current bid and buy-out price relative to the bidder's reference becomes marginal. Also the risk of losing the auction increases as the current bid draws closer to the buy-out. Hence the insurance effect will become more significant in the bidder's mental accounting.

H1a: Smaller price gap between the current bid and the buy-out price will result in increased attractiveness of the buy-out

It has been observed that many Internet auction, bidders have engaged in “sniping” and wait till the last minute to submit their bids. This is due to the lack of incentives to bid early as the early bidders will just be revealing information to their rivals (Lucking-Reiley D. 2000). Furthermore, Bapna R. (2000) finds that this group of bidders account for the winners in approximately 20 percent of the auctions he observed. If all bidders were to follow this bidding strategy, the game will eventually become a first-price, sealed-bid auction and lost the attractiveness of the English auction.

In a seal-bid auction, bidders tend to underestimate their chances of winning the auction due to ambiguity aversion (Salo A.A. and Weber M. 1995). With this lowered perception of winning (i.e. increased risk), bidders may be tempted to opt for the sure-win buy-out option.

As discussed earlier, another motive for activating the buy-out is to end the auction immediately to gain possession of the item. Long auction duration is likely to give these bidders more incentive to buy-out.

H1b: Long auction time will result in increased attractiveness of buy-out

4.3 Model 2 – Buy-out Auctions

4.3.1 Research Model

In this part of our research, our purpose is to examine the outcome of the auctions; how factors such as buy-out price, starting bid price and auction duration can impact the seller profits.

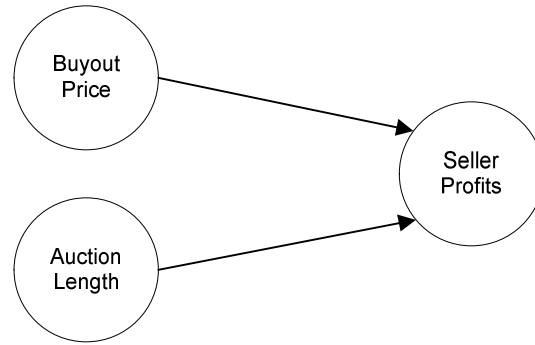


Figure 4-2 Model 2: Buy-out Auction Profits Model

4.3.2 Hypotheses

The presence of a relation between buy price and seller profits is apparent. Sellers often face a dilemma in pricing the buy-out. The tradeoff between attractiveness of the buy-out and profit is such that a low buy price (which is more likely to be met) is at risk of causing the auction to close at a price lower than what some bidders may be willing to pay; whilst a high buy price, though profit maximizing (even if the buy price is not met) is at risk of turning off some high-valuation bidders, resulting in their reluctance to place high bids and causing ending bid to be low.

H2a: A high buy price will result in higher seller profits

Following H1b, we speculate that the sellers can maximize their profits by setting higher buy prices for long auctions. A longer auction duration is likely to gain exposure to a larger group of potential bidders, thus creating a larger number of rival bidders. This creates more uncertainty to bidders and is likely to raise their willingness to pay to mitigate this ambiguity aversion. In addition, the longer auction is likely to raise the willingness to pay for bidders who are eager to end the auction immediately to gain possession of the item.

H2b: Longer auction duration will result in higher seller profits

4.4 Model 3 – Reserve Price Auctions with Buy-out

4.4.1 Research Model

In this study, we speculate that we can maximize seller profits by placing a buy price (which is sufficiently high to fetch a good profit if it is ever activated) for reserve price auctions.

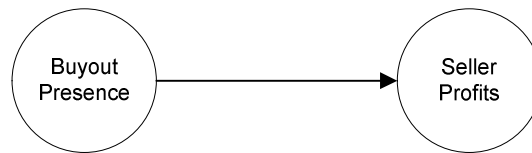


Figure 4-3 Model 3: Reserve Price Model

4.4.2 Research Hypothesis

Although most bidders will not have private values that will match the buy price, the buy price may have some effects on some risk-averse bidders, giving them the impression that the average private values of other bidders are very high. This will disturb and alter their reference point, thus making them more willing to pay higher prices.

