

Do Consumers Know Their Willingness to Pay? Evidence from eBay Auctions*

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VERY PRELIMINARY

Abstract

According to standard economic theory, the price a firm can charge for its product is bounded by consumers' expected utility and by the prices of competitors. Using a novel data set on eBay auctions of a popular boardgame, we find that buyers neglect cheaper prices once they have started bidding. In 51% of all auctions, the final price is higher than the "buy-it-now" price at which the same good is available for immediate purchase from the same website. We also find that, at the same time, consumers adjust their willingness to pay to irrelevant information on higher outside prices. The final price is on average more than 7% higher if the seller's item description explicitly mentions the (higher) retail price of the manufacturer. This finding suggest that anchoring affects real-world transactions outside the laboratory and that firms can easily implement it. Both results are robust to auction timing, auction length, and seller and buyer reputation. Our results question the validity of the "law of one price" even in low-transaction cost environments.

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1 Introduction

According to standard economic theory, the maximum price a consumer is willing to pay for a good depends on the consumers' expected utility and the lowest price (including transaction costs) at which the consumer can obtain the good elsewhere. Net of transaction costs (such as search effort), the same good should be offered at the same price. In this paper, we cast doubt on the validity of the "law of one price." We show that consumers fail to account for readily available information on lower prices for the same item, once they started the bidding process. At the same time they adjust their willingness to pay to irrelevant information on higher outside prices, if included in the advertisement by the seller. Neither finding is explicable by transaction costs or informational asymmetries, suggesting that non-standard factors affect consumers' willingness to pay. Our findings also suggest two simple strategies for firms to increase prices. First, firms should indicate a higher "previous" or competitor's price. Second, they should try to get potential buyers involved in the transaction (e.g. via submitting a bid).

Our evidence is based on a novel data set of online auctions. Internet auction sites such as eBay allow consumers to buy and sell very conveniently. Compared to traditional auctions, search and listing costs are lower. Participants do not need to physically attend an auction house nor do they need to commit full time during the auction period (Lucking-Reiley 1999). In addition, consumers benefit from the general advantages of buying online over in-store purchases: It is easy to find the desired product with a simple online search; consumers can get a quick overview over all products offered; it is easy to compare prices. The online technology should thus increase consumers sensitivity to lower prices. From a behavioral economics perspective, however, this may not be the case. Bidders may react to high-price anchors and disregard information of lower prices, even if available without additional search costs (on the same site). Bidding related arousal, e.g. competitiveness, joy of winning, may reinforce these effects.

To analyze the impact of online bidding technology on purchase decisions we constructed a data set of eBay auctions with simultaneous buy-it-now price. The standard eBay auction is a form of sealed-bid second-price auction. Bidder submit the maximum willingness to pay, and an automated proxy bidding system increases their bids up to that amount as competing

bids are submitted. Under the “buy-it-now” format, the item goes to the person that bids the buy-it-know price first. It is thus identical to a direct purchase at a fixed price. The buy-it-now option is widely used on eBay and, in particular, by professional online retailers for whom eBay serves as an additional outlet. If identical items are simultaneously sold via regular auctions and the buy-it-now option, the buy-it-now price provides an upper limit to bidders’ willingness to pay.

We collected data on all eBay auctions and buy-it-now purchases of a boardgame called Cashflow 101 from February 19 to September 5, 2004. Cashflow 101 is an educational game, teaching people basic accounting, financial management, and investment knowledge. The manufacturer sells the item from his website online for \$195 plus shipping cost of about \$10. On eBay, we identified 687 transactions involving a sale of Cashflow 101, 194 auctions and 493 direct purchases (buy-it-now). On these transactions, we obtained all information contained on the ‘item view’ pages and the ‘bidding history.’ This information includes the exact product name, auction timing, initial price, price path, final price, shipping costs, payment options (such as Paypal and acceptable credit cards), shipping insurance information, and the eBay reputation indicator of the seller and all bidders. We checked item by item whether the description mentioned the manufacturer price of \$195. A key feature of our data is that a buy-it-now price was available simultaneously with the ongoing auctions and without interruption during all but six days of the entire sample period. After eliminating non-US\$, failed, and terminated auctions as well as three auctions without simultaneous buy-it-now price, we obtained a final data set of 169 successful auctions and 493 buy-it-now transactions.

Our key findings are two-fold. First, in 51% of all auctions, the final price is higher than the buy-it-now price at which the good is available for immediate purchase from the same website. Second, explicit mentioning of the (high) retail price at which the manufacturer offers the boardgame increases the final price of the auction. The final price is on average more than 7% higher in the subset of auctions where the seller’s item description explicitly mentions the (high) retail price of the manufacturer compared to the subset of auctions without such mention. Quality differences cannot explain the result (and typically do not exist). Moreover, both results are robust to controlling for auction timing within week and day, auction length,

reputation of the seller, and reputation of the buyer.

The first finding indicates that consumers display limited attention towards alternative, lower prices, at least once they are “engaged” into a potential purchasing transaction (e.g. after having submitted a bid). Differently from findings in the previous literature, search or other transaction costs cannot explain the results. Our finding suggests that, from a firm’s perspective, it is desirable to solicit bids at low price levels. As the price goes up, consumers may stick to the transaction and pay little attention to alternative purchasing opportunities.

Our second finding indicates that buyers are affected by sellers’ advertisement of a “discount” relative to a higher price of another seller. We view this finding as the first robust evidence that anchoring-type biases affect real-world transactions outside the laboratory. Anchoring appears to have a sizeable effect in the example analyzed in this paper, and it can be easily implemented by firms. Common sales practices such as mentioning the higher original price of a good, crossing it out, and putting the new price below, are likely to have large effects on consumers purchasing decisions.

Our paper relates to the literature on unstable or unknown preferences. For example, Ariely, Loewenstein, and Prelec (2003) show that subjects’ valuations of products and hedonic experiences are affected by arbitrary “anchors” such as a person’s social security number. Our paper also relates to previous literature on online auctions. Ariely and Simonson (2003) find that almost all eBay buyers (98.9%) bid more than the lowest price available from other websites within a 10 minute web search. On average, eBay consumers pay 15.3% more than the lowest regular online retail prices they found. Our results add to these previous findings by eliminating alternative explanations, in particular transaction costs. Using different website can be time-consuming. The user does not only need to find the website but also needs to set up separate IDs with new passwords, credit card information etc. Moreover, bidders may be paying for the trustworthiness of eBay, such as the feedback system or the payment protection plan via PayPal. Our analysis eliminates those explanations since the data contains only alternative purchasing options *within* eBay. We also add to the previous literature by documenting the simultaneous neglect of relevant lower prices and over-adjustment for irrelevant higher prices.

Section 2 presents some institutional background about eBay and explains the auction design. Section 3 describes the auction object, the boardgame Cashflow 101, and provides details about our data set. In Section 4, we present the empirical results and discuss potential explanations. Section 5 concludes.

2 Background Facts on eBay

Since its inception in 1995, eBay has become the dominant online auction site. Without carrying any inventory, eBay draws profit by charging listing fees and sales commissions. For its third quarter 2004, eBay reported \$805.9 million in revenues with \$182.3 million net income. Its predicted revenues are \$3.25 billion for 2004 and \$4.2 billion for 2005.¹ 51.7 million users bid, bought, listed or sold an item in 2004.

To trade in eBay, users must generate an ID using a valid email address and a credit card number. Members can both sell items and bid for listed items. To sell items, users have to list them. Sellers choose categories for the items to be listed, listing periods, and starting prices. They can choose 1, 3, 5, or 7 listing days for free; or they can choose 10 days for an extra listing fee of \$0.20. In addition, sellers can specify a “buy-it-now price” and a “secret reserve price.” Sellers face three types of fees. First, they have to pay an insertion fee for the listing. Since they have to pay this fee regardless of whether their items are sold or not, they have an incentive to choose starting prices at the level of their willingness to accept (WTA). If an item is won, eBay charges a sales fee in proportion to the final sale price to the seller.² Also, if the winner makes a payment through PayPal³, another fee, in proportion to the transaction amount, is applied to the sellers’ account. Buyers don’t pay any fee to eBay or Paypal.

To bid for items, users have to log in using their IDs and submit proxy bids. eBay follows a modified sealed bid second price auction with a proxy bidding system. The bidder who submitted the highest bid wins the item but only pays the second highest price plus a small increment. An overview

¹Dow Jones Newswires, 10/20/2004.

²Detailed information in on <http://pages.ebay.com/help/sell/fees.html>.

³Founded in 1998, PayPal, enables any individual or business with an email address to send and receive payments online. PayPal was acquired by eBay in 2002.

of the increments used by eBay is in Table I.⁴ Alternatively, items can be bought at a fixed price via the “Buy-it-now” option. Whoever bids the price first gets the item. Note that items are often available multiple times in one listing. It is common that online retailers list their items using eBay. In this case, they offer a “buy-it-now” purchase only.

The reliability of buyers and sellers on eBay is measured with so-called “Feedback Scores.” The score is always shown in parentheses next to the user ID. It is calculated as the number of members who left a positive feedback minus the number of members who left a negative feedback. One member can only contribute to the score by +1, 0 or -1. That is, if the number of positive comment minus number of negative comment is positive, the score is affected by +1. If negative, it is down by 1, and so on for each member. An additional feedback measure is the “Positive Feedback Percentage.” It is percentage of positive feedback out of the total feedback. It is not recorded for bidders without previous history and naturally volatile for bidders with a short history.

3 The Data

3.1 Cashflow 101

The boardgame “Cashflow 101” aims at teaching financial and accounting knowledge while entertaining.⁵ The manufacturer (<http://www.richdad.com/>) sells the item on his website at the retail price of \$195 plus shipping cost of around \$10.⁶ However, it can also be purchased from eBay or on-line retailers. At eBay, this game is sold in two forms: via auctions and via “buy-it-now.”

