THE INTERTEMPORAL BEHAVIOR OF ECONOMIC PROFITS

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The intertemporal behavior of economic profits is examined. Tests show that profit rates are not independent of their initial level. A set of tests for the nature of the profit adjustment mechanism is proposed and a stock market-based profit measure is employed. Despite intertemporal dependence, we find evidence of profit rate adjustment patterns roughly consistent with neoclassical theory for negative profits. In some, but not all cases, the probability of maintaining positive profits appears less than the probability of moving toward zero profits.

1. Introduction

One of the central results of competitive market analysis is that monopoly profits cannot persist in the absence of entry barriers. Resources will be recommitted to higher-return uses except where resource mobility is limited. The welfare superiority of market-oriented economic arrangements is, of course, linked inextricably to this feature of market behavior.

Since departures from competitive market arrangements are a necessary condition for monopoly returns to exist and to persist, industrial organization economists have focused on the relationship between market structure and economic performance. In particular, many studies have attempted to explain the existence of 'excess' profits at some point in time by regressing accounting profits on market structure and other variables. The results of this research program have provided information about U.S. industrial markets but their findings bear only indirectly on the question of whether monopoly profits persist.

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Surprisingly, there is very little direct evidence on the persistence of economic profits. Only a very small number of studies have addressed the persistence question directly and they have come to very different conclusions. We believe this disparity of results reflects an underlying lack of consensus about the empirical implications of the competitive market model for profit persistence.

For example, Brozen (1982) analyzes data on industry accounting profit rates for a 60-year period. He claims the low autocorrelation of profit rates in concentrated industries is inconsistent with the persistence of excess profits (1982, pp. 234–237). Although Brozen's work does not feature explicit tests of a set of well-developed propositions about profit rate movements, it seems clear that Brozen interprets the competitive model as implying low intertemporal correlations of profit rates.

Using Brozen’s basic approach, Lev (1983) provided additional evidence on the autocorrelation properties of accounting profit rates. He found that 'earnings autocorrelations are systematically effected by type-of-product, barrier-to-entry (competition), and by capital intensity (operating leverage)' (1982, p. 46).

By contrast, Mueller (1977) rejects the autocorrelation approach in favor of explicit hypotheses about the nature of profit rate movements which are drawn from a probabilistic model of competitive markets. In Mueller’s view, a firm’s risk-adjusted profit rate on capital should converge on the competitive profit rate over time. This means that given sufficient time ‘the profits of a firm at any two points in time should be independent of one another’ (p. 370). His alternative hypothesis, corresponding to a non-competitive market, is that profits earned in one period provide the resources to insure profits in the future. As a result, ‘the probability that a firm has a given profit rate at any point in time is directly related to its past profits, even extending the time span far into the past’ (p. 370). Mueller finds that firms with high accounting profit rates in an initial period are substantially more likely to have a higher accounting profit rate 23 years later than firms which earned normal profits in the same initial period. Mueller concluded that the ‘competitive environment’ hypothesis is not supported by the data.

In short, there is no agreement about the appropriate way to test for profit mobility and, not surprisingly, considerable difference of opinion about what the data show. Our aim in this paper is to present and test a set of hypotheses about intertemporal profit rate behavior. In the next section, we consider one of the questions raised by Mueller’s work and present evidence which affirms one of his conclusions. In section 3, we describe our view of the intertemporal behavior of economic profits in competitive markets. Since the adjustment process does not work instantly, the theory of profit rate dynamics is cast in terms of long-run movements.\footnote{On this, see Stigler (1968, pp. 8–9).} We propose a set of tests
for consistency of real-world profit rate movements with the competitive model. Section 4 presents the statistical model which is used to test these hypotheses and analyzes certain issues related to data and measurement methods. The test results are presented and discussed in section 5. In the last part of the paper, we summarize the results of our inquiry.

