Effect of price quoting on financial assets price: An experimental analysis

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Abstract

Stock options are usually sold in bundles of 100 units, and their price can be quoted either per unit or per bundle. In this paper, the effect of different methods of quoting financial asset prices on the subjective value of a contract was examined experimentally. In particular, we examined differences in subjects' Willingness-To-Pay (WTP) and Willingness-To-Accept (WTA) for financial assets depending upon whether prices are quoted per unit or per bundle. We found that subjects bid (ask) a higher price when prices are quoted per unit than when they are quoted per bundle. The results indicated that different quoting methods affect the bidding price for risky assets. These results can have important implications for trading on financial markets.

Keywords: Behavioral Finance, Experiment, Myopic Loss Aversion, WTP, WTA.

1. Introduction

In the US, stock and index options contracts, which are usually sold in bundles (mostly 100 units), quote prices per unit, while in Israel prices are quoted per bundle. To illustrate, on February 14, 2006 the quoted price for a call option on the S&P 500 with a strike price of 1270 points, to be realized in March 2006, was $21. Since this price is for one unit, the price of a contract with 100 units is $2,100 (from the CBOE - Chicago Board Options Exchange). Alternatively, if the same asset were to be traded on the Israeli stock exchange, the theoretical price quoted for the bundle would be $2,100.

The purpose of this paper is to experimentally examine the effect of different methods of quoting financial asset prices on the subjective value of a contract. In particular, we examined subjects' Willingness-To-Pay (WTP) and Willingness-To-Accept (WTA) for one unit of financial assets when buying (or selling) a number of separate units, versus their WTP (or WTA) for one unit when buying (or selling) a bundle of assets. The different quoting methods represent an example of the framing effect, different variations of which have been tested in many behavioral and experimental economics studies (Tversky and Kahneman, 1981, Kuhberger, 1998). In research studies on the framing effect, logically equivalent choice situations are described differently and the resulting preferences are studied. An extension of the framing principle, known as mental accounting (Thaler, 1990, 1999), refers to the implicit methods people employ to code and evaluate financial outcomes. Another relevant behavioral effect is the "myopic loss aversion" (Thaler et al., 1997), which assumes that people are myopic in evaluating outcomes over time, and are more sensitive to losses than to gains.

The paper is organized as follows: Section 2 presents the main hypothesis, and Section 3 describes the experimental procedure. Section 4 presents the results, and finally Section 5 concludes.

2. The Main Hypothesis

Our null hypothesis is that subjects' bidding (asking) prices are influenced by different quoting methods. In particular, we expect that the price per unit will be higher when the price is quoted per unit than when it is quoted per bundle. This hypothesis, which is in line with the framing effect, is based on the notion of "myopic loss aversion" (Thaler et al., 1997).

3. The Experiment

The experiment was comprised of two groups of participants: (a) 67 undergraduate students of economics at the Academic College of Emek Yezreel, and (b) 24 professionals working as financial advisors at a large financial bank in Israel. In a Second-Price

Auction (SPA), subjects were asked to place a bid for buying (WTP) and selling (WTA) different lotteries. The SPA is a common method for eliciting subject preference and risk attitude (Di Mauro and Maffioletti, 2004). In the instructions, subjects were told that in the case of a buying (selling) auction, the subject with the *highest (lowest)* bidding (asking) price will win the auction, but will pay (receive) the *second highest (lowest)* bidding (asking) price in the group participating in the auction.

In each auction, the subjects received an initial balance. In the case of selling problems, they owned a lower initial balance and the lottery. The reason subjects who owned the lottery were given a lower initial balance was to prevent an income effect. At the end of the experiment, subjects were randomly divided into groups of five by a computer program, and SPA was applied to determine the winner and the price. One of the problems was selected randomly for each subject, and each was paid 20% of the final outcome for the selected problem. The average payment was 20 New Israeli Shekels (approximately equivalent to $4.50 US).

Subjects were asked to indicate their WTP and WTA for the basic lottery, which we named Lottery A. This lottery gives ten and two tokens with probabilities of 0.3 and 0.7, respectively. In addition, subjects were also asked to bid for one unit of Lottery A in the case that they were asked to buy (sell) 5, 10 or 50 units of this lottery. While the lottery occurs only once, a subject who wins the auction will pay (or get) the price of one unit multiplied by the number of units.

Subjects were also asked to bid prices for bundles of 5, 10 and 50 units of Lottery A. The assets are described in Table 1.