The cheapest way of getting the boardgame is using on-line shopping sites outside eBay. During the early period of our sample period, one could purchase the boardgame at \$123 plus \$9.95 shipping cost from an online retailer outside eBay. The lowest outside price varies over the sample period.

⁴For details see <http://pages.ebay.com/help/buy/proxy-bidding.html> and <http://pages.ebay.com/help/welcome/questions/buy-item.html>.

⁵Richard Kiyosaki invented the game in 1996 “to help people better understand their finances.” See ‘The Rising Value of Play Money’, *New York Times*, 02/01/2004.

⁶See <http://www.richdad.com>. The details of the shipping cost are (as of Nov. 10, 2004): UPS Ground \$8.47, UPS 2nd Day Air \$11.64, UPS Next Day Air \$24.81.

For example, on August 11, 2004, the lowest price was \$127.77 plus shipping cost of \$7.54. eBay’s “buy-it-now” price is a little bit more expensive than the cheapest possible price from outside eBay. The typical buy-it-now prices was \$129.95 (plus \$9.95 shipping costs) from February 2004 to July 2004. The typical “buy-it-now” price increased to \$139.95 (plus shipping cost of \$9.95 - \$10.95) in August 2004.

3.2 Two Retailers

A key feature of our data on eBay auctions of Cashflow 101 is the almost continuous presence of “buy-it-now” listings with fixed prices by two professional sellers. We denote these two retailers X and Y . Both retailers offered the same buy-it-now price of \$129.95 and shipping cost \$9.95 until end of July 2004. From August 1 on, both raised the buy-it-now price to \$139.95.⁷ Seller X increased the shipping cost to \$10.95 as well, but seller Y kept it as before (\$9.95).

To see that the prices of these sellers’ provide bidders with an upper limit of their willingness to pay for Cashflow 101, the stability of the buy-it-now pricing is crucial. Any bidder had at any time these buy-it-now prices.

a few additional features are noteworthy. First, the items were not only exactly the same board games as those offered in the auctions, but also of same or better quality. While items sold by individuals may have been used, the professional sellers offer brand new items. Moreover, the return policy of individuals may be worse than that of the sellers.⁸ And the shipping costs of the professional retailers were typically lower. (The distribution of the shipping cost charged by individual sellers are shown in Figure 3). They also have considerably better *Feedback Scores* than ordinary individual users.

Table II describes the reputation information of two retailers. X has 2849 *Feedback Scores* with *Positive Feedback rate* 100% as of October 1, 2004. X received one neutral feedback which does not affect the *Feedback Scores* and no negative feedback at all. The overall number of positive feedback received was 2959. Seller Y has 3107 *Feedback Scores* with *Positive Feedback*

⁷There was no price change from the original distributor (<http://www.richdad.com>).

⁸Advertisement of X is: “6 Month No Risk Return Policy”; the advertisement of Y : “Your Bullet-Proof Protection... If, by the 180th day (six months) of evaluating CASHFLOW[®] 101, you are not absolutely delighted with the game, we want you to send the game back to us and we will gladly refund your entire purchase price - no questions asked.”

rate 99.9%. There were 3111 members who left a positive feedback and four members who left a negative feedback. The number of positive feedback received was 3333. There was one negative feedback made for the past 12 months.

3.3 Data Set

We collected the data of all auctions of Cashflow 101 from the eBay website from 2/19/2004 to 9/5/2004. Data is missing on the days 7/16/2004 to 7/27/2004 since eBay changed the data format requiring an adjustment of our downloading format. During this period, 493 items were listed as “buy-it-now” formats by the two professional retailers and about 194 items were listed by individuals. We restricted the sample to auctions in U.S. currency. We removed items that remained unsold due to high starting prices or secret reserve prices. There were also a few cases in which sellers ended auctions early without making sales. In addition, 19 items were listed by individuals with a “buy-it-now” option together with a proxy bidding feature. To have a conservative and consistent benchmark of high-quality buy-it-now options with anticipated price we consider only the professional buy-it-now listings and remove these (often lower) buy-it-now options.⁹ Finally we restricted the sample period to instance where at least one of the professionals’ buy-it-now listings were present at any time during the auctions, eliminating three auctions. Removing these data, we get 169 completed auctions without “buy-it-now” features. For these 169 auctions, thus every bidder, checking at any time during the sample period the website with Cashflow 101 transactions, would have found and could have accepted this alternative purchase price. This allows us to use those buy-it-now prices as a benchmark for the maximum willingness to pay a buyer should display under standard assumptions of rationality.

We also examined potential quality differences among the items sold by professional retailers and individuals. The original boardgame comes with some extras such as three audio cassettes and one VHS. Items sold by professional sellers include all these “bonuses” and sometimes more, includ-

⁹One item was sold at \$149.99, four of them had “buy-it-now” prices of \$135 - \$139, and three were sold. Most of the rest had “buy-it-now” prices ranging between \$110 and \$130. Only six cases had “buy-it-now” prices ranging from \$85 to \$99.95. In those six cases, the items were sold within a few hours.

ing a few extra gifts such as a fake one-million-dollar bill, a handout with boardgame playing tips, free access to some financial service websites. The games of the retailers are also brand-new and include a six month return policy.

The details and quality of the items sold by individuals vary somewhat. Some of them are entirely new with exactly the same conditions as offered by the manufacturer. In other cases, the boardgame was opened and played several times, some cassette tapes are missing, etc. Some sellers list the boardgame only. Also, individuals do not always offer as good a return policies as the professional sellers. In our analysis, we are including all items that contain at least the boardgame itself. In addition, we controlled directly for quality differences, e.g. whether the bonus items were included. That removes systematic variation within the individually sold items. However, the quality of professionally sold items is likely to be (if anything) systematically higher, which makes the buy-it-now price an even more conservative comparison for the final price in the individual auctions.

Table III contains the summary statistics and the first main result. The average starting price is \$46.15, far below the retail price of the board game. The average final price, however, is higher than the simultaneously available buy-it-now price, \$131.90. As indicated in by “Abnormal Final Price > 0?”, more than 41% of all auctions end at a final price above the simultaneously available buy-it-now price

This result becomes even sharper if we consider shipping costs. The majority of sellers, 84%, choose the option to charge flat shipping costs.¹⁰ The mean shipping cost is \$12.49. The average total price (including shipping costs) amounts to \$144.20.¹¹ Here, more than 51% end above the simultaneously available buy-it-now price and corresponding (lower) shipping costs (see “Abnormal Total Price > 0?”). In the later steps of the analysis we will

¹⁰ Alternatively to setting “flat shipping cost” the seller can opt for the variable shipping costs depending on the winner’s location. Typically, the seller opts for the “shipping cost calculator” of eBay and chooses the shipping method. The buyer can type his or her zip code into the calculator and learns the approximate shipping cost. There are also cases where the seller simply states that “the winner should contact the seller regarding the shipping cost.” In both cases, the information is not available to us.

¹¹ In most cases, insurance are optional with the additional cost, although some sellers require insurance to be included in the shipping expense. A few sellers did not specify the insurance price, although they told it would be possible upon request.

investigate the determinants of this finding.

Further summary data reveals that auctions get on average 17 bids. This number of bids includes unsuccessful attempts (bids which fail to exceed the highest submitted bid until that time). Our data reveals all immediately or ultimately failed bids and the price paid by the winner. We also obtained the data on feedback scores. The average seller score (251.6) is significantly higher than the average buyer score (35.6). 17.2% of the buyers have zero feedback at the time of purchase; the median is 4. The seller score translates into a positive feedback percentage of 62.1% on average.

The vast majority of auctions last 7 days, which is the longest duration without additional charge. The most common ending day is Sunday (24.9%) followed by Saturday (18.3%). Tuesday has the lowest volume, followed by Friday. Only a minority of individual sellers offer delivery insurance (37.3%). And only 28.4% offer bonus tapes or videos, as far as the titles of the description implies. Both are granted by the professional sellers. Finally, about one third mentions that the board game costs \$195 if purchased from the manufacturer.

Figures 1 to 9 show distributions of some key variables. The most common range for the starting price (about 45%) is below \$20, indicating that sellers think that a low starting price can attract more bidders. Sellers also choose a seven day auction length most of the time, hoping to attract more bidders over time.¹² Figure 3 indicates that professional retailers charge less on average for shipping cost (\$9.95) than ordinary individual sellers.

The correlations among variables in Table III are examined. *Starting Price* and *Number of Bids* have a correlation $\rho = -0.72836$. This is because when the starting price is low, there are many non-serious bids that will eventually push up the bids to a reasonable price range. Thus, *Starting Price* and *Number of Bids* are collinear. As a result, *Starting Price* will be included, but *Number of Bids* will not, in the later regression analyses. eBay includes all the unsuccessful or non-serious bids (bids that is lower than the current highest bid) in calculating the number of bids. Some bidders place several unsuccessful bids in a few minutes¹³, so that the number of bids recorded is noisy. A high number of bids does not necessarily mean

¹²For longer than seven days, the seller must pay additional fee of 20 cents to eBay.

¹³Some bidders prefer to increase the bid amount by small amounts until they finally outbid the current highest bid.

that there were competitions. It may just indicate that some bidders did not understand eBay’s proxy bidding system, and made many bids in a row, which did not outbid the highest bid at that moment. *Final Price* and *Explicit195* have a correlation 0.25143. This indicates that explicitly mentioning that the retail price is \$195¹⁴ can have some effects on bidders’ choice. Meanwhile, the starting price does not seem to be related with the final price as they have the correlation 0.01720.¹⁵

4 Empirical Analysis

4.1 Multi-variable Regression Results

In this section, the regression analysis is done with the total price (with the shipping cost) to be the dependent variable. Possible regressors are other variables listed in Table III.