The compromise effect of the extreme aversion principle suggests that by addition of an “extreme” option (the buy-out price), the lower extreme (the current bid) option’s attractiveness will be jeopardized, but not the middle option (the bidder’s private value). The “advantage” in this context refers to the chance of winning the auction and the “disadvantage” refers to the bid amount. Although the secret reserve price is generally unknown to the bidders, the presence of the buy price sets a ceiling to the amount the bids can reach, hence giving bidders an estimate of the reserve price. Consequently, bidders may be more willing to bid at a price close to their private value and cause the secret reserve price to be met more easily, resulting in higher seller profits.

H3: The presence of a buy price will result in higher seller profits

5 Research Methodology

5.1 Operationalization of a Period

A permanent buy-out auction can be treated as a finite number of temporary buy-out auctions. For model 1, we define a period as each decision making stage of the auction – i.e. every time a bid/buy-out is placed (by any bidder regardless of private value) – where bidders have the choice to bid or buy-out at that moment, knowing that they may or may not have the chance to buy-out later in the auction.

For model 2 and model 3, we define a period as an auction game where we are only interested in the outcome of the auction.

5.2 Operationalization of Independent Variables

Consistent with Yahoo! auctions, bidding history such as bidder, bid time and bid amount are recorded real time as the auction progresses. This serves to allow bidders to monitor bidding trends of the auction and to allow us to study various aspects of the auction, such as bidding habit with time, bidding decisions relative to current bid and buyers' private values etc. Independent variables for model 1 (gap of current bid and buy price, and remaining auction time) can be derived from the bid history.

To study the significance of the price gap on buy-out choice, the starting bid variable was set at three levels. Relative to a random generated seller's valuation of the product on auction, the starting bids were priced at levels of \$15, \$30 and \$45 less this random figure. The upper limit for the buyers' private values is set at ($\$30 + \text{seller private value}$). Therefore, our starting bid levels are generated as 0.5, 1 and 1.5 times this gap of \$30, which corresponds to \$15, \$30 and \$45 respectively.

To study the significance of the auction on buy-out choice (in model 1) and seller profits (in model 2), the auction duration variable was set at three levels. In real online auctions, the auction duration range from three days to ten days. However, our choice of conducting laboratory experiment as opposed to a field experiment did not permit us to

investigate the effects of auction duration in terms of days. By compressing the duration from days to minutes, we believe that we should be able to observe some relative differences in bidding behavior due to differences in auction length.

The auction duration was set at three levels, namely three minutes, seven minutes and twelve minutes. After a series of pilot testing, we establish that twelve minutes is the longest auction duration that will allow us to conduct at least ten auction games within the two hours of experiment time. In addition, the shortest auction duration is set at three minutes as it is the shortest time possible for bidding momentum to build up and allow us to observe some bidding trends. Any game shorter than three minutes is at risk of the outcome being a result of pure chance. And seven minutes is chosen as it is the midpoint of three and twelve minutes.

In model 2, the second independent variable studied is the buy price. Two levels of buy prices were set – one being the seller private value and the other at the midpoint of the range [seller private value, buyers private value upper limit], which corresponds to \$15 above seller private value. Of the 16 auctions played, half had the lower buy price and the remaining had the higher buy price.

In model 3, the independent variable studied is the presence of the buy-out. The auction games are conducted either with or without a buy price. The buy price is set at the upper limit of the buyers' private values. This was to ensure that no buyer will be eligible to activate the buy-out and hence achieve profit maximization.

5.3 Operationalization of Dependent Variables

For model 1, the dependent variable is recorded as either a “buy-out” or “no buy-out”. We can derive the attractiveness of the buy-out based on the frequency of buy-outs relative to the total number of trials.

For model 2 and model 3, the dependent variable is the profit of the seller. This figure is derived from the ending bid amount (or buy price) minus seller's valuation for that item on auction.

