

# Entrepreneurial Proclivity And The Interpretation Of Subjective Probability Phrases

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## Abstract

*Verbal expressions of probability are frequently used to describe business and venture opportunities. This research investigates whether entrepreneurs and non-entrepreneurs interpret such expressions differently. We also investigate whether the interpretation of verbal probability expressions is related to the entrepreneurial proclivity of subjects, regardless of whether they are entrepreneurs. The Entrepreneurial Attitude Orientation (EAO) scale was used to measure entrepreneurial proclivity. Fifty-two subjects (17 entrepreneurs and 35 non-entrepreneurs) quantified thirty-five common verbal expressions of probability. The elicited quantifications of the probability phrases were highly variable between individuals, which is consistent with results reported elsewhere. We found no significant difference between the entrepreneur and non-entrepreneur groups' interpretations of the phrases. No meaningful correlations were found between EAO score and probability phrase interpretations. Our results seem to indicate that the interpretation of subjective probability phrases is not related to entrepreneurial proclivity and that the probability phrases involved in the presentation of opportunity are unlikely to affect the way that an entrepreneur perceives that opportunity as opposed to a non-entrepreneur.*

## 1. Introduction

Consider a weather forecast. The likelihood of rain might be presented via an explicit expression of probability, e.g. a report of a "50% chance of rain tomorrow," or some verbal expression of probability, e.g. rain tomorrow is "possible." Do people perceive any significant difference between these two expressions? People encounter and address uncertainty daily in many areas besides the weather — in business, politics and medicine. Many business and venture oppor-

tunities present themselves with no numerical statement of the risk and uncertainties involved; instead, one hears, sees or reads about a "good chance" to make money. There might be a variety of underlying factors that make an entrepreneur more likely to pursue a venture than a non-entrepreneur. In particular, we conjecture that an entrepreneur might perceive verbal expressions of probability more optimistically than a non-entrepreneur. This paper explores two main re-

search questions: (1) Are verbal probability descriptions like the phrase “good chance” perceived differently by those who are entrepreneurs than by those who are not? and (2) Does there appear to be a systematic relationship between how entrepreneurial a person is, regardless of whether he/she actually is an entrepreneur, and how verbal probabilities are interpreted?

We start in the following section by providing a brief review of previous work in subjective probability and verbal expressions. Section 3 describes the methodologies used in our study. In section 4 we present the results of a study that compares the quantifications of verbal probability phrases by entrepreneurs to those of non-entrepreneurs and investigate the relationship of elements of entrepreneurial attitudes to the interpretation of the phrases. Section 5 summarizes our conclusions and their implications and section 6 suggests some directions for future research in this area.

## 2. Subjective Probability Phrases

### *Background*

There is a large body of literature on verbal probability expressions and subjective probability phrases that can be traced back to Simpson's work in 1944. Most of this research has been presented in the speech (Simpson, 1944, 1963; Wallsten et al., 1986), psychology (Cohen et al., 1958; Lichtenstein and Newman, 1967; Bass et al., 1974; Jaffe-Katz and Budescu, 1989; Reagan et al., 1989; Weber and Hilton, 1990; Fillenbaum et al., 1991; Clarke et al., 1992), and organizational psychology literature (Budescu and Wallsten, 1985; Brun and Teigen, 1988; Smith et al., 1991; Wright and Bower, 1992). Exceptions to this include work presented in the medical literature (Mapes, 1979; Bryant and Norman, 1980; Toogood, 1980; Kenney, 1981; Nakao and Axelrod, 1983; and Kong et al., 1986) and the work presented in the forecasting literature by Beyth-Marom (1982). To date, no previous research has investigated the role of entrepreneurial tendencies in the interpretation of subjective probability phrases.

### *Methods*

A variety of methodologies have been used to quantify the numerical values associated with subjective phrases. Bass et al. (1974) elicited numerical equivalents for expressions of frequency and amount. For probability expressions, researchers have generally used one of five types of assessment tasks — the rank-ordering of phrases (e.g., Budescu and Wallsten, 1985), matching a given numerical probability with a verbal phrase (Reagan et al., 1989), comparing expressions via paired comparisons (Budescu and Wallsten, 1985), assignment of probabilities using some numerical scale (Simpson 1944 and Beyth-Marom 1982, among others, use a 0-100 scale; the 1985 work by Budescu and Wallsten is an example of the use of a 0-1 scale), and estimating the range of numerical values (e.g., Brun and Teigen, 1988; Reagan et al. 1989). These different methods have been found to be highly consistent in the results obtained (Budescu and Wallsten, 1985; Reagan et al., 1989). Probability phrases have been presented both as isolated expressions (e.g., Clarke et al., 1992; Bryant and Norman, 1980; Lichtenstein and Newman, 1967; Simpson, 1944,1963) or in the context of scenarios (e.g., Weber and Hilton, 1990; Brun and Teigen, 1988, Wallsten et al., 1986; Kong et al., 1986; Beyth-Marom 1982).