If bidders assess the total cost that they pay for the auctioned item rationally, they should count for the shipping cost as well. However, do people really incorporate the shipping cost to the total expense and adjust their bids accordingly?

The problem with the shipping cost is that some auctions do not have fixed shipping costs. In our example, only 148 data had fixed shipping cost. For the other 27 cases, either the bidder had to contact the seller or the cost depended on the distance from the seller’s location.

Assuming that people care about the shipping cost as well, we use *Abnormal Total Price(ATP)*, defined as, “*ATP:= Total Price - (‘buy-it-now’ price available at the auction end date) - (shipping cost)*”¹⁶ as a dependent variable in a multi-variable regression analysis. Using various combinations of independent variables, we examine which variables are related with the final winning price including the shipping cost.

Table IV shows multi-variate regression results with respect to the independent variables from Table III. Not all the independent variables from Table III are incorporated. For example, *Number of Bids* is strongly neg-

¹⁴Alternatively, bidders sometimes claim some non-credible amount for a retail price, say, \$150. All such cases are included in the “explicit195” dummy as the value 1, and we count all these cases and call them “The retail price is \$195” collectively.

¹⁵The starting price and the total price has the correlation -0.02464.

¹⁶*totalprice* -\$139.90 (before Aug. 1st), and *totalprice* - \$149.90 (after Aug. 1st)

atively related with the *Starting Price*. Thus, including only one of the variables will lessen the problem of collinearity. After all, it is a very noisy variable. The effect of *Feedback Score* or user’s experience is estimated by $\text{Ln}(\text{Feedback Score} + 1)$ for buyers and sellers. The *Ending Hour* can be an interesting factor, however, different places have different time zone, so the effect is unclear. Even within the continental U.S., there are three hours of difference between the East coast and West coast. Also, the number of data is not big enough to include all the dummies for *Ending Hour*. The variable “*smartbuyer* : = *buyernumfeedback* * *explicit195*” is added to see the effect of buyers’ trading experience when the misleading information that the retail prices is \$195 (*Explicit195*=1’) is included in the description.

The most important and consistent effect is whether there is an explicit statement in the description that the retail price is \$195. Observe that only the dummy variable *Explicit195* has a positive coefficient with 95% statistically significant t-statistics. The total price is positively related to the auction length. However, Table IV also implies that one additional day of auction duration increases the final price by \$1.3 in both cases. It would thus maximize sellers’ profits to pay the extra fees for a 10-day auction period (at most \$0.20 as in 2004). The data suggests that buyers may not fully account for the potential increase. While it is the case that the vast majority (65.0%) chooses the maximum number of free days, only 4.7% are incurring the \$0.20-fee and choose a ten-day listing period. While the data is evidently insufficient to test whether the optimality of sellers’ choice of auction length (both due to the lack of sufficient variation and, most importantly, exogenous variation), the sharp contrast between the frequency of free listing days (95.3%) and the frequency of auction lengths with an additional fee (4.7%) allows for the question whether buyers may underestimate the value of additional days of listing.

What is the relationship between a starting price and the final price? One view is that a low starting price can induce more number of bidders, and thus would push the price up with more competition. Another view is that a low starting price will have *an anchoring effect*¹⁷ so that the final price will be low as well. The effect of the starting price on the final price

¹⁷People sometimes have a bias towards the number that was initially given to them when estimating true value of something. The initial number can be arbitrary and not directly related with the true value (Kahneman, Tversky (1974)[19]).

is not clear in our analysis, with the regression coefficient virtually 0.

smartbuyer does not have any significant effect both statistically and economically. This implies that the effect of explicitly stating that the retail price is \$195 does not have a particularly different effects between the experienced and inexperienced buyers. Thus, *smartbuyer* will not be included as independent variables in the future regression analysis.

To examine the effect of the auction end day, we add dummy variables for each day (let's call them dummies for "seasonality") in addition to the regressors used for Table V (excluding *smartbuyer*). Table V shows regression coefficients for the day dummies and for *Explicit195*. One dummy for the end day of the auction was added at a time. For example, the Sunday effect was measured by adding a dummy *Sun* equal to 1 if the auction end day was Sunday, and 0 otherwise. The *Explicit195* dummy remains statistically significant even after the inclusion of the seasonality dummies.

Observe that Sunday has a negative effect on the final price and Thursday and Saturday has a positive effect. Although none of the coefficients of the seasonality dummies are statistically significant, Sunday, Monday and Tuesday has a negative effect on final prices while other days have a positive one.

Finally, a multiple regression was done with all the seasonality dummies. Since all seven dummies for seasonality are perfectly correlated, we need to include only six dummies for end days. The dummy for Tuesday was excluded. Thus, the resulting coefficients in the regression will capture the relative differences with respect to Tuesday.

Table VI shows the regression results. With the inclusion of all these variables, we have similar results for the effect of the auction end day, although the t-statistics has weakened a lot. *Explicit195* always has a significantly positive effect on final prices. The final prices is positively related with the auction length variable and this result is quite significant. We also observe that a winner's *Feedback Score* is negatively related with the final price, while the seller's has positive effects on the price. (Both coefficients are not statistically significant.) That is, buyers with less experiences (low *Feedback Score*) tend to bid higher, and sellers with more experiences have higher final price.

4.2 Robustness Check

4.2.1 Using Alternative Variables or Time Period

For a robustness check, the same regression approach was repeated with “Abnormal Final price”, that is, excluding the shipping cost. We get similar results.

Subset of data that were collected before the “buy-it-now” price increase (Data collected from Feb. 20th to the end of July, 2004) also shows similar results.

The number of bids can be included as independent variables. Since eBay auction is virtually open to everyone who can access to the internet, it is unclear whether we have a good measure of the number of bidders, or even the number of bids. Especially, the number that eBay records as the total number of bids for an item is misleading, since it includes all the unsuccessful bids.

Adding *Number of Bids* decreases the coefficient of *explicit195*, produced positive coefficients for *Starting Price* and *Number of bids*, and increased the R-square significantly. But we have a lot bigger negative intercept compared with the regression without *Number of bids*. After all, the variable is very noisy.

Finally, instead of using the log transformation of the buyers and sellers’ *Feedback scores*, the actual raw scores were used, and we have similar results.

4.2.2 Logit and Probit Models

In this section, the Logit models and the Probit models are tested. That is, we examine a variable (*finallogit*) of 0’s and 1’s such that it is 1 if the final price is above “buy-it-now” and 0 otherwise. *totallogit* also incorporates the shipping cost as well. This approach will emphasize whether the final price (or total price) is rational in the sense that it is below “buy-it-now” price (“buy-it-now” price + shipping cost).

However, these models may not be appropriate in our example. It is not as proper as if we classify the patients “sick” and “not sick”, since the price is distributed continuously. Anyway, it would be worth trying to calculate the odds and the probability that someone would bid more than a “buy-it-now” price.

Table VII shows the results for the analysis. Each column represents the coefficients and standard error. Basically, the Logit model and the Probit model give very similar results. For example, *Explicit195* has positive coefficients, meaning that it increases the probability of the total price going beyond the “buy-it-now” price plus the shipping cost. However, it loses the statistical significance. Only the effect of *Auction Length* remains statistically significant.

Another approach can involve repeating the same analysis after imposing a cut-off boundary (say, \$5) around the “buy-it-now” price and replace them into 0’s and 1’s if the final price is below or above the boundary. Data within the boundary can be considered as “missing”.

Since only 1, 3, 5, 7, and 10 days of auction duration exist, we used discrete dummies (D3, D5, D7, and D10) for auction length instead of using the actual number. But it does not work well for linear regression. Although the coefficients for D3, D5, D7, and D10 have positive coefficients, the magnitude is not necessarily increasing. But it does work better for discrete regression for the Logit and the Probit model. The coefficients for the dummies are positive and increasing.

4.3 Discussion

Limited Attention. The regression results suggest that the major driving force for the high final prices is the misleading description that the retail price of the boardgame is \$195. Huberman and Regev (2001)[17] reports an example in which the stock price of a biotech company surged after a Sunday *New York Times* article, which is essentially the same article previously reported in the journal *Nature*. The paper concludes that “Thus, enthusiastic public attention induced a permanent rise in share prices, even though no genuinely new information had been presented.” Our case can be considered as an example of “limited attention” as well, demonstrating that bidders (sometimes, sellers as well) do not take advantage of all the easily available information when they make bids (list items). They could have easily found that “buy-it-now” items were available all the time. But instead, they seemed to be misled by the description that they bid more than the “buy-it-now” price.

It is mysterious that bidders can fail to recognize the “buy-it-now”

choices. If we use search command, identical “Cashflow 101” items are displayed at the same webpage.¹⁸ Most eBay users would search for the boardgame this way, rather than identify through categories, since the category for the game is not unique.¹⁹ If bidders were careful enough to check out the details of the description to observe the claim that the retail price is \$195, why aren’t they careful enough to realize that they could purchase the item more cheaply and immediately using the “buy-it-now” feature? Do eBay bidders have an aversion for the “buy-it-now”? Or do they simply not understand the meaning of the “buy-it-now” auction and consider it as something they cannot bid on? Are they excited about winning the auction itself and willing to pay more for that? Are they so naive that they would believe whatever is written in the description?

“Cashflow 101” costs more than \$100 on eBay most of the time, which is not a small amount of money for a boardgame. Thus, it is hard to believe that bidders are so careless not to look for a cheaper and faster way of purchasing it, which is just ‘one-click’ away.²⁰

Anchoring. What is the driving force of a final bid going above the “buy-it-now” price then? The regression results show that bidders are affected by the explicit mentioning of the \$195 manufacturer price. This might be considered as one form of anchoring effect, or so called “Coherent Arbitrariness” as in Ariely, Loewenstein and Prelec (2003)[2] paper. They argue that initial arbitrary anchor can have a lasting effect on consumers’ maximum willingness-to-pay (WTP). However, this paper may explain why people bid more for items with the description \$195, but not explain why they would place bid higher than “buy-it-now” price.

