NCCC-134
APPLIED COMMODITY PRICE ANALYSIS, FORECASTING AND MARKET RISK MANAGEMENT

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Raymond M. Leuthold, Philip Garcia, and Richard Lu

Suggested citation format:

Leuthold, R. M., P. Garcia, and R. Lu. 1993. "The Returns and Forecasting Ability of Large Traders in the Frozen Pork Bellies Futures Market." Proceedings of the NCR-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. Chicago, IL. [http://www.farmdoc.uiuc.edu/nccc134].

The Returns and Forecasting Ability of Large Traders in the Frozen Pork Bellies Futures Market

Raymond M. Leuthold, Philip Garcia and Richard Lu*

I. INTRODUCTION

Followers of futures markets have long been interested in the flow of money among traders, i.e., who wins, who loses, and why. This is an especially interesting topic with futures markets because trading is a zero-sum game prior to commissions. Total gains equal total losses. Early discussion of money flows was carried on in the context of a risk premium, or normal backwardation. Keynes (1930) is given credit for originating this theory that speculators demand a risk premium for absorbing the risks that hedgers wish to offset. Accordingly, speculators should receive positive returns as compensation for risk, while hedgers lose in the futures market the amount of this risk premium. Numerous tests of this theory have been made over the years, e.g., Telser (1958), Cootner (1960a, 1960b), Gray (1961) and Dusak (1973) to name a few. These papers have spawned further comments and subsequent tests. Results have been mixed, but the preponderance of evidence rejects this theory.

An alternative theory would suggest that futures markets forward price efficiently, suggesting that the risk premium is bid to zero. Individual gains from trading would thereby come from superior forecasting skills, market power, or luck. Speculators provide liquidity and enhance the price discovery function. Empirical examples here include Goss (1983), Garcia, et al. (1988b), and Leuthold, et al. (1989) to name a few. For agricultural commodities the results are mixed, varying by commodity, time period, and method of analysis (Garcia, et al., 1988a).

Some early studies of speculator returns, such as Stewart (1949), Hieronymus (1971), and Ross (1975), studied speculator returns by utilizing a sample of traders from brokerage house records. These records are usually of only small traders, and come from a single brokerage house, making it difficult to generalize. Another class of studies by Houthakker (1957), and Rockwell (1964) utilized month-end large trader reports (CFTC) with over-simplifying assumptions about trading behavior.

More recently, Hartzmark (1987, 1991) has added substantially to this literature by examining daily commitments and settlement prices for large (reporting) traders for nine markets over a 4 1/2 year period, 1977-1981. Large traders tend to earn positive returns, but limited evidence exists that these traders are able to consistently forecast market behavior effectively. In fact, Hartzmark (1991) found evidence that returns for large traders are generated randomly.

This paper is an extension of the Hartzmark work, but we examine just one market, frozen pork bellies traded on the Chicago Mercantile Exchange, in more depth and over a longer period of time. This market should provide a good indication of forecasting ability because frozen pork bellies have long been considered highly speculative within the complex of agricultural futures. Using an extended data period permits a more complete view of how the distribution of returns is related to forecast ability over time. In the short run, the distributions of trader forecasts and their returns may be very different and susceptible to random occurrences. However, in the longer run, if some traders are consistently better forecasters, they will accumulate wealth. Hartzmark in his forecast study identified the existence of some small forecastability in the frozen pork bellies market. We propose to examine this in more detail.

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*Professors and Graduate Research Assistant, respectively; University of Illinois, Urbana-Champaign.

In the next section we describe the data used. Section III reports the distribution of daily returns of all reporting traders for each of the 9 years. This is followed in Section IV by a description of our statistical methodology. Section V assesses the forecasting skills of some of the largest reporting traders. This allows us to draw implications about whether traders are consistent in their ability to earn positive returns and have superior forecasting skills, or whether they are lucky. We will also examine their ability to make a "big hit", which means being on the "right" side of the market when large price changes occur. The last section provides a summary and conclusions.