2. Time-dependence of profits

The central question to be addressed is the meaning of the competitive market hypothesis. Most economists would probably agree on two points: (1) in the long run, all economic profits disappear at the margin, and (2) the existence of non-zero economic profits induces resource shifts which tend to push these profits (or losses) back to zero.

Mueller (1977) proposes one interesting way of gathering evidence on these general statements. In his discussion of profit persistence, he says: 'the competitive environment hypothesis is that entry and exit in each product area are sufficiently free to bring profits quickly into line with competitive rates of return' (p. 370). Under his version of the null hypothesis of competitive markets (our terminology), the probability of a particular profit performance in the terminal period is independent of the initial period profit performance; that is, the conditional probability of terminal period profit performance equals the marginal probability of terminal period profitability. The alternative hypothesis is that the marginal and conditional probabilities are not equal. That is, terminal period profit performance is directly related to the firm's initial success (or failure). Mueller interprets rejection of the null hypothesis as a rejection of the competitive market hypothesis.

Contingency table methods are ideally suited for determining time-independence of profits. To implement the chi-square test of independence, we split the range of both of our profit variables (defined in the appendix) for the first period (1963) and the terminal period (1981) into seven equal-sized intervals and calculated the following statistic:

$$\sum_{j=1}^{r} \sum_{i=1}^{c} \frac{(n_{ij} - e_{ij})^2}{e_{ij}} \sim \chi^2_{(r-1)(c-1)}$$

where $n_{ij}$ gives the number of observations in a cell in row $j$ and column $i$, $e_{ij}$ gives the expected number of observations in a cell, $r$ is the number of rows, and $c$ gives the number of columns. Recall that the null hypothesis of the independence test is that the probability of terminal period profitability is independent of initial period profits. For Mueller's accounting profit measure, the test statistic was 108.57 with 36 degrees of freedom (d.f.) and for a stock
market-based profit measure, the test statistic was 233.43. The critical value at the 1 percent level with 40 d.f. is 63.69 so there is a clear rejection of independence for both profit measures.

Our results imply that some combination of profit-protecting investments, durable entry barriers, and durable cost advantages generates a long-lasting intertemporal correlation of profit rates. Whether this is due to cost advantages, entry barriers (possibly due to government actions or inactions), or the investment (and perhaps limit pricing) activity of firms is an important question which is beyond the scope of this paper. Extending this analysis to samples stratified by entry barriers, intangible capital, or a firm's relative market position would be a first step.

In our opinion, the validity of the competitive market hypothesis does not depend on a demonstration of the time-dependence of profit rates because there is no necessary inconsistency between time-dependence of profit rates and a tendency to see economic profit rates move toward zero. In particular, to find in general that profits persist says very little about whether zero profits or positive profits are persisting. The crucial question is how profit rates move. Before discussing our empirical methods, however, it is necessary to elaborate our tests of the competitive market hypothesis and its implications for the probabilities of certain profit rate movements.

3. A theory of profit rate dynamics

A general statement of the competitive market hypothesis is that the market mechanism will induce resource shifts whose effect is to eliminate non-zero profits. As a practical matter, the competitive market hypothesis can take two forms. In our view, the strongest statement of the neoclassical theory of intertemporal profit rate determination is that all non-zero economic profits will revert to zero over time. As a practical matter, though, at any point in time some firms will be earning positive economic profits and some will be earning negative economic profits. Under the weak form of the competitive market hypothesis, the market's profit adjustment mechanism will produce regular, predictable movement of non-zero economic profits towards zero even if the adjustment process remains incomplete. The alternative hypothesis is that profit rate adjustments would be unrelated to the existence of non-zero economic profits or would produce irregular, unpredictable profit changes.