Most the prior literature focus on the effect of anchoring when the information is insufficient. Mentioned in Kahneman, Tversky (1974)[19] or

¹⁸From eBay homepage, type “cashflow” or “cashflow 101” in the search box.

¹⁹The boardgame is usually listed in several categories. It is the seller who decides where to put the item. Since the boardgame has audio cassette tapes and a VHS as well, and considered to be ‘educational’, it is usually listed under various categories such as : Books (Education & Textbooks or Audiobooks : by retailer Y), Everything Else (Education & Learning : by retailer X) or even Toys & Hobbies (Games, Educational).

²⁰We may think of the case that bidders do not like to roll down the screen so that they ignore information at the same page if it is too below the screen. However, there is no reason that “buy-it-now” auctions are always shown at the bottom. Also, eBay users must be familiar with searching for identical items with lower *current* bids.

Rabin (1998)[30], as *anchoring and insufficient adjustment*, in forming numerical estimates of uncertain quantities, adjustments in assessments away from (possibly arbitrary) initial values are typically insufficient. Such an insufficient adjustment is not reduced much even if people are aware of its influence, or when subjects' payoffs depended on their responses. (Chapman, Johnson (2002)[9]) There is also evidence from process measures that decision makers concentrate their attention on target features similar to the anchor. For example, Chapman and Johnson (1999)[10] reported an experiment that subjects compared apartments described on three attributes, that when a provided anchor value was high, they spent more time looking at positive features of the apartment; when the anchor was low, they spent more time looking at negative features.

The traditional notion of *anchoring and adjustment* usually refers a lack of adjustment that when people do not have complete information, they choose a reference point and then adjust from it. However, the case of Cashflow 101 boardgame is different, since people do not need to adjust. Anchoring and insufficient adjustment matters when there is an uncertainty or information is incomplete, but in our example, people are given correct information ("buy-it-now" price) but still people base on misleading information (claimed retail price of \$195.)

Bidders for Cashflow 101 may face the same situation if they fail to recognize the "buy-it-now" price. In that case, they may anchor their maximum willingness-to-pay (WTP) on the suggested retail price (\$195) in the item description.

However, it is very unbelievable that those bidders do not understand the "buy-it-now" which is displayed on the same web page. There is no uncertainty in the alternative price ("buy-it-now") for "Cashflow 101" on eBay. In Ariely, Koszegi, Mazar, Shampner[3] paper, experiments using different price distribution of Mug cups and Godiva chocolates show that consumers' assessments on their maximum willingness-to-pay (WTP) may depend on the distribution, even though bidding their true value is the dominant strategy. However, "Cashflow 101" example is as if their conducting the experiments with the retail price of the Mug or Godiva chocolates given to the subjects before they make the value assessments. It is very doubtful whether they would get similar results.

In the example of "Cashflow 101", people ignore "Buy-it-now" informa-

tion, and base on wrong information. In an auction, it is these people who determine the price in the market and they affect the final price, while in financial markets, these people will be taken advantage of and disappear as arbitrageurs take advantage of them.

Bidding Fever? Is it possible that some fraction of the final price is impacted by the competitive bidding, or ‘bidding fever’? To examine this, we need to define the ‘bidding fever’ carefully. By definition, the auction format itself induce competitions. The bidder needs to outbid everyone else. Then what would be the appropriate definition of the ‘bidding fever’ as a form of irrationality? For example, knowing that the bidder is over-paying in a case of winning, if he still bids the amount just to ‘win’ the auction, we can definitely call it a ‘bidding fever’. More specifically, we ask the following questions on the criteria.

- Should we consider non-sincere bids (bids that are not intended to win the item.) at the early stage as well? For example, it is very hard to win Cash Flow 101 with a bid less than \$100. Should we consider a competition with bids ranging, say, \$50-\$80 a ‘bidding fever’?
- Should the winner be one of the members involved in competitive bidding? That is, if there were competitive bidding among members, but the final winner is not involve with that competition, can we still say that ‘bidding fever’ resulted in the final price?
- What if the price is reasonable, namely, below ‘buy-it-now’ price, is it still a fever?
- What is the time frame of the ‘bidding fever’? What is the maximum time period between bids to be counted as the results of bidding fever? 24 hours before the final bids? Also, how many alternating bids should be defined as fever? Two bids? Three bids?
- How do we distinguish the ‘bidding fever’ versus ‘endowment effect’²¹?

In fact, it is very hard to judge whether there was a bidding fever, and if so, how it is different the normal competition in auction bidding. Especially,

²¹People display emotional attachments to the items they own.

in eBay, since many people are bidding at the last moment (‘sniping’), it is hard to distinguish the flow of the bids at the last minute as ‘bidding fever’. Also, even if there was evidence of ‘bidding fever’, it is difficult to quantify, or rank them by the degree of competitiveness.

In our data set, there seems to be about 20 cases that apparently, bidders got involved with competitions and bid up the final prices. But the definition of fever is not so clear, so we leave it as a future research topic.

4.4 Future research

Other interesting factors are the seasonality, the buyer’s experience, and the auction length. It seems that the final prices are lower on Sundays. Is it because bidders have more time on Sunday so that they can wait until the last minute and “snipe (submit the bid at the last minute)” rather than submit a proxy bidding for their true valuation?²² Or is it because the ending volume is highest on Sunday (Table V) so that it becomes less competitive? But wouldn’t there be more bidders as well? What about the effect of Thursday then? To answer this question, the bidding history for each item has to be examined and checked whether the last minute bidding activity is the determining factor of the final price.

After all, this is just a pilot study, and more general research on the above topics should be designed.

Another interesting thing on eBay is that inexperienced bidders tend to submit more unsuccessful bids. Do such bids affect the auction in anyway?

5 Conclusion

Data from internet auctions enable us to examine more closely how the winning price of an auction is determined. we eBay auctions on a pure private value item with a fixed reference price (“buy-it-now”) were examined. About 150 data for a boardgame named “Cashflow 101” were collected from the eBay website for about 6-month period (Feb. 20th - September 6th, 2004). Some bidders place bids higher than they can win the “buy-it-now” auction for the same or even for a superior item. A high final price is pos-

²²Whether the tendency of a last minute bidding is higher on Sunday compared with other weekdays can be a future research topic.

itively related with the misleading description that the retail price is a lot higher. Unlike financial markets where the smart money will take advantage of irrational participants and eventually drive the prices towards fundamental values, it is often the irrational (or naive) bidders that determine the final prices of auctions. In this sense, the effects of irrational participants are more serious in auction markets than in stock markets. Thus, examining the effect of irrational behavior in auction markets would be even more important than that of the stock market.

Auctions with longer lasting periods can generate more revenue than shorter ones. There are also some seasonality effects, buyers' experience with eBay, and the auction length. Final prices are lower on auctions ending on Sundays, and higher on those ending on Thursdays or Saturdays. They are also negatively related with Buyers' *Feedback Score*, although the magnitude is very small. However, low R-squares in the regression results indicate that there can be other unobservable factors that determine the winning prices. Developing a more sophisticated statistical model than the linear regression would be better.

Expanding the data set into different items and refining the statistical estimation methods would be desired for future research. After all, isn't it ironic that people bid irrationally high on a game that is supposed to teach them how to become financially smart?

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Table I. Bid Increments

The bid increment is the amount by which an outstanding bid will be raised if it is outdone unless the winning bidder's maximum bid beats the second-highest maximum by an amount less than the full increment. (Source: <http://pages.ebay.com/help/buy/bid-increments.html>, as of 10/02/2004.)

Current Price		Bid Increment
\$0.01-	\$0.99	\$0.05
\$1.00-	\$4.99	\$0.25
\$5.00-	\$24.99	\$0.50
\$25.00-	\$99.99	\$1.00
\$100.00-	\$249.99	\$2.50
\$250.00-	\$499.99	\$5.00
\$500.00-	\$999.99	\$10.00
\$1000.00-	\$2,499.99	\$25.00
\$2500.00-	\$4,999.99	\$50.00
\$5,000.00	and up	\$100.00

Table II. Retailers' Information

For each of the two professional sellers, who list “Cashflow 101” under the “Buy-it-now” format, the first panel shows the composition of the Feedback Score and the second panel shows the flow of feedback over the previous one year (as of 10/01/2004).

Seller X (ldholmes)

Feedback Score:	2849
Positive Feedback:	100%
Members who left positive feedback:	2849
Members who left negative feedback:	0
All positive feedback received:	2959

Recent Feedback:	Past Month	Past 6 Months	Past 12 Months
positive	52	365	818
neutral	0	1	1
negative	0	0	0

Seller Y (successsuccess.com)

Feedback Score :	3107
Positive Feedback:	99.90%
Members who left a positive:	3111
Members who left a negative :	4
All positive feedback received:	3333

Recent Feedback:	Past Month	Past 6 Months	Past 12 Months
positive	112	666	1316
neutral	0	2	2
negative	0	0	1

Table III. Summary Statistics

The sample period is 02/20/2004 to 09/06/2004. Starting Price is the minimum bid set by the seller. Final Price is the final payment of the winner excluding the shipping cost and amounting to the second-highest bid plus the bid increment. Shipping Cost is the flat-rate shipping cost set by the seller. Total Price is the sum of Final Price and Shipping Cost. Abnormal Final Price is equal to Final Price minus the simultaneous "buy-it-now" price set by a professional retailer. Abnormal Total Price is equal to Total Price minus the sum of the simultaneous "buy-it-now" price and the cheapest shipping cost for the "buy-it-now" item as set by a professional retailer. Number of Bids are per auction. Auctionlength is the number of days that the item was listed; endhour is the ending hour of the auction (e.g., "0" means "12am - 1am", "1" means "1am - 2am", etc.).