II. DATA BASE

The data used in this study come from the Commodity Futures Trading Commission (CFTC) reports on end-of-day commitments of large (reporting) traders. In the frozen pork bellies market all traders holding 25 contracts or more, either at the beginning or end of the day, must report their trading activity to the CFTC, indicating long and short positions separately for each contract maturity month. This data set does not include activities of day traders or scalpers since these participants seldom carry their positions overnight. We have available daily commitments of frozen pork bellies traders for 9 years, 1982-1990. This gives us a sample of 3,171 traders with over 450,000 daily trading observations.

Daily profits for each trader and contract position are calculated by multiplying the end-of-day positions by the change in the settlement price between the current day and the following day. The prices are available from the Chicago Mercantile Exchange. These profits are used to measure performance. This is, of course, an approximation of actual trader profits. Actual transaction prices are unavailable, and as mentioned above, intraday profits and losses earned by large traders cannot be ascertained from these data.

Hartzmark was able with his data of 1977-1981 to classify traders as hedgers or speculators based on official categories. However, we are not able to make similar classifications. In the early 1980s the CFTC, due to cost-reducing policy changes, began classifying traders as commercial and noncommercial. This is a very aggregate classification as traders are no longer required to subcategorize their positions. That is, if a trader reports in as a commercial, then all of that trader's positions will likely be classified as commercial, even if some positions are spread trades or speculative. Traders have considerable degrees of freedom to self-select their category, and we found that most report as noncommercials. In the data, traders also were identified by type, such as commodity pool operator, commodity trading advisor, managed account, etc., but we found this information highly variable and unreliable for trader classification.

III. REPORTING TRADER RETURNS

The overall performance of all reporting traders in the frozen pork bellies market is assessed by their daily profits calculated as described in the previous section. By deduction, the trading performance of nonreporting traders is available.

Table 1 shows the profits and losses of reporting traders in the frozen pork bellies market for each year 1982-1990. Results are also presented for their long and short positions along with total gains and losses. Over this 9-year period these traders made a total of $122 million, generating positive profits each calendar year except for 1990. Consequently, nonreporting traders lost $122 million net over this same time period.

Reporting traders made $156.1 million from short positions and lost $34.1 million from long positions. There was considerable variability annually between the gains and losses in long and short positions. The total gains and losses columns give some idea as to the amount of money exchanging hands between these and other traders.

Also presented in Table 1 is the monthly mean profit for reporting traders and the associated t-ratio. Overall, the mean profit of all reporting traders over the 9 years is significant, the t-ratio is 2.38. However, during individual years, only 1988 and 1989 had significant profits. Table 1 indicates profits were substantially higher during these two years than for other years.

IV. STATISTICAL METHODS

For the remainder of our analysis we utilize a subsample of the total data set. In order to study whether traders make profits consistently, or have "big hit" ability, or are lucky, we selected a subsample of the 50 largest traders in our group and the 20 largest spreaders[1]. There was considerable overlap between these two groups, resulting in a subsample of 58 traders. These traders remain in the sample for the full 9-year period for the most part, and an analysis of them gives a picture of the abilities of those participating in the market on a continual basis. After these 58 traders are analyzed as a group, we categorize them by trading function for further evaluation.

Testing for Consistent Forecasting Ability

This section describes the methods used for studying the relationships between trader's profits and their ability to forecast, or anticipate, price changes. Two procedures, similar to those used by Hartzmark (1991), are followed. The procedure to test for consistent forecast ability emulates that introduced by Henriksson and Merton (1981), HM, and modified by Henriksson (1984) and Cumby and Modest (1987), CM. First, the number of "correct" forecasts each trader makes is observed. A trader is correct when he/she is long (short) when the subsequent price move is up (down). The concern is the probability of observing the number of correct predictions providing forecasts are made randomly.

A binary variable Z(t) indicates if actual profits are made between time t and t+1. The variable Z(t) is equal to one if the price goes up and the net position of the trader is long, or if prices go down and the net position of the trader is short (the dollar return, R(t) is greater than zero), and Z(t) is equal to zero otherwise. The binary variable U(t) indicates the trader's prediction at time t. This variable is equal to one if the trader is long, and zero otherwise. The log odds that an individual trader correctly forecasts the market price change is given by:

$$\log\left(\frac{Pr[z(t)=1]}{Pr[z(t)=0]}\right) = a + BU(t). \qquad (1)$$

A logit framework is specified to determine the sign and magnitude of B. The coefficient B equals zero when the trader possess no forecasting ability. If B is significantly greater than zero the trader possess superior forecast ability, and if B is significantly less than zero, the trader possesses inferior ability. This model is designated as HM.