### *Central Tendency*

There is consistency in the general quantitative meaning associated with individual probability expressions amongst researchers and over time. Reagan et al. (1989) compared the results of nine different studies conducted over 20 years and found “considerable agreement.” Clarke et al. (1992) report a similar result when they compare their elicited probabilities to those of Lichtenstein and Newman (1967). This consistency has been shown for the means (e.g., Clarke et al., 1992; Kong et al., 1986) or the rank orderings (e.g., Hakel, 1968; Budescu and Wallsten, 1985). Simpson (1963) reported that the midpoints of values for 20 verbal probability expressions were within 2% of those he elicited 20 years prior (Simpson, 1944). Budescu and Wallsten (1985) report that individuals were found to have rela-

tively stable rank orderings of phrases over time but that different individuals have different rank orderings.

### *Variability*

The vast majority of researchers in this area have reported large amounts of variability in the numerical values assigned by individuals to probability phrases. Variability is greater between subjects than within an individual's behavior (Lichtenstein and Newman, 1967; Bryant and Norman, 1980; Budescu and Wallsten, 1985). Work by Clark et al. (1992) and Nakao and Axelrod (1983) has shown that the amount of formal education (especially mathematical education) might tend to lessen the amount of variability within a subject's responses. Studies that have analyzed probability phrases presented in-context (Beyth-Marom, 1982; Brun and Teigen, 1988; and Weber and Hilton, 1990) have tended to show that context affects people's interpretation of probability phrases. This finding has been postulated as perhaps due to opinion differences about the events in question both with respect to the perceived outcome severity and to its perceived base rate of occurrence. Researchers also agree that there are large overlaps in the numerical values assigned to terms.

### *Classification of Phrases*

The presence of overlapping numerical values assigned to probability phrases has led a number of researchers to seek to provide an organized classification of the terms. A variety of schemes have been suggested. Beyth-Marom (1982) suggested a 7 point scale for the categori-

zation of the expressions; Brun and Teigen (1988) use such a scale in their work.

Other studies have used fuzzy set theory to describe the range of values that a probability phrase is meant to express and the degree to which a value within that range is expressed by the phrase (Weber and Hilton, 1990). This is accomplished by scaling the quantifications of probability phrases into membership functions. Membership functions figure prominently in the work of Zadeh (1975), Wallsten et al. (1986), Reagan et al. (1989), Jaffe-Katz et al. (1989), and Fillenbaum et al. (1991).

## 3. Methodology

### *Probability Expressions*

We selected thirty-five verbal expressions of probability for the study. Thirty of these expressions have appeared in the forecasting literature (Beyth-Marom, 1982). Five additional expressions of interest that relate to business opportunities were added. These expressions appear below in Table 1.

### *A Measure of Entrepreneurial Proclivity*

This research involves the use of the Entrepreneurial Attitude Orientation (EAO) scale developed by Robinson, Stimpson et al. (1991). The EAO scale is a measure designed to predict entrepreneurship based on *attitude theory*. Attitude has been defined as the "predisposition to respond in a generally favorable or unfavorable manner with respect to the object of the attitude." Every attitude has an object, i.e. a specific person, place, thing,

Table 1  
Verbal Expressions of Probability Analyzed in the Study

small chance one can expect poor chance high chance negligible chance insignificant chance perhaps	possible reasonable chance there is a chance most likely one should assume doubtful not inevitable	nearly certain reasonable to assume highly significant chance non-negligible chance may one must consider not likely	can't rule out entirely significant chance meaningful chance certain it seems close to certain very high chance	likely very low chance low chance it could be chances are not great it seems to me bad luck
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event, activity, mental concept, cognitive orientation, life style, or combinations thereof. Attitudes also exist at the general and specific levels for many objects (Robinson, Stimpson et al. 1991, Shaver 1987, Ajzen 1982, Rosenberg and Hovland 1960).

The EAO is based on a *tripartite* model of attitude, which holds that attitude consists of a combination of three types of reaction to everything: affect, cognition, and conation. *Affect* reactions represent the positive or negative feelings a person might have about an object. *Cognition* conveys the beliefs and thoughts an individual has about an attitude object. *Conative* reactions are behavioral intentions and predispositions to behave in a given way toward an object.