Sun, M, Tu, W, Th, F, Sat are dummy variables and equal to 1 if the auction ends on that day of the week. Primetime is a dummy variable and equal to 1 if the auction ends between 15:00 and 19:00, following the convention in Jin and Kato (2004). Delivery Insurance is a dummy variable and equal to 1 if any delivery insurance is available. Bonus Tapes/Video is a dummy and equal to one if the title imply that there are bonus tapes and video. Explicit195 is a dummy variable equal to 1 if the seller mentions the manufacturer's price of \$195 in the description.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Starting Price	169	46.15	43.88	0.01	150.00
Final Price	169	131.90	16.83	81.00	179.30
Shipping Cost	142	12.49	3.79	4.95	20.00
Total Price	142	144.20	15.00	110.99	185.50
Abnormal Final Price	169	0.12	16.69	-48.95	47.55
Abnormal Total Price	142	2.46	15.01	-28.91	45.60
Abnormal Final Price > 0 ?	169	0.414	0.494	0	1
Abnormal Total Price > 0 ?	142	0.514	0.502	0	1
Number of Bids	168	17.1	9.2	1	39
Feedback Score Buyer	169	35.6	102.1	0	990
Feedback Score Seller	169	251.6	1419.5	0	14,730
Positive Feedback Percentage Seller	168	62.1	48.3	0	100
Ln(Feedback Score Buyer + 1)	169	2.0	1.7	0	6.9
Ln(Feedback Score Seller + 1)	169	2.4	2.4	0	9.6
Auction Length [in days]	169	6.25	1.70	1	10
one day	169	0.01	0.11	0	1
three days	169	0.12	0.32	0	1
five days	169	0.17	0.38	0	1
seven days	169	0.65	0.48	0	1
ten days	169	0.05	0.21	0	1
Auction Ending Weekday					
Monday	169	0.124	0.331	0	1
Tuesday	169	0.077	0.267	0	1
Wednesday	169	0.154	0.362	0	1
Thursday	169	0.118	0.324	0	1
Friday	169	0.095	0.294	0	1
Saturday	169	0.183	0.388	0	1
Sunday	169	0.249	0.433	0	1
Auction Ending Hour	169	14.8	5.2	0	23
Prime Time	169	0.331	0.472	0	1
Delivery Insurance	169	0.373	0.485	0	1
Bonus Tapes/Video	169	0.284	0.452	0	1
Explicit195	169	0.320	0.468	0	1

Table IV. Determinants of the Abnormal Total Price

OLS regression with dependent variable is the "Abnormal Total Price", i.e. the difference between the winning price and the simultaneously available buy-it-now price. Variable definitions as in Table III.

	ATP	ATP
Explicit195	8.566** (2.63)	6.480* (2.96)
Shipping Cost	0.282 (0.36)	0.271 (0.37)
Auction Length	1.289 (0.68)	1.317 (0.69)
Starting Price	0.025 (0.028)	0.018 (0.03)
Ln(Feedback Score Buyer + 1)	-0.341 (0.73)	-0.721 (0.84)
Ln(Feedback Score Seller + 1)	0.220 (0.58)	0.098 (0.60)
(Feedback Score Buyer)*Explicit195		0.030 (0.03)
Prime Time		1.039 (2.69)
Delivery Insurance		2.455 (2.64)
Bonus Tapes/Video		2.344 (2.86)
Constant	-12.574 (7.22)	-12.846 (7.48)
<i>N</i>	142	142
<i>R</i> ²	.1	.12

Standard errors appear in parentheses.

Asterisks denote statistical significance at the 1%(**) or 5%(*) level.

Table V. Determinants of Abnormal Total Price (II), including varying ending-day dummies

All the control variables of the second column of Table IV (except the interaction between the feedback variable and Explicit195) are included, in addition to varying ending-day dummies. Only 'Explicit195', 'Auctionlength' and the varying ending-day dummy are reported. All other variables are neither statistically nor economically significant.

		R-square
Explicit195	7.340*** (2.75)	
Auction Length	1.278 (0.69)*	0.12
Monday	-2.100 (3.67)	
Explicit195	7.597*** (2.84)	
Auction Length	1.327 (0.69)*	0.12
Tuesday	-1.000 (4.73)	
Explicit195	7.608*** (2.82)	
Auction Length	1.289 (0.70)	0.12
Wednesday	0.955 (3.52)	
Explicit195	7.393*** (2.76)	
Auction Length	1.31932* (0.68)	0.13
Thursday	5.319 (4.01)	
Explicit195	7.499*** (2.80)	
Auction Length	1.3158* (0.69)	0.12
Friday	0.365 (4.56)	
Explicit195	7.349*** (2.76)	
Auction Length	1.402** (0.69)	0.12
Saturday	3.936 (3.34)	
Explicit195	7.957*** (2.77)	
Auction Length	1.272 (0.68)*	0.13
Sunday	-4.502 (2.78)	

Standard errors appear in parentheses.

Asterisks denote statistical significance at the 1%(***) level, or 5%(**) level, or 10%(*) level.

**Table VI. Determinants of Abnormal Total Price (III),
including all ending-day dummies**

In this regression, all the weekday variables except Tuesday are included in addition to the independent variables (excluding the interaction between the feedback variable and Explicit195) in Table IV.

Explicit195	7.803** (2.93)
Shipping Cost	0.215 (0.38)
Auction Length	1.290 (0.71)
Starting Price	0.018 (0.03)
Ln(Feedback Score Buyer + 1)	-0.353 (0.76)
Ln(Feedback Score Seller + 1)	0.134 (0.61)
Prime Time	1.255 (2.72)
Delivery Insurance	2.267 (2.69)
Bonus Tapes/Videa	3.691 (2.89)
M	-0.823 (5.74)
W	1.844 (5.66)
Th	5.816 (5.96)
F	1.483 (6.39)
Sat	4.257 (5.45)
Sun	-2.127 (5.09)
Constant	-14.327 (8.94)
<i>N</i>	142
<i>R</i> ²	.15

Standard errors appear in parentheses.

Asterisks denote statistical significance at the 1%(**) or 5%(*) level.

Table VII. Determinants of Overpayment

We estimate Logit models and Probit models where the dependent variable is equal to 1 if the total price is greater than the simultaneously available buy-it-now price plus shipping cost (totallogit) were used with 'totallogit' as its dependent variable.

	Logit	Logit	Probit	Probit
explicit195	0.651 (.40)	0.580 (.42)	0.406 (.25)	0.356 (.26)
shippinginfo	0.000 (.05)	-0.015 (.06)	0.002 (.03)	-0.007 (.03)
auctionlength	.253* (.10)	.259* (.11)	.158* (.06)	.160* (.07)
startprice	0.001 (.00)	0.001 (.00)	0.001 (.00)	0.001 (.00)
logfb	0.084 (.11)	-0.097 (.11)	-0.050 (.07)	-0.059 (.07)
logsfb	0.066 (.09)	-0.074 (.09)	-0.040 (.05)	-0.046 (.05)
primetime	0.192 (.39)	0.215 (.39)	0.111 (.24)	0.135 (.24)
insurance	0.254 (.38)	0.226 (.39)	0.155 (.23)	0.138 (.24)
titledum	0.483 (.41)	0.602 (.43)	0.307 (.25)	0.386 (.27)
M		-0.868 (.85)		-0.531 (.52)
W		-0.338 (.82)		-0.204 (.51)
Th		0.284 (.88)		0.178 (.54)
F		-0.324 (.92)		-0.191 (.57)
Sat		0.067 (.80)		0.047 (.49)
Sun		-0.468 (.75)		-0.288 (.46)
Constant	-1.668 (1.09)	-1.198 (1.34)	-1.076 (.67)	-0.768 (.82)
<i>N</i>	142	142	142	142
<i>Pseudo-R</i> ²	.06	.08	.06	.08

Standard errors appear in parentheses.

Asterisks denote statistical significance at the 1%(**) or 5%(*) level.

Figure 1. Distribution of Starting Prices

Figure 1 displays the distribution of the minimum starting price set by the sellers for the full sample of 169 auctions. Starting prices are grouped together in \$10-intervals, with "10" indicating a starting price up to \$10, "20" a starting price greater than \$10 and up to \$20 etc.

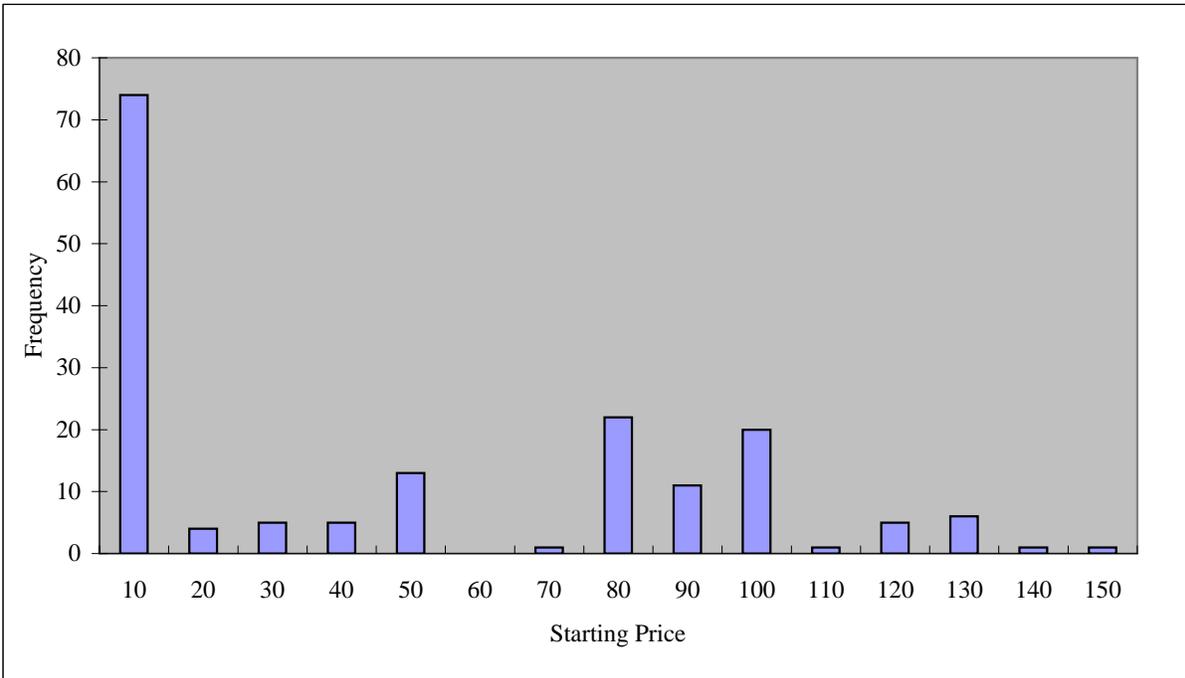


Figure 2. Distribution of Final Price

Figure 2 displays the distribution of the final winning price excluding the shipping cost for the full sample of 169 auctions. Final prices are grouped together in \$10-intervals, with "90" indicating a final price greater than \$80 and up to \$90, "100" a final price greater than \$90 and up to \$100 etc.