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[1] Spread trades and traders are defined as circumstances where the absolute difference between the long and short positions for a given time period is less than 10 percent of the average of the total long and short positions.

The original HM procedure has been criticized because it assumes independence between forecast ability and the distribution of returns. Thus, the CM procedure was developed; which is followed here.

Testing for Big Hit Ability

A second question goes beyond predicting correct price movements, and is concerned with whether the trader adjusts his/her positions depending upon the strength of market conviction. That is, do traders take larger positions when greater price changes are expected? The tests for big hit forecast ability takes into account both the magnitude of the trader's net position as well as the magnitude of the actual price change.

In this analysis it is assumed that the magnitude of the price change, or dollar return, R(t), depends linearly on the forecast. Big hit ability is indicated if the trader holds the largest position when there are the largest price movements in the correct direction.

Two versions of this test are presented. The original was proposed by CM as (designated here as CM):

$$R(t) = a' + B' U(t). \tag{2}$$

The second version was proposed by Hartzmark (1991) as a modification of CM because with these data additional information is available. It is assumed that R(t) depends on the net position of a trader, and big hit ability is demonstrated if a trader's largest positions are held when there exist the largest price movements in a favorable direction, i.e., the trader has stronger feelings about a price move and takes bigger positions. Define NP(t) as the net position (long minus short positions) at time t, such that NP(t) is greater than zero if the trader is net long, and NP(t) is less than zero if the trader is net short. The regression equation then is (designated here as BH):

$$R(t) = a'' + B'' NP(t) + e(t). \tag{3}$$

Implications of B (i.e., B' and B'') are the same as above. If B is significantly greater than zero, the trader possesses superior big hit ability. If B is significantly less than zero, the trader exhibits inferior big hit ability.

Following Hartzmark (1991), the parameter estimates themselves provide little information about individual trader forecast ability, so we create a comparable measure of ability, forecast coefficients (FC_i), where i represents an individual trader. These are based on the coefficient's probability significance levels. These measures incorporate information on the sign of the coefficient, standard error, and degrees of freedom. They are defined as:

$$FC_i = (1 - \text{probability level}_i) \times (\text{sign of coefficient}_i).$$

For example, if the probability significance level from an OLS regression equation is 0.10, and the coefficient is negative, then:

$$FC_i = (1 - .10) \times (-1) = -0.90.$$

The range of FC_i is from -1.0 to 1.0.

V. FORECAST ABILITY

Assessment of Individual Traders

The procedures outlined above for forecasting ability were applied to the 58 largest traders and only to those days when traders' positions changed, or were updated, rather than each day the trader was in the market. If a trader remains on the same side of the market after a transaction, it still counts as an update. This classification implicitly assumes that if a trader has an opinion about the market, the trader changes or adjusts the market position. Conversely, if the trader retains the same exact position over several days, the trader's price forecast has not changed, even though price levels may have.[2]

The average profit per day and associated t-ratio for the 58 traders as a group over the 9 years was $2,633 profit and 4.05, respectively.[3] Clearly, these traders were very successful, earning a large profit on each trade, and a mean that is highly significant.

Figure 1 shows the frequency distribution by decile of the forecast coefficients for HM, the measure for consistent forecasting ability.[4] Clearly, these traders demonstrate ability to forecast price moves positively and consistently with 39 having positive forecast coefficients and only 19 with negative coefficients. Seventeen traders are in the highest two deciles.[5] These results imply that these traders, on average, are consistent in positioning themselves on the side of the market that will generate a profitable return; they consistently, on average, forecast price moves correctly and then position themselves appropriately.

Figure 2 demonstrates the frequency distribution by decile of the forecast coefficients for BH, the measure for big hit ability.[6] Clearly, these traders show even stronger ability to forecast and make a big hit. Forty traders have positive forecast coefficients, 24 of these are in the top two deciles, while only 18 have negative coefficients. This means that these traders are able to anticipate when the largest price moves are going to occur, and position themselves with larger corresponding

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[2] Our results are not extremely sensitive to this classification; they are similar under both circumstances.