5.4 Experiment Design and Procedures

5.4.1 Task and Procedure

The laboratory experiment approach was chosen in favor to field experiments for several reasons. Laboratory experiments allow us to control and manipulate the factors affecting the outcome of the auctions, resulting in strong internal validity. With laboratory experiments, we can now investigate the buying motives of the bidders with respect to their private values, which are not available in the field environment. Finally, we can auction generic products (such as product A, product B etc.) instead of real products in laboratory environment. This helps eliminate potential buyers' bias in certain products or brands, thus allowing us to capture the actual buying habits due to our manipulated factors.

The experiment for model 1 and model 2 is a 3 x 3 factorial design, manipulating the starting bid level and auction duration. A total of nine sessions were conducted, with each session having ten to fifteen subjects. Each session played only one treatment combination and a total of 16 auctions were conducted within two hours. Each participant was randomly assigned to a seat which corresponds to a bidder number with a unique set of randomly generated private values for all the items on auction. The subjects were briefed thoroughly about the game rules, the various auction mechanisms and reward system, and then begin with two dry-run auctions where explanations were given as the auctions progressed. After all final doubts were clarified, the real auction with monetary rewards commences.

The experiment for model 3 is conducted in two sessions, with each session playing a total of ten auctions. Each session will play only one treatment – either with buy-out or without buy-out. Each auction lasts five minutes.

At the end of every session, participants were asked to complete a short questionnaire that captures their demographical information and their risk attitudes. The Jackson Personality Inventory was adopted for the risk assessment.

During the pilot runs, we found that the waiting time was too dreary for the participants and caused some participants to behave irrationally. Moreover, bidders rarely stare at the auction screen for days in monitoring the real online auctions, instead only checking the status periodically and are occupied in other activities most of the time. Hence, we encouraged the participants to do their own work whilst the auctions were in progress. The remaining time of the auctions were announced at one minute intervals so that the participants need not constantly check the clock. In addition, we played some light music in the background to make the wait more pleasant so that the participants will not rush to end the experiment early.

5.4.2 Auction Design

For every auction, a seller's private value (PV) for the auctioned item was first random generated in the range [50, 150] under uniform distribution. Using this figure, 15 random numbers were generated in the range of [seller PV-50, seller PV+30] as private values for the 15 bidders. The random numbers gap was set at 60 initially with the midpoint being the seller's private value. However, we deliberately wanted to disqualify some bidders from the auctions so that the number of eligible bidders will be varied and unknown, just as in the case of real Internet auctions. The lower range figure of 50 was chosen as our lowest starting bid was \$45 less the seller private value.

For the 10 auction games for model 3, the reserve prices were set at the seller private values. Half of the games had the bidder private values upper limit set at \$30 more than the reserve price, whilst the rest were set at \$20 more than the reserve price. The starting bids were set at 1.5 times this gap lower than the reserve price i.e. \$45 and \$30 less the reserve price respectively. This aims to prevent the bidders from deriving at the actual reserve price by mathematics given the starting bid and buy price. The range of random

bidders private values were [seller PV-50, seller PV+30] and [seller PV-30, seller PV+20] respectively.

5.4.3 Rewards System

Every participant who turned up for the experiment was awarded 100 points. For every auction, the winning participant was rewarded additional points based on the winning bid and the participant's bidder private value of the product. The formula is

Points awarded = Private value - winning bid

This formula holds regardless of the sign of the awarded points i.e. if negative points were awarded, the participant will have his or her points deducted accordingly. The exchange rates for the points were

For experiments that were shorter than 1.5 hrs, the exchange rate was 10 points = S\$0.80

For experiments that were longer than 1.5 hrs, the exchange rate was 10 points = S\$1.00

The purpose of setting two separate exchange rates was to deter participants from trying to end auctions earlier in order to end the experiment earlier. In addition, participants who did not participate in any of auctions in the form of bidding will be disqualified and have all the points forfeited. This was to prevent free-riding through the experiment to earn the participation fees.

5.4.4 Subjects

A total of 102 subjects participated in the experiment. The subjects were undergraduate students from various faculties reading an introductory computing module. Each subject participated in only one session. The subjects were offered all the nine sessions in which they registered for their preferred timeslots. Each session permitted a maximum of 15 participants and participants were assigned according to their preferences in first-come-first-serve basis. The breakdown of the demographics is as follows.