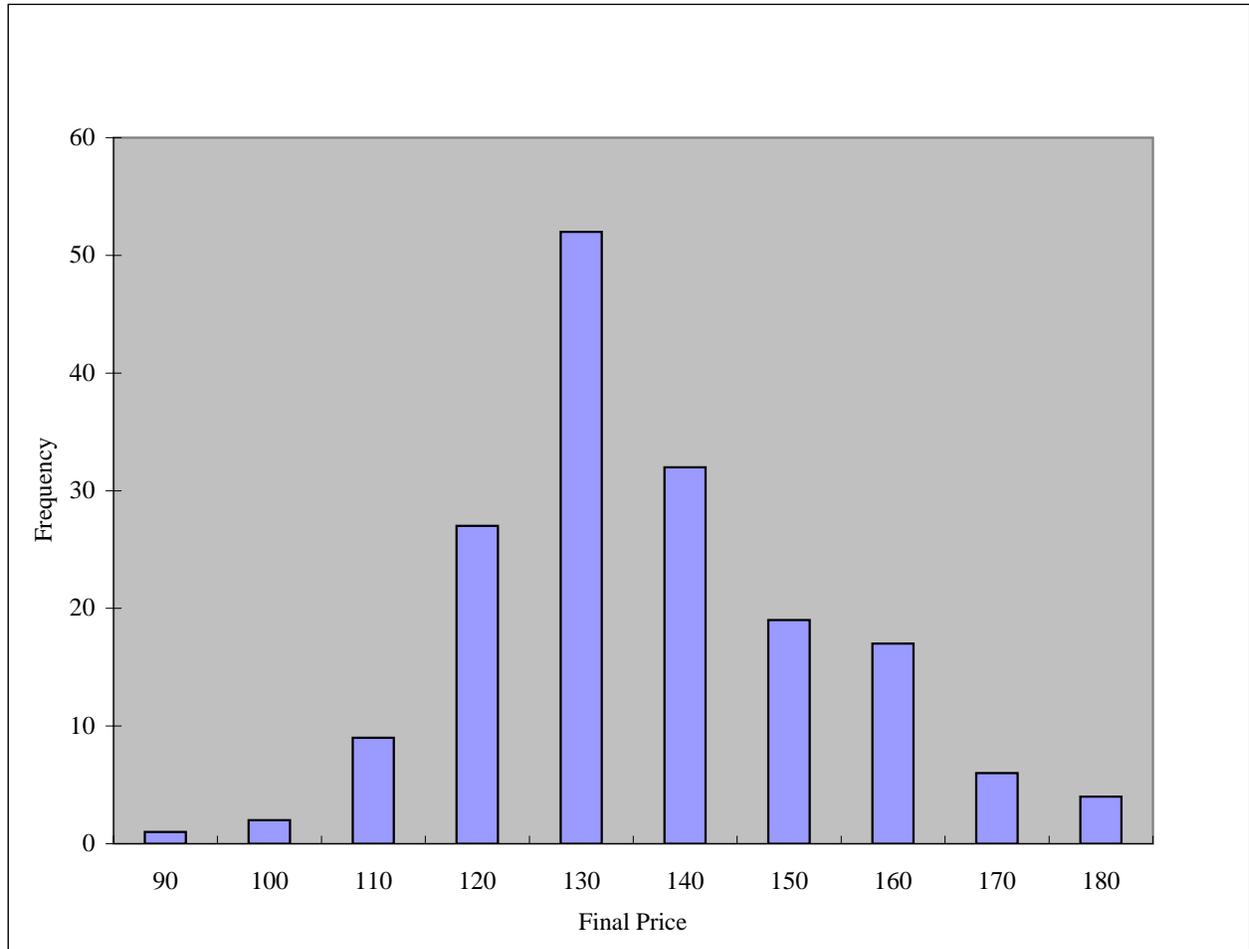


Figure 3. Distribution of the Shipping Cost

Figure 3 displays the distribution of the shipping cost suggested by the individual sellers. Sellers suggested shipping costs in 142 auctions. Shipping costs are grouped together in \$2-intervals, with "6" indicating shipping costs greater than \$4 and up to \$6, "8" indicating shipping costs greater than \$6 and up to \$8 etc.

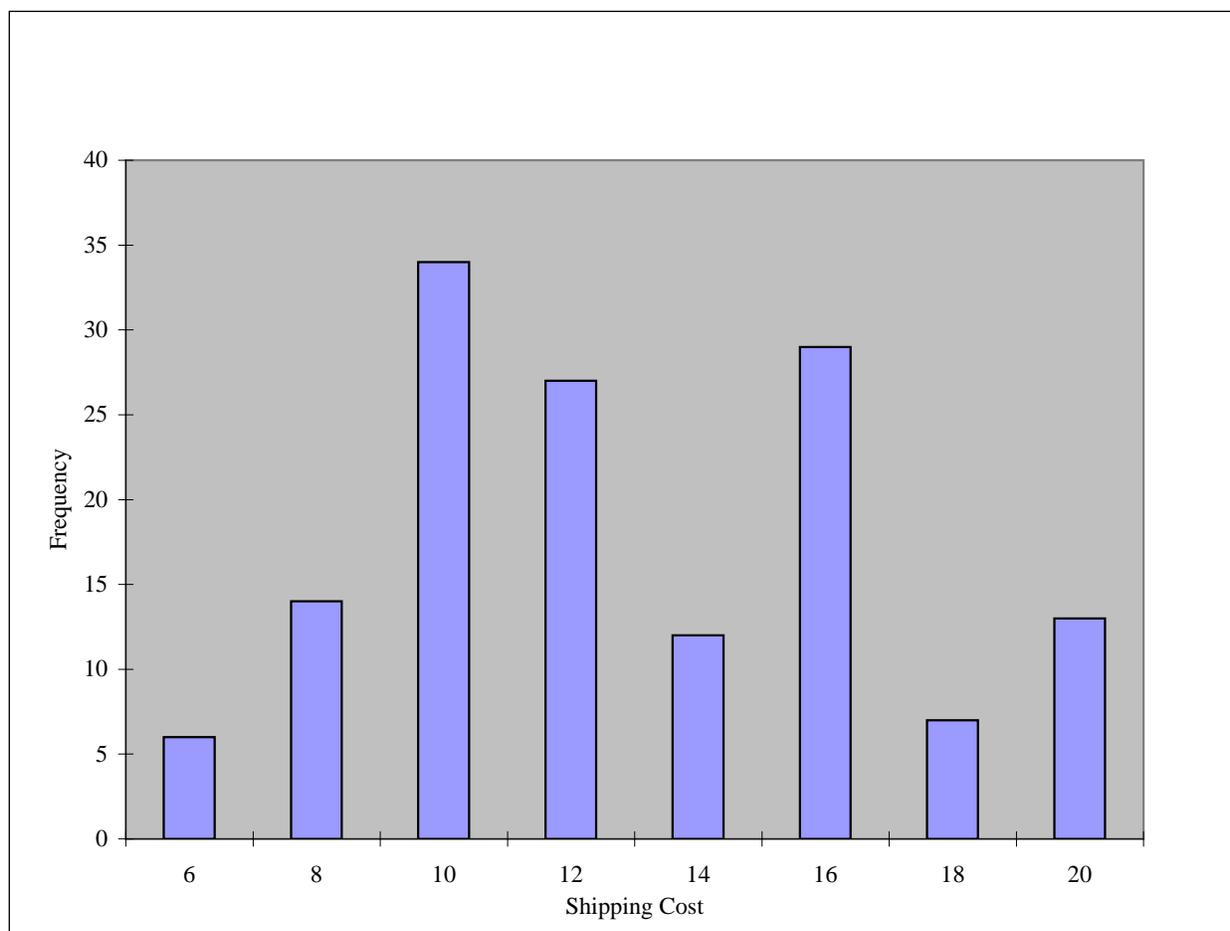


Figure 4. Distribution of the Total Price

Figure 4 displays the total price to be paid by the winner, that is, the final price plus the shipping cost, for the sample of auctions with shipping cost information (142). Total Prices are grouped together in \$10 intervals, with "120" indicating a total price greater than \$110 and up to \$120, "130" a total price greater than \$120 and up to \$130 etc.