[3] This profit is not directly comparable to the mean profit presented in Table 1 because only those days when the trader changes position (new information) were included for analysis. Total profit for these 58 traders over the 9-year period exceeded $150 million. In addition, in order to run the regressions, those days when the trader held equal long and short positions (net position of zero) were excluded from analysis.

[4] Regressions for CM and BH, run on each of the 58 traders, were corrected for heteroscedasticity and autocorrelation where necessary as discussed by Cumby and Modest (1987, p. 181).

[5] This does not necessarily mean that each of these 17 traders had a coefficient that was significantly different from zero.

[6] The distribution of the forecast coefficients for CM is almost identical to that for BH, so is not shown.

market positions.[7] That is, they take large positions immediately prior to the biggest price moves. Given the many traders excluded from this analysis, e.g., other reporting traders, scalpers, and small traders, this sample could represent an elite subset of successful traders.

As a further descriptive measure of the strength of the consistent forecasting and big hit abilities of these traders, respectively, Figures 3 and 4 plot the forecast coefficient for each trader against the t-ratio of the average profit per trade for days when net position changes. Figure 3 is based on equation 1 and Figure 4 reflects results from equation 3. Clearly, there is a positive relationship between forecast coefficients and t-ratios. That is, stronger t-ratios on returns, or profitability, are associated with more positive forecast coefficients.

Analysis by Trader Classification

Interpreting the previous results is somewhat complicated because traders are assumed to be homogenous, i.e., they are not differentiated by their spreading, speculative and hedging activities. To provide further insight, based on their ending daily positions for days when changes in the net position occurred, the traders were categorized in 4 groups: short and long hedgers, spreaders and speculators. Short (long) hedgers were identified by the dominance of short (long) positions in the market over the nine-year period. Spreaders were identified consistent with the previous definition. Speculators were those traders which did not fall into the above categories. The classification resulted in 12 short hedgers, 3 long hedgers, 20 spreaders and 23 speculators. For each category, correlation and descriptive regression analyses were performed between the FCs for the various forecast measures and the t-ratio for the profits generated to further describe the relationships between forecast ability and profits.[8] The descriptive regressions specified the t-ratio for profits as the dependent variable with the forecast measure and the forecast measure squared as the regressands. In general, strong positive and relatively linear relationships were encountered between the forecast measure and the t-ratio for profits (Tables 2 and 3). Except in one case, highest correlations and highest adjusted R^2s were found for the speculators. The relationships for spreaders and short hedgers were more variable. As measured by the HM measure, spreaders were able to consistently assess the direction of market movements. Their ability to identify the big hit was much more limited and, perhaps, outside of the focus of their trading activities. Interestingly, for the short hedgers, the CM and the BH measures provide dramatically contrasting views of their ability to identify the big hit. The size of the position taken by the short hedgers as measured by the BH variable was positively related to the likelihood of generating profits. It is not clear why these measures produced such substantive differences, but may reflect the difficulty in differentiating between forecast ability and the exercise of market power.

On balance, the results suggest that a strong, positive relationship exists between the significance of profits generated and the forecast ability of the traders examined. Speculators have forecast ability which is rather invariant to the measure used. However, spreaders and short hedgers provided more limited evidence of forecast ability. In the case of the short hedgers, the reduced

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[7] Unfortunately, our data do not allow us to ascertain whether these traders anticipate these larger price moves, or whether they take larger market positions and create the price move from their trades.

[8] Because of the limited number of long hedgers, separate analyses were not performed for this category. Clearly, these regressions, and subsequent figures, are descriptive only, providing insight into relations between profits and forecasts. They provide relative appraisal of fits in lieu of numerous pictures.

evidence of forecast ability may be related to the fact that these traders use futures primarily to offset cash market positions. For spreaders who reduce their market risk by taking different positions across contracts, the ability to consistently identify the direction of market change may be more relevant to their trading activities than identifying the opportunities for the big hit.