3This is what Mueller's earlier paper tested but we believe he used an inappropriate statistical procedure. Mueller's classification system of equal-sized classes [see Mueller (1977, p. 371) for a description of his classification system] yields correct inferences about the existence of competitive market forces only under the null hypothesis that the marginal and conditional probabilities are independent. Since the evidence from the contingency table test suggests this assumption is inappropriate, an alternative procedure seems necessary. We use a variant of Mueller's methods in our tests which we explain in detail in section 4.
Fig. 1a illustrates several possible intertemporal adjustment paths. Line $A$ represents the case of monotonic profit rate adjustment while the process suggested by line $B$ is one dominated by overshooting or large random shocks to firm profits. Line $C$ depicts the sort of behavior that would prevail if the market were unsuccessful in eliminating excess profits.
These considerations lead us to offer three principal hypotheses about the intertemporal behavior of profit rates. First, the probability of maintaining non-zero economic profits declines as the difference between the profit rate and zero (in absolute value) increases. We represent this with lines $A1$ and $A2$ in fig. 1b. Our first hypothesis is that the probability of a firm moving on the path described by $A1$ is less than the probability of moving on the path described by $A2$. Second, for firms which initially are earning normal returns, the long-run probability of earning non-zero economic profits declines as the difference (in absolute value) between the terminal period profit rate and zero increases. That is, firms initially earning normal returns are less likely to end up 'far away' from zero profit than to end up a 'little bit away' from zero profit. In fig. 1c, the probability of seeing the movement described by $B1$ is less than the probability of witnessing the movement captured in $B2$. Third, for firms which initially are earning non-zero economic profits, the probability is higher that over time their profit rates will tend toward zero rather than move further away from zero. We can demonstrate this using fig. 1d. $C1(D1)$ represents a more unlikely path of profit rate movement than $C2(D2)$.

To turn these general notions into the testable hypotheses, it is convenient to introduce a system for classifying firms according to profitability. Suppose there are seven classes into which profit rates might fall. The first category holds the highest profit rates, the seventh incorporates the lowest profit rates, and the fourth class includes zero profit. The other profit classes represent intermediate profit rates ranging between high (or low) profits and zero profits. One way to set up this classification system is to focus on the distribution of profit rates of firms, and in particular on the first two moments of that distribution. The zero profit class should be centered on the mean of the distribution of economic profits because the central tendency of a market economy is to push economic profits to some average level which is zero. In the long run if profits respond as economic theory implies, the distribution of profits has a mean of zero and no variance. This is the strong form of the competitive market hypothesis. Since profit data do not correspond to this theoretical time period and reflect numerous one-time shocks, we would never expect to see a spike at zero profits. Accordingly, existence of profit rate distribution with higher moments is consistent with the competitive market hypothesis and interest shifts to tests of the weak form just outlined. To form the zero profit class, we set upper and lower boundaries of $\mu \pm \varepsilon$ where $\mu$ is the mean of the distributions and $\varepsilon$ is an

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4 Other tests of market adjustment behavior have been proposed but to varying degrees are unable to cope with the intertemporal phenomenon. The Lerner index, the various concentration indices, dispersion of prices and the extent of price discrimination have been advanced as possible indicators of the extent of competition. The stability of rates of return and the distribution of those returns is another way to assess the strength of competitive influences in a market. See Stigler (1963, pp. 34-49, and 54-71), Stigler (1968, pp. 14-15), and Clarkson and Miller (1982, pp. 59-73).
arbitrary (small) constant. The other profit classes can be defined by successively adding (subtracting) the standard deviation of the profit class distribution to (from) the upper (lower) bounds of the zero economic profit class.\footnote{This orientation to the distribution of profit rates has an antecedent in Stigler's (1963) study of industry capital investment and its relationship to profit rates.}

Using our profit rate classification system, our first general hypothesis can be formalized in three parts for testing.

**Hypothesis A.** Regardless of a firm's initial economic profits, there is a positive probability the firm will be earning zero profits in some appropriately-spaced terminal period.