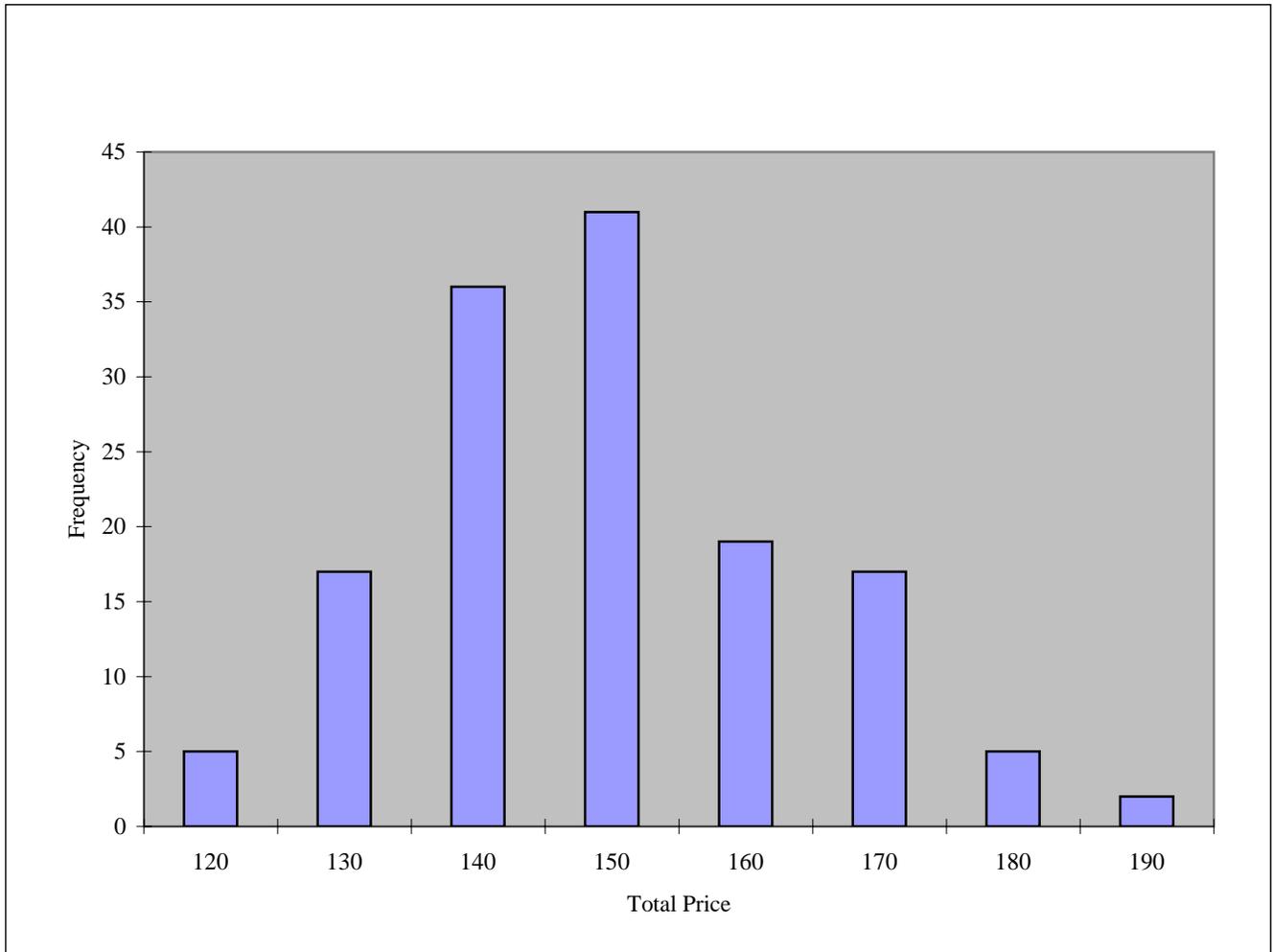


Figure 5. Distribution of the Abnormal Final Price

Figure 5 displays the value of the Abnormal Final Price, which is calculated as the final winning price minus the 'buy-it-now' price simultaneously available from one of the two professional sellers, for the full sample of 169 auctions. Abnormal Final Prices are grouped together in \$10-intervals, with "-\$40" indicating an abnormal final price greater than -\$50 and up to -\$40, "-\$30" indicating an abnormal final price greater than -\$40 and up to -\$30 etc.

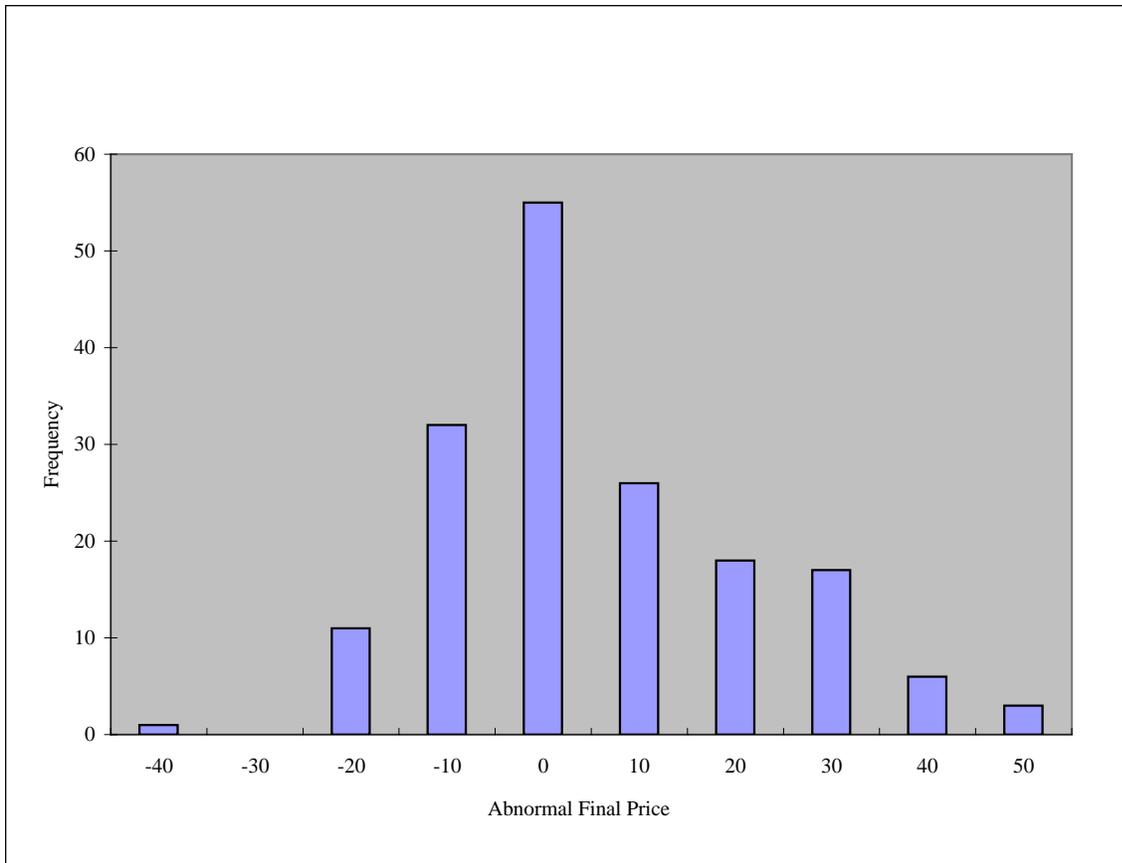


Figure 6. Distribution of the Abnormal Total Price

Figure 6 displays the Abnormal Total Price, which is calculated as "(final price + shipping cost) minus ('buy-it-now' price + 'buy-it-now' shipping cost)", for the sample with available shipping costs (142 auctions). Abnormal Total Prices are grouped together in \$10-intervals, with "-10" indicating an abnormal total price greater than -\$20 and up to -\$10, "0" indicating an abnormal total price greater than -\$10 and up to \$0 etc.