VI. CONCLUDING REMARKS

Previous research using daily trading data suggested that profits were being generated in market activities by large traders, but that they were not related to traders' ability to forecast market behavior. Here, using an extended data set from 1982-1990 of daily trading activities for traders in the pork bellies market, we find that the distribution of returns overtime is not random. All reporting traders do generate significant profits, implying losses for the nonreporting traders. For the elite subset of the largest traders examined, significant profits were positively related to the traders' ability to forecast price behavior. For speculators the positive relationship between significant profits and forecast ability was invariant to the measure used, indicating that they were not only able to anticipate the direction of market changes, but were on the right side of the market when large changes occurred. Short hedgers and spreaders demonstrated less of an ability to forecast market changes. The reduced evidence of forecast ability may be consistent with their uses of the futures markets. Short hedgers may be primarily concerned with offsetting cash market positions. While for spreaders the ability to consistently identify the direction of market changes may be more relevant than being able to identify large market changes. Hence, these results suggest that, in a longer run context, certain larger traders can accumulate experience and knowledge of the market which permit them to generate consistent forecasts and accumulate considerable wealth.

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Table 1
Trading Results of Reporting Traders in the
Frozen Pork Bellies Futures Market, 1982-90

Year	Short Positions[a]	Long Positions[a]	Losses[a]	Gains[a]	Net [a,b]	Mean Profits [c]	t-ratio
1982	$ -61.6	$ +73.3	$ -797.1	$ +808.8	$ +11.7	$2,990.1	0.84
1983	+46.5	-44.2	-442.5	+444.8	+2.3	746.3	0.16
1984	+4.3	+3.7	-398.1	+406.1	+8.0	3,009.6	0.82
1985	+35.1	-34.1	-287.2	+288.2	+1.0	498.0	0.14
1986	-17.5	+19.5	-287.9	+289.9	+2.0	1,110.5	0.23
1987	-10.4	+18.1	-348.1	+355.7	+7.6	3,770.3	1.01
1988	+99.2	-50.3	-456.5	+505.4	+48.9	9,481.3	2.87
1989	+57.8	-12.1	-503.9	+549.6	+45.7	15,949.7	2.84
1990	+2.7	-7.9	-490.9	+485.7	-5.2	-2,207.0	-0.30
Total	$ +156.1	$ -34.1	$ -4,012.2	$ +4,134.2	$ +122.0	$3,863.3	2.38

[a] Millions of dollars. Commissions are not included.
[b] Nonreporting traders will show identical results, but of opposite sign.
[c] Profits per trader per month.

Table 2
Bivariate Correlations between Forecast Ability Measures
and the Significance of Profits

	Forecast Ability Measures[a]		
Category	HM	CM	BH
Short Hedgers	0.63	0.36	0.91
Speculators	0.81	0.83	0.79
Spreaders	0.53	0.43	0.37
All	0.67	0.64	0.70

[a] The forecast measures are defined in the text.

Table 3

Descriptive Regressions between Measures of Forecast Ability and Significance of Profits

Categories	HM[b]	HM²	R^2	CM	CM²	R^2	BH	BH²	R^2
Short Hedgers [12][a]	-0.498	2.950	0.37	0.890	0.067	-0.06	1.566	0.967	0.86
	(-.231)[c]	(1.250)		(0.396)	(0.020)		(6.841)	(2.146)	
Speculators [23]	1.650	0.820	0.66	1.558	0.941	0.71	1.554	0.198	0.59
	(6.507)	(1.444)		(6.206)	(1.933)		(5.104)	(0.314)	
Spreaders [20]	0.891	1.187	0.32	1.191	-0.332	0.09	0.544	0.853	0.09
	(2.335)	(1.810)		(1.372)	(-0.264)		(1.034)	(1.007)	
All [58]	1.406	0.722	0.45	1.410	0.250	0.39	1.308	0.678	0.49
	(6.365)	(1.775)		(4.973)	(0.519)		(5.968)	(1.678)	

[a] The number of observations are in brackets.

[b] Constant terms are suppressed for brevity.

[c] T-ratios are in parenthesis.