Table 1: Assets description

Probabilities \ Assets	Probabilities & Values		
	30%	**70%**	**Units**
Lottery A	10	2	1
Lottery A * 5	10	2	**Bidding for 5**
Lottery A * 10	10	2	**Bidding for 10**
Lottery A * 50	10	2	**Bidding for 50**
Lottery 5*A	50	10	**1 bundle of 5 units**
Lottery 10*A	100	20	**1 bundle of 10 units**
Lottery 50*A	500	100	**1 bundle of 50 units**

4. Results

To test the main hypothesis, we calculated the average ratio of a bid for one unit when buying a number of units at the same time to the implied bid for a unit when the price is quoted as a bundle (with the same number of units)

Table 2 and 3 describe the average prices for one unit of Lottery A for the students and the professionals, respectively, for each of the two cases: (a) bidding for a number of units (price quoted per unit) and (b) bidding for a bundle (price quoted per bundle). The tables also show the T-test values for the hypothesis that the average ratio does not differ from 1.

Table 2: Prices and Rates - Students

No. of Units	Average price per unit		Average Ratio	T-test*
	a	**b**		
WTP				
5	4.82	5	1.15	1.6
10	5.56	5.19	1.2	2.4
50	4.33	3.74	1.24	2.73
WTA				
5	4.88	4.61	1.24	2.32
10	4.76	4.78	1.12	1.42
50	4.29	3.82	1.31	2.84

a- Bidding for number of units (price quoted per unit)
b- Bidding for a bundle (price quoted per bundle)
* T-test for the null hypothesis that the ratio equals 1.

Table 3: Prices and Rates- Professionals

No. of Units	Average price per unit		Average Ratio	T-test
	a	**b**		
WTP				
5	5.60	4.37	1.4	2.23
10	4.96	3.69	1.7	2.00
50	3.68	3.34	1.29	1.93
WTA				
5	3.97	4.10	1.05	0.65
10	4.19	3.81	1.17	1.87
50	4.39	3.60	1.53	1.83

Table 2 and 3 show that for both groups of subjects, the bidding price per unit (WTP and WTA) is higher when the price is quoted per unit than when it is quoted per bundle (In most of the cases, the average ratio between them is significantly higher than 1). Therefore, we accept the null hypothesis, and conclude that the quoting method can affect the subjective value of an asset.

One possible explanation for our results is based on the assumption that subjects focus on the mean and variance of an asset when buying (selling) a risky asset. It is possible that in the case of one unit out of n units, risk aversion is applied to each unit, as opposed to applying risk aversion to the entire portfolio in the case of a bundle. This means that in the case of one unit out of n units, subjects take into consideration the risk applicable to one unit and not the risk of the entire bundle. In the case of a bundle, subjects take into consideration the risk associated with the entire bundle.

These results are in line with the behavioral hypothesis of "myopic loss aversion" (Thaler et al., 1997), which assumes that people are myopic in evaluating outcomes over time, and are more sensitive to losses than to gains. The myopic loss aversion explanation indicates that subjects face lower risk when quoting a price for one unit out of n units, and so are willing to pay or accept a higher price.

An alternative explanation is based on the isolation effect (Kahneman and Tversky, 1979). According to this effect, in order to simplify the choice between alternatives, people often disregard the components shared by the alternatives and focus on the components that distinguish them. Again we assume that subjects focus on the asset's mean and variance when buying (selling) a risky asset. It is possible that in order to simplify the pricing task, subjects disregard the variance of the portfolio while taking into consideration only the unit variance, and focus on the portfolio mean that distinguishes them. These effects lead subjects to see the same mean for the bundle and for all the units together when bidding (asking) a price for one unit out of n units, but see a higher variance for the bundle than for all units when bidding (asking) a price for one unit out of n units.

5. Conclusions

Subjects bid (ask) a higher price when prices are quoted per unit than when they are quoted per bundle. These results indicating that different quoting methods affect the bidding price of risky assets can have important implications for trading on financial markets as well as for market microstructure.

The study's findings indicate that assets are more attractive for subjects and that the market price may be higher when the quotation method is per unit. Therefore, on real life markets it is possible that using the quoting per unit method will lead to a higher demand than on those markets using the quoting per bundle method.

Finally, these results are not limited to financial markets and can be applied to other markets where subjects buy and sell a number of units of the same product.

6. References

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