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COM-GAME: A COMMODITY TRADING GAME FOR USE IN AN INTRODUCTORY BUSINESS STATISTICS COURSE

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There are two major objections to the use of any business game:

1) the absence of any clear identification of the objectives of the game with the objectives of the course using the game [1, p. 399], and
2) the high cost of game playing in terms of instructional resources (contact hours and preparation hours) which might be put to alternative and perhaps more productive use.

This paper will demonstrate that adequate consideration has been given to both of these problems in the design of COM-GAME.

Educational Objectives

Rather than enumerating all of the objectives of an introductory course in business statistics that might be served by a commodity trading game, this paper will consider only a few such objectives and try to go into these objectives in sufficient depth to illustrate game-related class exercises to achieve these objectives. The topics considered include: 1) dispersion, 2) covariance/ correlation, and 3) the expected value decision criteria.

1. The application of dispersion or variance can be illustrated by comparing the margin requirements of various commodities to their trading range in the current contract year. The margin requirements are usually 1/8 to 1/5 of the value of the anticipated trading range. For example, current margin requirements for soybeans are $3,000. The value of the trading range is 5000 bushels x (7.80 - 4.80) = $15,000. Thus the margin is 1/5 of the trading range.
   A margin call is given when about 1/4 of the margin is used up; this corresponds to about 1/32 to 1/20 of the value of the annual trading range.
   Unusually volatile commodities, like soybeans or pork bellies, will provide a useful

illustration of data where the tail areas are larger than the normal tail areas, but smaller than Chebyshev areas. The life of contract trading range for these commodities will normally be more than 6 standard deviations.

2. Covariance/correlation is difficult for many students to master. Illustration of this concept via application in spreads/straddles might prove useful. For example, soybean contracts have an initial margin requirement of $3,000 while soybean spreads within the same contract year, have only a $250 margin requirement.

   If $3000 = k \sigma$ where σ is the standard deviation of the value of a single soybean contract

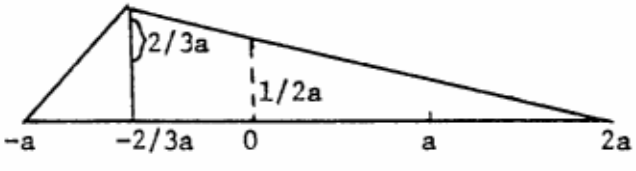
   then for a soybean spread

   $$250 = k \sqrt{2} \sigma (1 - \rho)^{1/2}$$

   Dividing one equation by the other and solving for p, gives an assumed p = .996. On the face of it, this value seems unrealistically high. A speculator with 12 soybean spreads is facing a much greater risk than the person with a single long or short position. This conclusion is confirmed by the advice given in broker advisory publications [3, pp. 12-13].

3. The expected value decision criteria can be illustrated in the methodologies of some successful commodity traders. The conventional wisdom in commodity trading is that the market is efficient and that the well prepared trader should expect to make money on a trade only 50% of the time; therefore, a trader should enter a position only if the profit potential is twice the loss potential.

   If a is the amount of the potential loss and 2a is the amount of the potential gain, then the simple triangular distribution below is an appropriate model of the speculators evaluation of the situation.



$$f(x) = \begin{cases} \frac{2}{a} + \frac{2}{a^2}x & -a \leq x \leq -\frac{2}{3}a \\ \frac{1}{2a} - \frac{1}{4a^2}x & -\frac{2}{3}a \leq x \leq 2a \end{cases}$$

The expected profit on the transaction is *1/9a.* Is this an adequate return? It depends on how much money was invested and for how long. If the speculator observes the conventional wisdom and never meets a margin call, then the maximum loss is that which would precipitate a margin call, the initial margin is usually about 4 times that amount or 4a. Thus the expected return is l/9a on an investment of
4a. If the speculator anticipates leaving the transaction open for a full calendar year, this represents a return of only

$$\frac{\frac{1}{9}a}{4a} = \frac{1}{36} \text{ or } 2.78\%$$

(hardly worth the risks commodity trading).
If the trade will be open for n months,
then the return is

$$\frac{\frac{1}{36}}{\frac{n}{12}} = \frac{1}{3n}$$

The return is computed for values of n from 12 to 1/4

n	Expected Return = $\frac{1}{3n}$ x 100%
1/4	133%
2/4	66.7%
3/4	44.4%
1	33.3%
2	16.7%
3	11.1%
4	8.33%
5	6.67%
6	5.56%
7	4.76%
8	4.17%
9	3.70%
10	3.33%
11	3.03%
12	2.78%

This evaluation suggests that many trades which appear attractive from an initial technical analysis may not offer any real profit potential. The example that comes to mind is as crush or reverse crush spread between soybeans, soybean oil, and soybean meal where the future involved is relatively distant. While such a trade might meet the criteria for the ratio of possible gain to possible loss, the movement of the crush margin to a more normal level is likely to take place only as that future becomes a rear term future. That is the anticipated n is certainly more than
6. Hence, such a trade does not offer a really attractive investment.