Figure 1

Distribution of Forecast Coefficients for HM

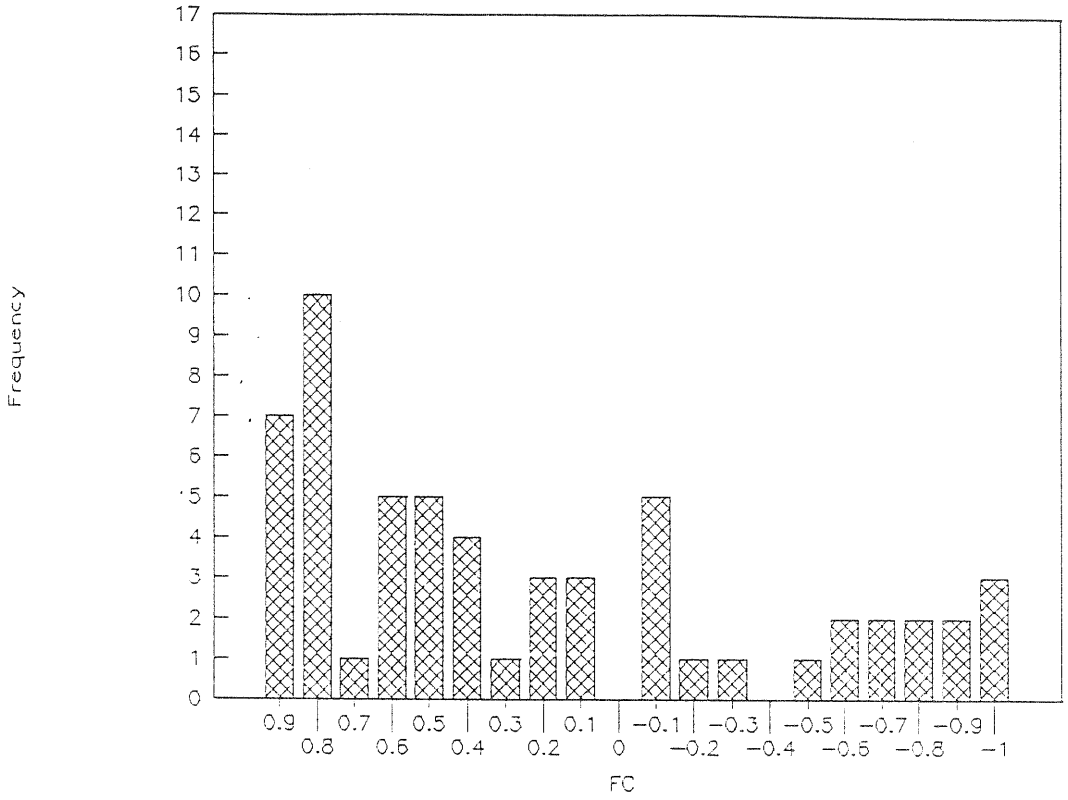

Figure 2

Distribution of Forecast Coefficients for BH

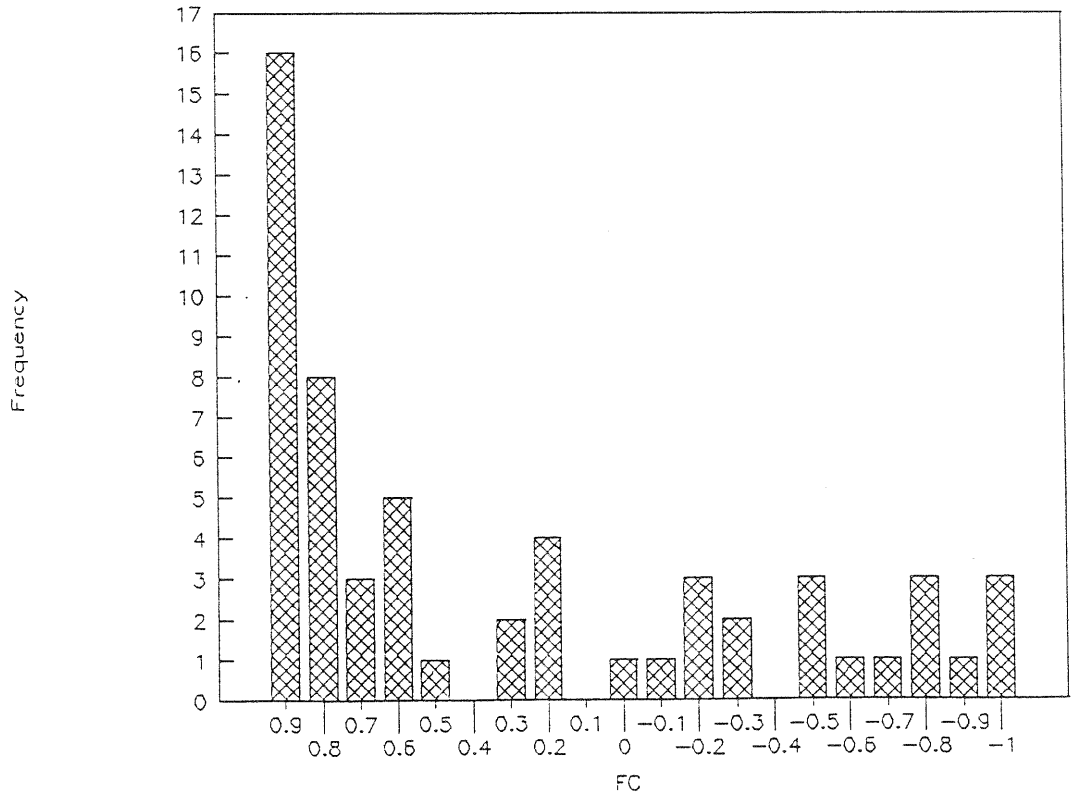