Demographics	Category	Frequency (N = 102)	Percent
Age	18	3	2.9
	19	10	9.8
	20	26	25.5
	21	28	27.5
	22	18	17.6
	23	12	11.8
	24	2	2.0
	25	2	2.0
Gender	Male	54	52.9
	Female	48	47.1
Faculty	Arts	33	32.4
	Business	14	13.7
	Engineering	5	4.9
	Science	33	32.4
	Computing	16	15.7
	Others	1	1.0
Participation in Online Auctions	Never	62	60.8
	Once every few weeks	34	33.3
	Once a month	4	3.9
	Once every 2 weeks	0	0.0
	Once a week	2	2.0

Table 5-1 Demographics Breakdown

Risk Attitudes

	N	Most risk averse	Most risk taking	Mean	Std. Deviation
Risk Assessment	102	-5	5	-1.11	2.670
Valid N (listwise)	102				

Table 5-2 Risk Attitudes Summary

The above is the descriptive statistics of the risk attitudes of the subjects. A scale of -5 to 5 was used where -5 represents extreme risk aversion, 5 represents extreme risk taking, and 0 represents risk neutral. The mean score of our subjects is -1.11, indicating that our subjects are generally risk averse.

6 Results

6.1 Data and Statistical Models

Owing to the categorical nature of the dependent variable, we employed the use of logistic regression in analyzing model 1. Multiple/linear regression was used to analyze model 2 and model 3.

For our analysis of model 1 and model 2, we selected only the middle eight auctions out of the 16 conducted to study. Of these eight auctions, four auctions had the buy price set at the seller private value whilst the remaining four had the buy price set at \$15 higher than the seller private value. These eight auctions were selected as they were neutral from issues of participants rushing to end the auctions towards the last few games when they realized that they will not be able to meet the 1.5hrs mark. Moreover, the participants would have played a number of games before they reached the first of these eight games and would have learnt the game rules and developed their bidding heuristics. For similar reasons, the middle six auctions out of the ten reserve price auctions were selected for study.

For model 1, every bid placed in the eight studied auctions will be recorded as a period, regardless of the bidder who placed the bid. The entered data included remaining auction time, price gap between current bid and buy price. The rationale is that the bidders who were eligible to buy out made a decision at that point in time and chose not to buy out, and hence can be considered a decision making stage by buy-out eligible bidders. The time was rounded down to the nearest 0.5 minute during recording.

For model 3, all the auction outcomes were normalized to that of auctions with a reserve price – buy price gap of \$30. This is to create a common setting for comparison of the profits based on just our manipulated variable.

6.2 Data Analysis

6.2.1 Model 1

The results of the logistic regression analysis are as follows.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	PriceGap	-.036	.009	14.847	1	.000	.965
	RemainTime	.109	.031	12.792	1	.000	1.115
	Constant	-1.152	.331	12.142	1	.000	.316

a Variable(s) entered on step 1: PriceGap, RemainTime.

Table 6-1 Wald Statistic for Model 1

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.794	8	.779

Table 6-2 Hosmer and Lemeshow Test Result for Model 1

The significance level of the Wald statistic is less than 0.05 for both independent variables, suggesting that both parameters are useful to our model. The r-squared statistic, which measures the variability in the dependent variable explained by a linear regression model, cannot be computed for logistic regression models. Here, we use the Hosmer and Lemeshow goodness-of-fit statistic to determine whether our model adequately describes the data. The significance value of our model exceeds the minimum acceptable significance level of 0.05, thereby proving that our model adequately fits the data.

Buyout Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Buyout	397	83.1	83.1	83.1
	Buyout	81	16.9	16.9	100.0
	Total	478	100.0	100.0	

Table 6-3 Frequency Statistic for Variable Buy-out Choice

A simple frequency statistic was also computed. The result indicates that the buy-out attractiveness of our experiment is 16.9%.