In terms of the profit classifications this yields

\[
\text{Test 1: } \Pr_{i4} > 0, \quad i = 1, 2, \ldots, 7, \tag{2}
\]

where \( \Pr_{i4} \) represents the probability of a firm being in profit class \( i \) initially but ending up in profit class four (zero economic profits). This proposition obviously must hold if we are to claim that the market system is capable of eliminating non-zero economic profits by reallocating resources to higher return uses. Statistically, this is not a particularly powerful test because the null hypothesis \( \Pr_{i4} = 0 \) will be rejected so long as some firms move from class \( i \) to 4. Accordingly, we propose more stringent tests.

The difference between initial period profits (\( \Pi_{IP} \) for positive profits, \( \Pi_{IN} \) for negative profits) and zero is a signal to the market about uses to which resources should be reallocated. As this difference grows, the incentive to reallocate resources grows, too, so we propose

**Hypothesis B.** The probability of a firm maintaining its initial profit class declines the bigger (and positive) or smaller (and negative) are initial period profits.

In terms of the profit class system we have

\[
\text{Test 2: for } \Pi_{IP}, \quad P_{ii} < P_{jj}, \quad i = 1, 2, 3, \quad j = 2, 3, 4, \quad i < j, \tag{3}
\]

\[
\text{Test 3: for } \Pi_{IN}, \quad P_{ii} < P_{jj}, \quad i = 7, 6, 5, \quad j = 6, 5, 4, \quad i > j. \tag{4}
\]

Given adequate information resources will be reallocated first toward uses offering the highest return. In our view, this means a firm which is initially in profit class 1 has a smaller probability of maintaining that profit level than a firm which is initially in profit class two or three. The initial economic profit
is greatest for firms in profit class one; consequently, we expect the rate of entry into markets served by firms in profit class 1 in the long run to be higher than in any other profit class thereby dissipating the excess returns of these firms first. Our view of the reallocation mechanism implies analogous results for firms initially earning negative economic profits [eq. (4)].

Hypothesis B may be extended to deal with other cases of profit adjustment toward zero leading to

**Hypothesis C.** The probability of a firm maintaining its initial economic profits is less than the probability those profits will move toward zero over time.

Using our profit class scheme, we have

Test 4: for $\Pi_{IP}$, $P_{ij} < P_{ik}$, $i=1, 2, 3$, $j=1, 2, 3$, $k>j \geq i$, $k=2, 3, 4$, (5)

Test 5: for $\Pi_{IN}$, $P_{ij} < P_{ik}$, $i=7, 6, 5$, $j=7, 6, 5$, $k<j \leq i$, $k=4, 5, 6$, (6)

e.g., $P_{11} < P_{13}, P_{12} < P_{13},$ or $P_{77} < P_{74}$. The first example says the probability of maintaining very high profits (profit class 1) is less than the probability those profits will be reduced to some lower level (profit class 3). In the next example, the probability of moving to some lower profit level from an initial profit class increases as the terminal (and lower) profit level is closer to zero. In the third example, a firm which is suffering economic losses will not continue to absorb these losses in the long run but will attempt to reduce its losses by redeploying its capital through mergers or diversification. Failing that, bankruptcy is perhaps the ultimate form of capital redistribution.

Our second general proposition deals with the probability that firms which initially are earning normal returns would earn non-zero economic profits in the long run. We formalize it for testing as follows:

**Hypothesis D.** For firms earning normal returns in some initial period, the probability of attaining positive (negative) economic profits in some appropriately-spaced terminal period declines the higher (lower) the terminal profit rate.

Using our profit class system yields

Test 6: for $\Pi_{TP}$, $P_{ij} < P_{ik}$, $i=4, 3, 2$, $j=1, 2, 3$, $j<i$, $k=2, 3, 4$, $k>j$, (7)
Test 7: for $\Pi_{TP}$, $P_{ij} < P_{ik}$,
\[ i = 4, 5, 6, \]
\[ j = 5, 6, 7, \quad j > i, \]
\[ k = 4, 5, 6, \quad k < j, \]
\[ (8) \]

where $\Pi_{TP}$ is positive economic profits in some terminal period and $\Pi_{TN}$ is negative economic profits in some terminal period. If markets are competitive, the probability of a firm acquiring positive (negative) long-run economic profits should decline as the profit rate is higher (lower) because the rate of entry (exit) should rise as the rate of economic profit increases (decreases). As an example, for firms initially earning normal returns, the probability of ending up in profit class one ($P_{41}$) should be less than the probability of ending up in profit class two ($P_{42}$) or three ($P_{43}$).