Four subscales make up the EAO, each of which contains affect, cognition, and conative components. The *achievement in business* subscale measures concrete results that are associated with the startup and growth of a business venture. The *innovation in business* subscale relates to one's ability to perceive and act upon business activities in new and unique ways. Another subscale measures an individual's *perceived personal control of business outcomes*. The fourth subscale, *perceived self-esteem in business*, pertains to self-confidence and the perceived competency of an individual in conjunction with his or her business affairs.

The EAO questionnaire offers seventy-five statements, each of which is associated with a particular component and subscale. A subject indicates agreement with a statement by circling a number between 1 and 10 inclusive that indicates the strength of agreement. A score of "10" for a question indicates strong agreement, and a score of "1" indicates strong disagreement. Some questions are framed negatively and are reverse scored. Higher scores on the EAO indicate stronger entrepreneurial proclivity. The EAO has been validated by Robinson, Stimpson et al. (1991).

#### Methods

The subjects consisted of sixty-two vol-

unteer Masters of Business Administration (MBA) and continuing education students at Loyola University Chicago. The participants were each assigned anonymous code numbers. The subjective probability phrases were presented out-of-context, one at a time, both written and verbally by a moderator. Subjects wrote their quantifications down on a standardized form which did not include the phrases. Approximately ten seconds were allowed per phrase, after which the phrase was erased from view. Subjects took home the EAO questionnaire from which their entrepreneurial score was obtained.

#### 4. Results

From the sixty-two subjects, we obtained fifty-two complete sets of data that included both the EAO and probability data. Two subjects completed EAO questionnaires without providing valid probability scores, and only fifty-three EAO questionnaires were returned. Of the fifty-two subjects, seventeen identified themselves as entrepreneurs.

#### Validation of the EAO

Comparison of the mean EAO scores for the entrepreneurial group and non-entrepreneurial group ( $H_a: \mu_E - \mu_N \neq 0$ ) using a t-test assuming unequal variances shows a somewhat weak statistical difference ( $t = -1.86, p=0.07$ ). Both the entrepreneur and non-entrepreneur groups in our study scored higher on the EAO scale over each of the four subscales than the groups in the Robinson, Stimpson et al. study (1991). Statistically significant differences were found between our groups and those of Robinson, Stimpson et al. for the innovation, personal control, and self-esteem EAO subscales. The non-entrepreneur group in our study scored significantly higher ( $p < 0.001$ ) than Robinson, Stimpson et al.'s non-entrepreneur group in these three EAO subscales. We feel this result might be due, in part, to the homogeneity of the study group with respect to career goals and the fact that they were in a business program. The achievement scores for both our groups were consistent with those of the Robinson et al. study. The statistical results of the two-tailed t-tests are present in Table 2.

**Table 2**  
**Comparison of EAO Scores to Those in the Robinson, Stimpson et al. (1991) Study**

	EAO Subscale	Robinson et al. (1991)	Current Study	t	Critical t	p value
Entrepreneurs	achievement	7.278	7.317	0.234	2.120	0.818
n=17	innovation	7.060	7.541	2.291	2.120	0.036
	personal control	6.583	7.858	2.486	2.120	0.024
	self-esteem	6.639	7.580	4.549	2.120	0.000
Non-entrepreneurs	achievement	6.457	6.728	1.764	2.032	0.087
n=35	innovation	6.274	7.227	4.899	2.032	0.000
	personal control	5.244	7.145	9.878	2.032	0.000
	self-esteem	5.293	7.196	9.241	2.032	0.000

#### *Variation in Subjective Probability Phrases*

As with previous studies, the variability among subjects over all of these scores was quite profound. For many of the phrases there were instances of highly extreme responses that were not considered representative. Because of this variability, we do not report the full range, but instead report the interquartile range and the 80 percent range. The interquartile range represents the difference between the third and the first quartile values. It discards 50% of the sample. Beyth-Marom (1982) points out that the interquartile range "highlights the most common interpretation" of the phrases. The 80 percent range, the difference between the 90th and the 10th percentiles, discards the lower and upper 10% of the sample. It provides a measure of the magnitude of the dispersion in interpretations without being affected by outliers. These ranges and the median probabilities assigned to the study phrases appear in Figure 1.

Notice in Figure 1 that the phrase medians appear to cluster in six distinct groups. This is consistent with the empirical results found by Beyth-Marom in her 1982 study from which she proposed a 7 category scale for classifying subjective probability phrases. The amount of variability illustrated in Figure 1 is very pronounced for all but the most extreme phrases (e.g., "certain"). For

some of the phrases in the middle of the rank ordering (e.g., "non-negligible chance," "it could be," and "can't rule out entirely"), the amount of variability is such that these phrases might not be easily categorized.