6.2.2 Model 2

The results of the multiple regression analysis are as follows.

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.734	1.817		-2.055	.044
	Buyout Price	11.028	1.488	.651	7.413	.000
	Auction Duration	.475	.202	.207	2.351	.022

a Dependent Variable: Seller Profits

Table 6-4 Coefficients Table for Model 2

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2409.287	2	1204.644	30.240	.000(a)
	Residual	2748.699	69	39.836		
	Total	5157.986	71			

a Predictors: (Constant), Auction Duration, Buyout Price

b Dependent Variable: Seller Profits

Table 6-5 ANOVA Analysis for Model 2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.683(a)	.467	.452	6.312

a Predictors: (Constant), Auction Duration, Buyout Price

Table 6-6 Model Summary for Model 2

The significance levels of both independent variables are below 0.05, suggesting that both parameters are useful to our model. Furthermore, a high r-squared value of 0.47 indicates a strong relationship between our model and the dependent variable.

6.2.3 Model 3

The results of the linear regression analysis are as follows.

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.000	1.769		5.087	.001
	Buyout Presence	11.600	2.502	.854	4.636	.002

a Dependent Variable: Seller Profits

Table 6-7 Coefficients Table for Model 3

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	336.400	1	336.400	21.495	.002(a)
	Residual	125.200	8	15.650		
	Total	461.600	9			

a Predictors: (Constant), Buyout Presence

b Dependent Variable: Seller Profits

Table 6-8 ANOVA Analysis for Model 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.854(a)	.729	.695	3.956

a Predictors: (Constant), Buyout Presence

Table 6-9 Model Summary for Model 3

The significance level of the independent variable is below 0.01, suggesting that the parameter buy-out presence is useful to our model. Furthermore, a high r-squared value of 0.73 indicates a strong relationship between our model and the dependent variable.

Results of Hypotheses Testing

	Hypothesis (path)	Path Coefficient (B)	Supported
H1a	Price Gap → Buy-out Choice	-0.036	Yes
H1b	Remaining Bid Time → Buy-out Choice	0.109	Yes
H2a	Buy-out Price → Seller Profits	11.028	Yes
H2b	Auction Length → Seller Profits	0.475	Yes
H3	Buy-out Presence → Seller Profits	11.600	Yes

Table 6-10 Hypotheses Testing Summary

7 Discussions and Implications

7.1 Discussion of Findings

Mathematically, our data seems to support all our hypotheses and speculations. However, there exist several other observations that cannot be captured in the statistics.

Consistent with our speculations, framing of the buy price by manipulating the starting bid is not likely to be feasible. Model 1 enforced the fact that in a permanent buy-out auction, the bidders are likely to anticipate less regret in choosing to bid rather than buy-out and hence will continue to bid until a threshold gap between the current bid and the buy price is met. Regardless of the level of starting bid, the current bid is likely to hit this threshold value before the buy-out becomes attractive to bidders. The seller can hope to increase the attractiveness of the buy price by setting the starting bid close to the buy price. However, a high starting bid is likely to turn off serious bidders as shown in literature (Lucking-Reiley D. 2000), and cause bidding activity to be low. This low activity may decrease the attractiveness of the buy-out as competition in the auction seems nonexistent and risk of losing the auction is low, thereby offsetting the perceived increase in buy-out attractiveness due to a closer starting bid.

From the results of model 1, we can assert that longer auction duration does result in more buy-outs being activated. In model 2, we have also shown that longer auction duration can raise seller profits by setting higher buy prices. Long auctions bring about an increase in buy-out attractiveness due to the longer waiting time to gain possession of the item, hence sellers can capitalize on this increased willingness to pay by setting higher buy prices i.e. sellers can frame a high buy-price by setting a long auction duration. To support this corollary, in the four high buy price auctions chosen for data analysis, only the auctions with twelve minutes duration had 100% buy-out rate.