Our last major proposition deals with the nature of the profit rate adjustment process.

**Hypothesis E.** For firms earning non-zero economic profits initially, the probability of ending up in a profit class closer to zero profits exceeds the probability of being in a terminal period profit class further from zero.

In terms of the profit class system,

Test 8: for $\Pi_{TP}, \Pi_{TP}$, $P_{ij} < P_{ik}$,
\[ i = 2, 3, \quad j < i < k, \]
\[ j = 1, 2, \]
\[ k = 3, 4, \]
\[ (9) \]

Test 9: for $\Pi_{IN}, \Pi_{TN}$, $P_{ij} > P_{ik}$,
\[ i = 5, 6, \quad j < i < k, \]
\[ j = 4, 5, \]
\[ k = 6, 7. \]
\[ (10) \]

This proposition is quite basic to the competitive market story since it requires that firms move towards zero profits even if these firms do not reach the zero profit level.

4. Empirical methods

4.1. Measuring economic profits

Using the Standard and Poor's annual COMPUSTAT tape for 1963–1982, we identified a sample of firms for which complete data were available for the sample period. Our sample includes firms from a large number of four-digit SIC industries but we eliminated firms whose returns were subject to
direct regulation, such as public utilities. Although our sample period is
determined by the available COMPUSTAT tape, it is an interesting period
over which to test our hypotheses. This period covers both rapid economic
growth and deep recession, and involves considerable change in the structure
of manufacturing industries.

A crucial question for our empirical work is whether accounting data on
profits, capital, and other activities of the firm are capable of providing
evidence about our hypotheses. The bill of particulars against use of
accounting data to measure economic profits is long and growing. Gonedes
and Dopuch (1979) analyze the problems facing economists who use
accounting data to render inferences about profit persistence. They point out
that accepted accounting practice will spread many types of costs, including
production and capital costs, over several distinct reporting periods without
regard to the timing of the underlying economic phenomena. As a result, the
reported accounting numbers can exhibit important serial correlation (i.e.,
"persistence"), regardless of whether this is actually reflective of the substan-
tive attributes of firm's decisions (p. 396). This sort of result may obtain
whether the firm is intentionally attempting to manage its earnings or
treating its accounting procedures as completely exogenous. Of course, other
accounting techniques may have the opposite effect, incorporating into a
single period's report costs or revenues more appropriately (for an
economist's purposes) spread over several periods. Along these lines, Benston
(1982) demonstrates that errors in cost accounting can produce dramatic
changes in net income (p. 209, table 9).

Most recently, Fisher and McGowan (1983) have completely discounted
the ability of accounting data to provide meaningful information about the
firm's economic profits (1983, pp. 90-91):

"...there is no way in which one can look at accounting rates of return
and infer anything about relative economic profitability or, a fortiori,
about the presence or absence of monopoly profits. Economists (and
others) who believe that analysis of accounting rates of return will tell
them much ... are deluding themselves."

From a different approach, Benston (1982, p. 215) reaches a similar
conclusion:

"In sum, the multitude of significant differences between economic
concepts and accounting figures, and even between the accounting
figures of different companies, generally prevent internal corporate

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6 Our sample is larger than those used by Qualls (1974) and Mueller (1977) in their work
using firm-level data. Qualls used a sample of 220 firms while Mueller used a larger sample of
472 firms.

7 See Clarkson and Müller (1982, pp. 97-103) for a useful introduction to the issues involved.
accounting records from being useful for purposes of economic studies or comparisons.'