Figure 3

HM Forecast Coefficient and Profitability T-Ratio

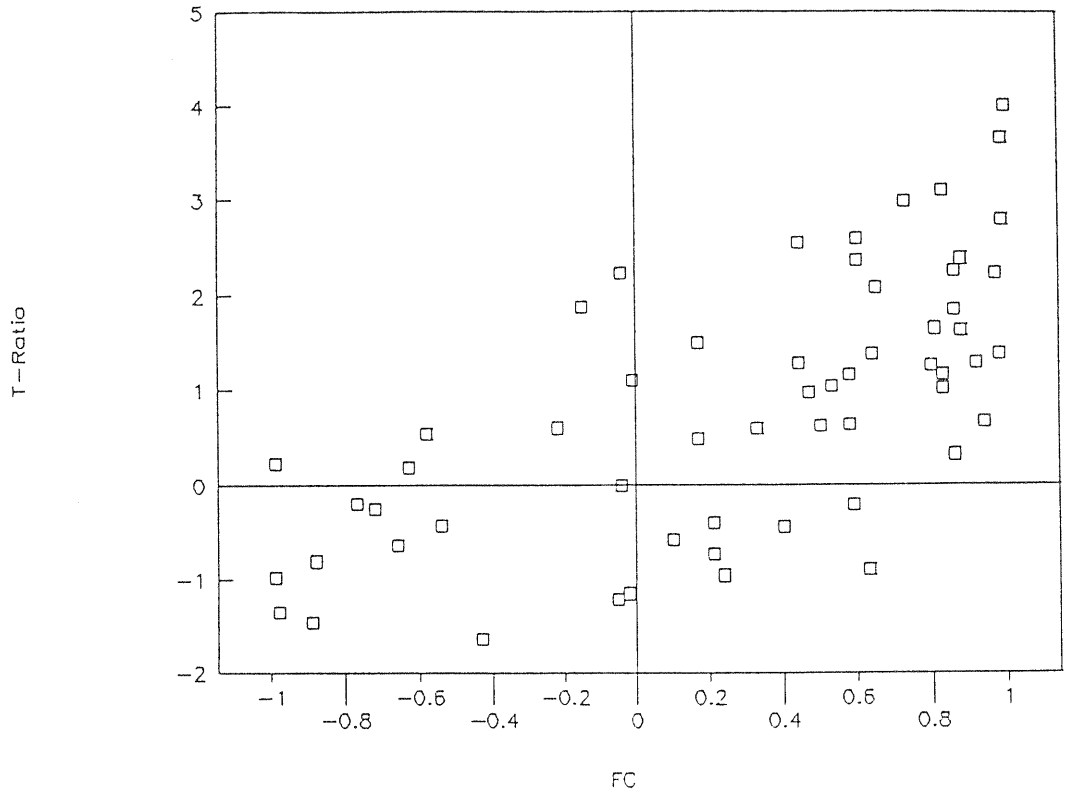

Figure 4

BH Forecast Coefficient and Profitability T-Ratio