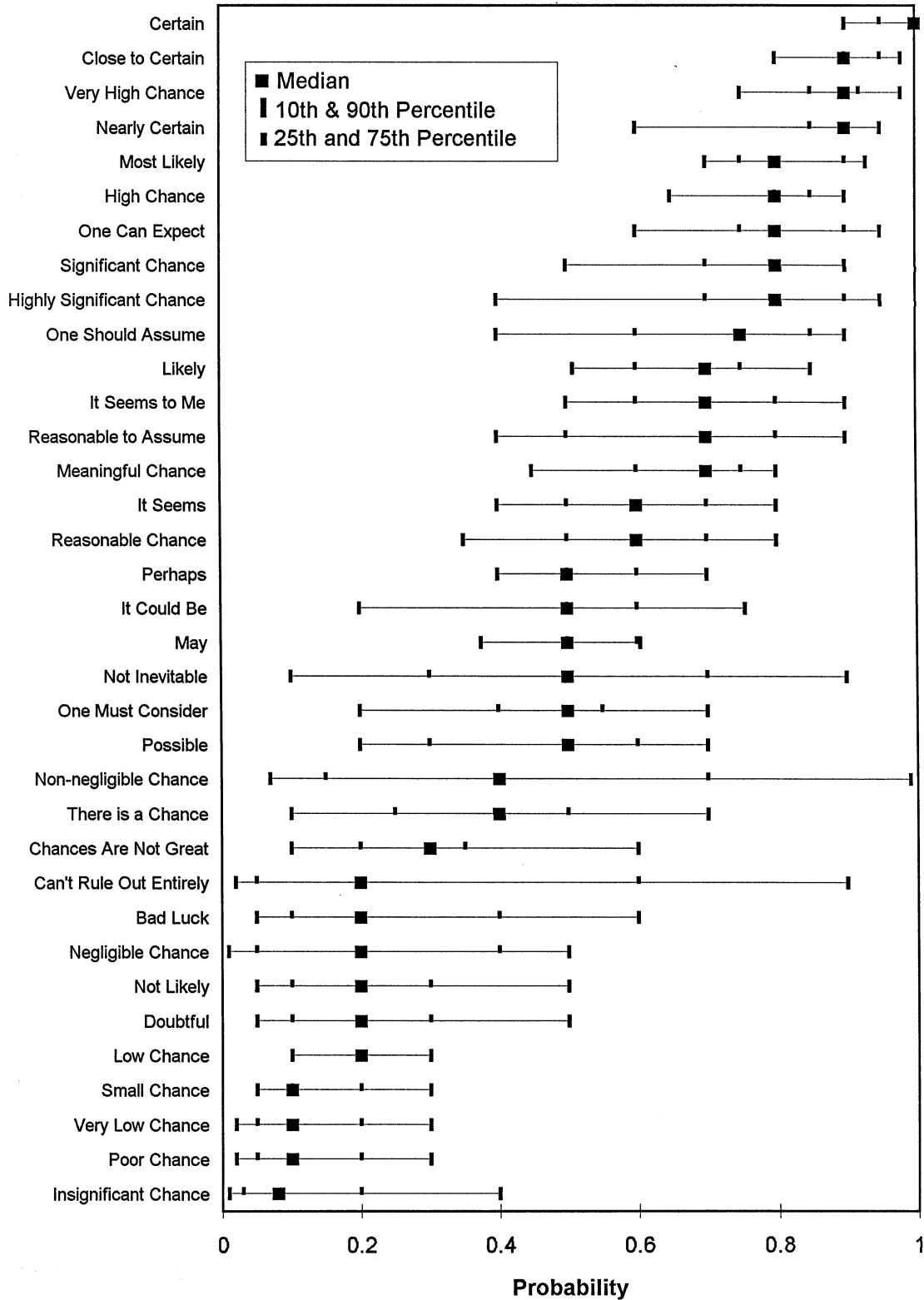
#### *Differences between Entrepreneur and Non-Entrepreneur Responses*

We present here results involving ten selected phrases. Four represent low probability occurrences: "Small Chance," "Can't Rule Out Entirely," "Doubtful" and "Bad Luck." Four represent higher likelihoods: "Possible," "Likely," "One Can Expect," and "Very High Chance." The other two phrases are not as immediately categorizable, i.e. implying more of a 50-50 proposition. These are "Reasonable Chance" and "May." For none of these expressions was there a significant difference between the responses of the entrepreneurs and non-entrepreneurs. The statistical results appear in Table 3.