The probability, then, that accounting data will permit us to generate unbiased inferences about the hypotheses we have advanced cannot be assumed to be very high in our estimation. Our very brief review of the accounting and economics literature suggests major problems with using accounting data.

Following the lead of Thomadakis (1977), Lindenberg and Ross (1981), Schwert (1981), and others, we propose to use primarily security market data to generate the profit rates to test our hypotheses. The advantages of using security market data are many [see Schwert and Ross (1983)]. We calculated each firm's relative excess value which is defined to be

$$ EVS = (MV - BV)/S, \quad \text{where} $$

$$ EVS = \text{excess value (normalized by sales to eliminate heteroskedasticity)}, $$

$$ MV = \text{market value of the firm's debt and equity}, $$

$$ BV = \text{book value of the firm's assets}, $$

$$ S = \text{firm's sales}. $$

When $EVS > 0$, the firm is realizing positive economic profits while, when $EVS < 0$, negative economic profits accrue to the firm. This measure is

8Some economists have responded to the long-recognized problems of accounting data by adjusting the data in one way or another. This procedure may be indefensible, however. Any adjustment of accounting data rests on some notion of what 'true' income is yet the profit concept underlying the usual adjustment of accounting data is invariably based on static, deterministic models. The adjustments one might entertain to make the accounting data correspond to an income concept in a world of uncertainty and imperfect markets are somewhat less obvious, but far more important. Restatements using 'true' income notions from a world of certainty and perfect markets are just as arbitrary as the original accounting data [see Gonedes and Dopuch (1979)]. The more serious problem with restatement is that the firm's economic decisions and accounting method choice are endogenous in the long run. Increasingly, accountants are analyzing accounting method choice using positive economic models [see Zmijewski and Hagerman (1981) for an example]. Studies which use restated data presume the firm would have made the same decisions if the restated numbers were generated by the accounting system. In our view (and that of some accountants), this burden is not obviously sustainable and restatements are accordingly problematic.

9Consider the following derivation from Hirschey (1982). The market value of the firm can be written $MV = e^{\Pi_0 + \Pi_1 + \cdots}$ where $MV$ is market value at time $t$, $\Pi_0$ is profit at time $t$ and $r$ gives an appropriate risk-adjusted discount rate. Following Lindenberg and Ross (1981), $MV$ can be decomposed as $MV = MV_T + MV_K + MV_M$ where $MV_T$, $MV_K$, and $MV_M$ are the capitalized values of profits due to tangible assets, real and pecuniary Ricardian rents, and monopoly profits, respectively, and where the time subscripts have been suppressed. Excess value is $EV = MV - MV_T + MV_K + MV_M$. Like the Lerner index, relative excess value $EVS$ is neutral with respect to factor proportions and leverage. This is particularly desirable when working with large cross sections of firms. Risk, inflation, and other opportunity costs are reflected in $EVS$ but not in the Lerner index.
related to Tobin’s $q$ ($MV$/replacement cost) and has been used in a number of earlier studies [see Thomadakis for an example].

One point deserves further discussion. While accounting data provide a backward-looking measure of profitability, the excess value measure provides a forward-looking measure of profit. As Ross suggests, the differences between profit measures provide an important opportunity to assess the information content of accounting profit data and market-based profit measures [Ross (1983, p. 376)]:

> 'The prices that the markets place on the securities issued by the firms and the changes in these values over time provide an ongoing assessment of the value of such firms. Accounting data, on the other hand, provide an alternative view of the same firms. The information on the balance sheets and in the income statements provides a historical record of where the firm has been and where it currently stands. One way to view the accounting data is to think of them as providing information on the resources used by the firm and on its performance. Comparing accounting data with market data, then, provides us with a comparison between two ways of looking at the same thing, and such comparisons will be valuable for both.'

Accordingly, although we have less confidence in the accounting data, we shall use accounting and market value based profit measures in our statistical work. The details of measurement and calculation are, for the most part, relegated to the appendix. Several features of our data analysis are quite important and are discussed next.