Another possible conclusion from this evaluation is that it is realistic for only the smallest commodity trader. A larger trader, who has several trades going at any given time, will normally have the profit from one trade to offset against another losing trade. Thus the larger trader can analyze trades losses using a larger figure for the acceptable loss level. As a result, his expected return will be larger.

Assume the large trader will accept a loss twice as large as that which the small trader considers acceptable.

a = maximum allowable loss
1/9 a = expected return

Because of the higher acceptable loss the initial margin is only two times the acceptable loss (2a). Assuming the average investment is equal to the initial investment gives a return of

$$\frac{\frac{1}{9}a}{\frac{2a}{\frac{n}{12}}} = \frac{2}{3n}$$

The expected returns for the trader who can handle larger losses are twice those available to the small trader. Note the larger trader must find a trade with a correspondingly larger potential return. This coincides with the conventional wisdom and the promotional literature of commodity brokers.

Other instructional objectives which the game might serve might be:

a) extensions of 3) involving other statistical distributions,
b) Markov chain/random walk analysis of the movement of commodity prices,
c) using ruin theory to select the size of the largest acceptable loss, and
d) the sampling methodologies used by the Department of Agriculture to make crop estimates.

Because of space limitations, no further instructional objectives will be discussed here. Instead the paper will move on to discuss the resource requirements of COM-GAME.

Instructional Resources Required For Game Use

COM-GAME has been designed to minimize the instructional resources required for use of the game in a class. The facets of the game which effect the resource requirements are:

1. The role of the administrator in COM-GAME is rather modest. A student manual has been written to assist the administrator in briefing students prior to playing the game. The student manual describes the terminology and mechanics of commodity trading and it provides sufficient background to allow students to follow the commodity column in the WSJ and the various broker advisory letters.

   During the play of the game, the administrator is not responsible for scoring the game. Scoring is the responsibility of the individual student; it involves the daily evaluation of the student's trading account. The students' manual includes a simplified explanation of brokerage accounting and several numerical examples of scoring (see Appendix) so that the administrator does not have to play an active role in this aspect of the game.

   The administrator, however, is required to maintain a daily log of commodity price quotes, from the WSJ, and a daily log of commodity trades

submitted by students. At the end of the game the administrator must verify the scoring of only the apparent winners.

2. Homework and classroom exercises, related to the game and the learning objectives of the initial business statistics course, have been partially outlined above. A more complete compilation of such exercises will be included in the game administrators manual. Clearly this aspect of the game is in need of further development. However, enough has been done to verify that COM-GAME can be meaningfully tied to the educational objectives of the business statistics course.

Summary and Conclusions

Much of the current research on business games [2, pp. 124-129] suggest that an effusive endorsement of COM-GAME and the joy of business gaming is not an appropriate conclusion to this paper. However, the conclusion of this paper leaves the author believing that he has designed a game which is educationally relevant and inexpensive to administer.

Sample of Brokerage Accounting

Date	Transaction or Holding	Price Original	Price Current	Margin Initial	Margin Maintenance	Round Term Commissions	Profit (Loss)
6/29/76	1 WZ B	3.18		350	200	12.00	(12.00)
new trades	1 CZ B	2.35		250	200	12.00	(12.00)
	1 SF B	5.04		700	600	12.00	(12.00)
	1 PBG B CME	76.00		1500	1000	50.00	(50.00)
				2800	2000		(86.00)
					800		

Profit (Loss) = Σ Profit (Loss) = (86.00)
Equity = Starting Balance + Profit (Loss)
= 10,000 + (86.00) = 9914
If Loss > 800, increase margin by the full amount of loss.
Otherwise, margin is unchanged.
Margin = 2800
Available = Equity - Margin
= 9914 - 2800
= 7114
This is the amount of money available to initiate new positions.
If Available < 0, then liquidate positions until available is > 0.

*Note if a trade is kept open into the delivery month, then the margin requirement is usually higher. Similarly, margins on old crop/new crop spreads are higher than the normal spread requirements.

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3. Schwager, Jack, A Guide To Trading Commodity Spreads (New York: Hornblower & Weeks-Hemphill, Noyes, 1975).