#### *Investigation of Subjective Probability Phrases versus EAO*

We found no significant correlations between any of the phrases used in this study and the EAO score. Further investigation into components and subscales also indicate no correlation. Table 4

**Figure 1**  
**Median, Interquartile Range and 80 Percent Range Results**  
**for Verbal Probability Expressions**



**Table 3**  
**Comparison of Non-Entrepreneurs' to Entrepreneurs' Interpretation of Subjective Probability Phrases (t-test with unequal variances)**

<i>Phrase</i>	Non-Entrepreneurs		Entrepreneurs		Test Results	
	<i>Mean</i>	<i>Variance</i>	<i>Mean</i>	<i>Variance</i>	<i>t</i>	<i>p-value</i>
Small Chance	0.191	0.042	0.174	0.024	0.34	0.735
Possible	0.444	0.048	0.471	0.038	-0.46	0.652
Can't Rule Out Entirely	0.351	0.174	0.301	0.077	0.51	0.613
Likely	0.673	0.035	0.695	0.013	-0.51	0.615
One Can Expect	0.768	0.038	0.735	0.050	0.51	0.611
Reasonable Chance	0.620	0.02	0.538	0.031	1.64	0.111
May	0.497	0.01	0.502	0.017	-0.13	0.901
Very High Chance	0.876	0.012	0.808	0.048	1.19	0.246
Doubtful	0.234	0.037	0.197	0.040	0.62	0.541
Bad Luck	0.288	0.056	0.203	0.022	1.52	0.135

**Table 4**  
**Correlations of Selected Verbal Probability Expressions with EAO Scores**

Verbal Probability Expression

<i>Scale</i>	<i>Small Chance</i>	<i>Possible</i>	<i>Can't Rule Out Entirely</i>	<i>Likely</i>	<i>One Can Expect</i>	<i>Reasonable Chance</i>	<i>May</i>	<i>Doubtful</i>	<i>Very High Chance</i>	<i>Bad Luck</i>
achievement	-0.21	-0.10	-0.09	-0.19	-0.28	-0.20	0.05	-0.44	0.11	-0.30
innovation	-0.13	-0.05	0.03	-0.09	-0.17	0.07	0.01	-0.28	0.13	0.11
personal control	-0.13	0.01	-0.26	0.01	-0.45	-0.04	0.02	-0.29	0.15	-0.09
self-esteem	-0.40	-0.12	-0.16	0.04	0.03	-0.10	0.00	-0.43	0.22	0.02
Total EAO Score	-0.24	-0.07	-0.13	-0.08	-0.27	-0.07	0.03	-0.42	0.18	-0.07

shows the Pearson correlation coefficients for the relationships of the ten representative probability phrases and the EAO and its subscales. Scatter plot analyses indicate that no significant non-linear relationships seem present between any of the probability phrases and the EAO scores (both total and subscale).

## 5. Conclusions

In an important result, Brun and Teigen (1988) found that subjects were prone to underestimate the actual ranges of ambiguity found in verbal probability expressions. This finding is a particularly important issue in business. Our research provides insight to the business researcher into the amount of variability that is associated with commonly used verbal probability phrases.

We have found no correlation between the probability phrases and the EAO, nor have we found significant differences between the interpretations of these phrases between entrepreneurs and non-entrepreneurs. This result seems to indicate that the interpretation of subjective probability phrases is not related to entrepreneurial proclivity. Thus, it appears that the probability phrases involved in the presentation of opportunity are unlikely to affect the way that an entrepreneur perceives that opportunity as opposed to a non-entrepreneur.

## 6. Suggestions for Future Research

It has been pointed out by a number of researchers (e.g., Beyth-Marom, 1982; Brun and Teigen, 1988; Weber and Hilton, 1990) that more

variability has been found in the quantifications of expressions presented in-context than out-of-context. In this research we only investigated out-of-context probability phrases. When scenario-based presentations of probability phrases have been made, the existence of a link between both the perceived base rate probability of events, the severity of the events described, and the desirability of the outcome has been reported by both Weber and Hilton (1990) and Wallsten et al. (1986). Research that controls for these factors, while investigating whether differences between entrepreneurs' and non-entrepreneurs' interpretations of verbal probability phrases can be detected using scenario-based assessment techniques, has yet to be performed. If differences can be detected, then the development of entrepreneur and non-entrepreneur membership functions for the quantifications of verbal probability phrases is a logical next step.

Our sample groups both consisted of students, and previous work with the EAO scale by Robinson, Huefner and Hunt (1991) has found differences between student entrepreneurs and non-student entrepreneurs. Whether this makes any meaningful difference in the results shown in this paper might be explored using non-student populations in future studies. □

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