In our experiment, sniping was indeed sighted in majority of the auctions that did not end with a buy-out. Unexpectedly, last minute bidding is most apparent in the three minutes

auctions. A possible explanation is that the short auction could be a representation of the final moments of long auctions. Moreover, the short waiting time to the auction end encouraged bidders to wait and watch the bidding patterns before placing their bids. However, we had very few opportunities to observe if the bidders would snipe in the longer auctions as most of them ended prematurely due to buy-out, which supports our hypotheses. When last minute biddings do occur, the activity of the bidders averaged at seven bids placed per minute during the final minute.

However, contrary to literature, our data seems to suggest that sniping did not bring about higher expected profits for the seller. The reluctance to participate early in the auctions did not convert the English auction to a first-price sealed bid one as described in literature (Lucking-Reiley D. 2000). Towards the final moments of the auction, when bidding activity is highest, almost no bid jumps were sighted. The final revenue was especially low for auctions with low starting bids as bidding momentum failed to build up early in the auction due to sniping (note that this only applied to short auctions as the long auctions would have ended with the buy-out), and bidders just sequentially increment their bids by the minimum bid increment, causing the items to be sold at a discount.

An implication to this observation is that the attractiveness of the buy-out in the long auctions may not be due to ambiguity aversion caused by the first price sealed bid auction mechanism of last minute bidding dominant long auctions. We are more inclined to attribute the willingness to buy-out to impatience. This is again proven by the willingness of bidders to wait and bid at the last minute when the auction duration is short, thereby demonstrating that waiting played a very significant role in bidders' bidding strategy. It should also be noted that in the longer auctions (seven minutes and twelve minutes auctions), more than 90 percent of the buy-outs activated were executed within the first minute of the auction.

In our reserve price experiment, the presence of the buy-out did bring about higher profits. The mean profit for auctions with a buy price was \$20.60 whilst the mean profit for auctions without a buy price was only \$9.00. The cause of this disparity may be due to

the willingness of bidders to jump bid when bidders could estimate the reserve price. We computed a mean bid jump interval for every reserve price auction by dividing the sum of all bid increment amounts with the number of bids for that auction. The average of this mean bid jump interval is 8.49 for auctions with a buy price and 2.73 for auctions without a buy price. In addition, it took only an average of 4.5 bids for the reserve price to be met in auctions with a buy price and 19.8 bids for auctions without a buy price. This outcome is consistent with the study by Easley R.F. and Tenorio R. (2001).

According to Avery C. (1998), jump bidding serves to signify to competing bidders that the bidder has a high valuation. Although Avery's context is that of the common value auction, and the bidding aggression is to deter rival bidders from competing by threatening the possibility of suffering the winner's curse, the aggressive jump bidding bidders in a private value auction portray a high valuation to their rivals even though the winner's curse syndrome is not present. Bidders continued to adopt the strategy of jump bidding after the reserve price had been met, on recognizing competition in the auction (Easley R.F. and Tenorio R. 2001). Hence bidding momentum continued to develop and drove the current bid towards the threshold gap between current bid and buy price before the buy-out would be activated. However, as this threshold was met, no bidders had the private value to activate the buy-out. The bidders then attempt to place last minute bids to win the auction. On the contrary, the bidding momentum of the auctions without a buy price starts to die down when the reserve price was met. The dominant strategy after this point was to bid at the last minute, and hence kept the ending prices close to the reserve price. Whilst extremeness aversion was the cause of jump bidding in reserve price auctions with a buy price, the jump bidding strategies of the few bidders created a false impression of competition and led to higher seller profits.

Throughout the experiment, we observed that the buy price did not deter low value bidders from participating in the auctions. They typically adopted the strategy of staying in the ascending bid auction until the current bid equaled their private value. With this relative high reference price (of the auction), the low value bidders perceived that their chance of winning the auction was minimum, hence making them risk neutral i.e. the buy

price no longer had any significance to the bidder and the bidder just bid as in a normal English auction. In fact, there were occasions where the low value bidders won the auction in last minute bidding despite having private values lower than the buy price. The loss averse high value bidders, in their attempt to maximize transaction utility, had decided against buying out and adopted last minute bidding, causing bid prices to remain low.