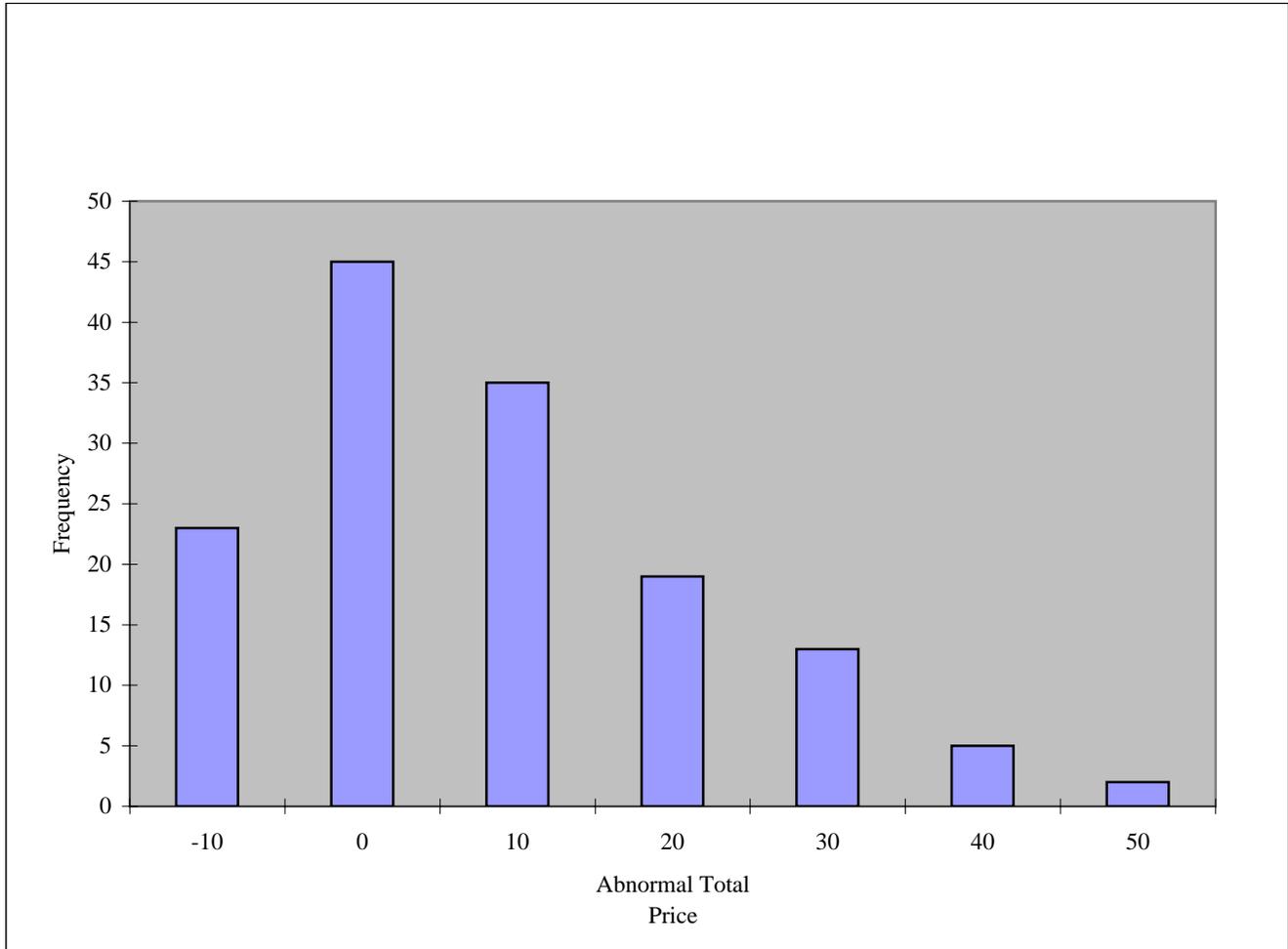


Figure 7. Distribution of the Auction Length

Figure 7 displays the distribution of the auction length in days. The standard periods are 1, 3, 5, or 7 days. 10-day listing requires an additional \$0.20 fee (at the time of data collection period).

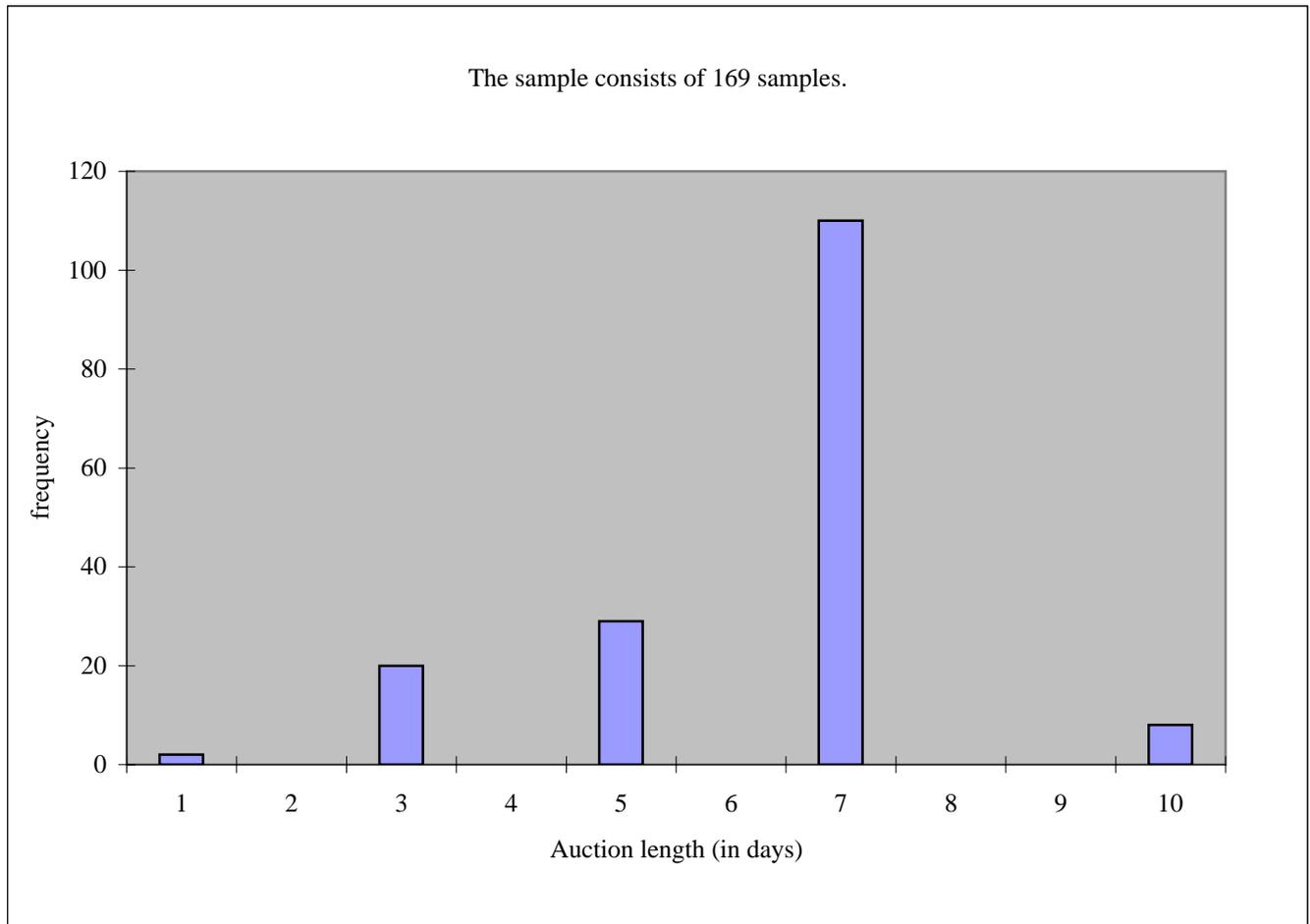


Figure 8. Distribution of Auction Ending Days

Figure 8 displays the frequency of the weekdays at which the individual auctions end for the full sample of 169 auctions.

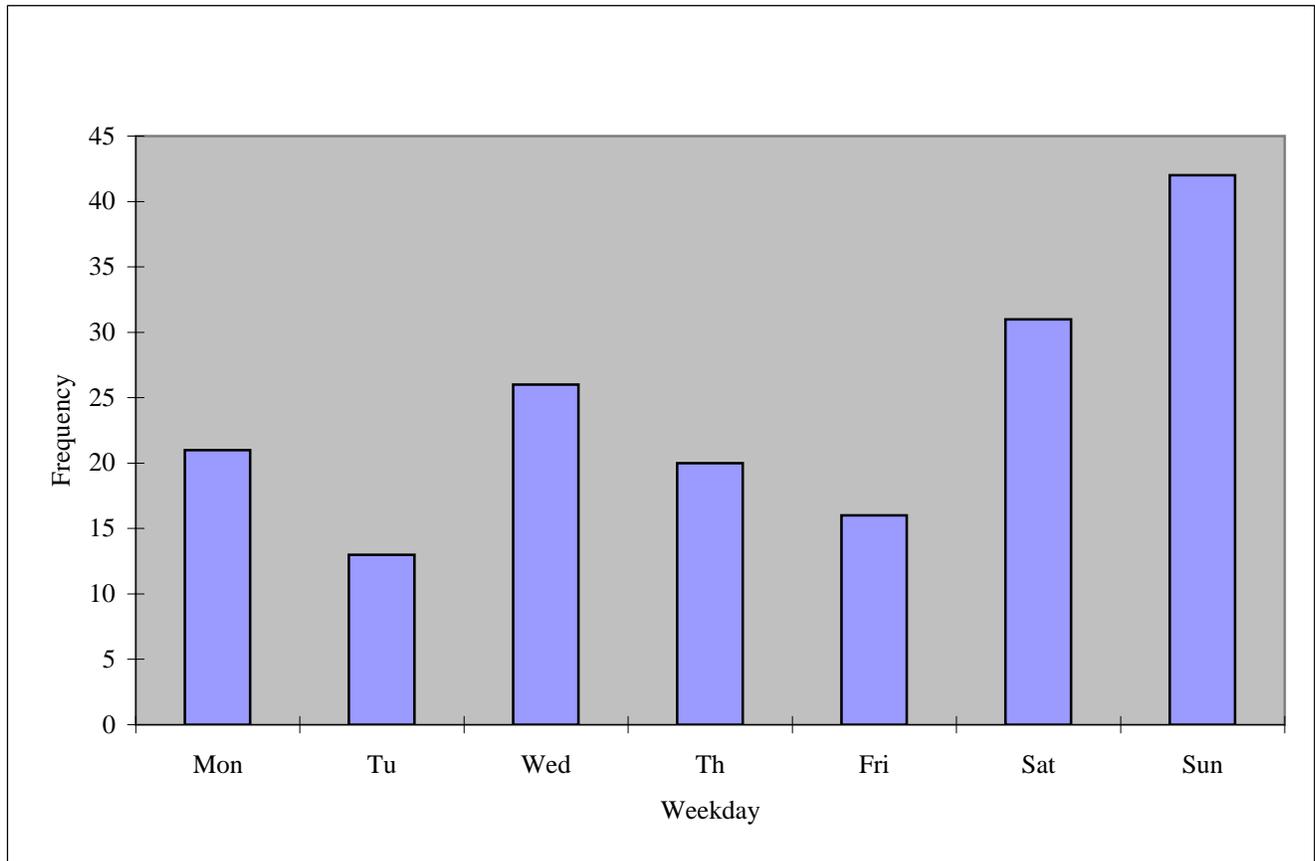


Figure 9. Distribution of Auction Ending Times

Figure 9 displays the distribution of the times of the day (Pacific Standard Time) at which an auction ends for the full sample of 169 auctions. With "0" we denote an auction ending time between 12 am and 1 am, with "1" between 1 am and 2 am, and so forth.