7.2 Implications for Practice

Our study shows that the reserve price auction augmented with a buy price may be more revenue maximizing than a regular buy-out auction, and that the additional charges for using both mechanisms may be worth the dollar. Furthermore, this mechanism spares the seller from deducing an optimal buy price that will be attractive to the bidders, yet fetch a good profit. Also, the reserve price can protect the sellers from selling the item at a discount when the buy price is not met and bidding momentum is low.

8 Conclusion

8.1 Limitations

As with most laboratory experiment, our experiment tends to appear weak on external validity despite much effort to recreate the real environment in the laboratory. The most disturbing of these is our inability to test the effects of auction duration in terms of days. Our experiment results could only explain the effects auction duration have on our dependent variables in relative terms and some unique phenomenon they may exist in auctions that run for days cannot be captured or observed in our experiment. Moreover, we cannot be certain if our reduced variable range is representative of the actual range it is supposed to characterize.

Secondly, our auction game differs from real Internet auctions in that all bidders are present at the launch of the auction. As such, we are unable to accurately recreate the Internet auction mechanism where the number of potential bidders is unknown and their time of entry to the auction unknown. This experiment flaw is to have impacts on the heuristics of bidders. For example, in a real Internet auction, an early bidder has the advantage of participating in the auction early when other potential high value bidders have not yet entered the auction. The bidder therefore has the chance to exercise the buy-out, compared to a potential late bidder who may never get to see the auction as it has ended prematurely due to the buy-out. Also, should the auction run towards the end of the duration, bidders who enter the auction at this point will have a much shorter waiting time to auction end and therefore has less incentives to activate the buy-out, compared to the earlier bidders who is likely to adopt a different set of heuristics.

Lastly, the subjects of our experiments were physically present throughout the auctions. This caused the heat and tension in the laboratory to be high and resulted in generally high bidding momentum. This might not be representative of real Internet auctions where bidders are less likely to feel “oppressed” by the aggressive bidders.

8.2 Directions for Future Research

Our study serves as an introductory research on the permanent buy-out auctions from the framing perspective. By establishing these research foundations, more research can head along this direction of price framing to study or develop more strategies for selling in the permanent buy-out auction. Also, our research has taken a seller focus i.e. strategizing on how sellers should frame the auction, rather than strategizing on how bidders should set their reference price. More research can be done from the bidders' perspective on their responses to the price framing and how they derive their reference points. Bidding strategies can also be developed to assist bidders in interpreting the framing of the auctions to achieve maximum transaction utility.

Throughout the study, we have made several speculations on the outcomes of auctions which we did not test, or tried to explain certain results through literature analysis and argument. Future research can attempt to prove or disprove these speculations. These speculations include our claims that the reserve price is not likely to have any impact on bidders in the permanent buy-out auction; and that jump bidding is the cause of higher seller revenues for reserve price auctions with a buy price etc.

Whilst we have shown that augmenting a buy price to a reserve price auction can achieve profit maximizing, we are not able to conclude that our strategy is more superior to a well priced regular buy-out auction. Future studies can also attempt to investigate and compare the seller profits under these settings.

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Bidder No.: _____

QUESTIONNAIRE

Name: _____

Faculty: _____

Age: _____

Sex: M / F

Have you participate in online auctions before? Yes / No

If Yes, how often? Once a week

Once every 2 weeks

Once a month

Once every few months

Please circle True / False for the following questions.

1) Skin diving in the ocean would be much too dangerous for me. True / False

2) Taking risks does not bother me if the gains involved are high. True / False

3) If I invested any money in stocks, it would probably only be in safe stocks from large, well-known companies. True / False

4) In games I usually "go for broke" rather than playing it safe. True / False

5) People have told me that I seem to enjoy taking chances. True / False

6) I would participate only in business undertakings that are relatively certain. True / False

7) I enjoy taking risks. True / False

8) I rarely, if ever, take risks when there is another alternative. True / False

9) I would enjoy the challenge of a project that could mean either a promotion or loss of a job. True / False

10) I try to avoid situations that have uncertain outcomes. True / False