4.2. Regression model

To test our hypotheses, we adopted the regression model Mueller (1977) used,

$$P_{ij_t} = \alpha_{ij} + \beta_{ij}(1/TIME) + e_t, \quad \text{where}$$

(12)

$P_{ij_t} =$ the probability of being in profit class $j$ in period $t$ conditional on starting in profit class $i$,

$\alpha_{ij} =$ the long-term probability of moving from profit class $i$ to profit class $j$,

$\beta_{ij} =$ slope coefficient which indicates the speed of movement from profit class $i$ to profit class $j$,

$e_t =$ error term.

As $\beta_{ij}$ is smaller, $\beta_{ij}(1/TIME)$ is smaller and the $P_{ij_t}$ is closer to $\alpha_{ij}$, the long-run probability of profit class mobility.
This model is particularly relevant for capturing adjustment paths as shown by lines A and C in fig. 1a.

The probability of a firm in group $i$ in the initial period moving to group $j$ in period $t$ ($P_{ijt}$) is

$$P_{ijt} = \frac{N_{ijt}}{N_i^*},$$

(13)

where $N_{ijt}$ is the number of firms in profit group $i$ in the first year that move into profit group $j$ in period $t$ and $N_i^*$ equals the number of firms in the $i$th profit class in the first period. Our probability calculations yield the aggregate probability of moving to a particular profit class in any time period from an initial period profit class. Obviously, our probability calculation depends critically on how we define our profit classes. We take up this issue next.

4.3. Probability calculations

The crucial decision we had to make concerned the boundaries of each profit class. We perceived two major alternatives: first, define profit class so as to give each equal probability or second, define profit classes as equal-sized intervals of the distribution of profit rates. Mueller (1977) selected the first alternative but as we argued earlier (see footnote 3) this is appropriate only when the underlying data confirm the independence of initial and terminal profit class performance. Our contingency table analysis reveals otherwise so we chose to define the profit classes by selecting equal-sized intervals of the profit rate distribution (though not equal-sized in terms of the number of firms in each class). Since the profit class boundaries are arbitrary under our scheme and the resulting calculations might be sensitive to our choice, we used several different profit class lengths in performing our tests.

Table A.1 in the appendix presents the scheme we used to find the profit classes for classifying firms in our sample for each year in more detail. The profit class boundaries were reset each year using the first two moments of the profit rate distribution for that year. This eliminates movement between profit classes due solely to cyclical influences.

4.4. Test procedures

In order to subject our hypotheses to joint $F$-tests and to gain maximum efficiency, we stacked the data and used dummy intercept variables and dummy slope variables. The tests are summarized in table 1. We illustrate this method using Test 6a as an example. The data matrices were set up
Table 1
Specific forms of tests of Hypotheses A–E.

I. Hypothesis A
Test 1: (a) $P_{14} > 0$

II. Hypothesis B
Test 2: (a) $P_{11} < P_{22} < P_{33} < P_{44}$
Test 3: (a) $P_{44} > P_{46} > P_{66} > P_{77}$

III. Hypothesis C
Test 4: (a) $P_{11} < P_{12} < P_{13} < P_{14}$
(b) $P_{22} < P_{23} < P_{24}$
(c) $P_{33} < P_{34}$
Test 5: (a) $P_{77} < P_{76} < P_{75} < P_{74}$
(b) $P_{66} < P_{65} < P_{64}$
(c) $P_{53} < P_{54}$

IV. Hypothesis D
Test 6: (a) $P_{41} < P_{42} < P_{43} < P_{44}$
(b) $P_{31} < P_{32} < P_{33}$
(c) $P_{21} < P_{22}$
Test 7: (a) $P_{47} < P_{46} < P_{45} < P_{44}$
(b) $P_{57} < P_{56} < P_{55}$
(c) $P_{67} < P_{66}$

V. Hypothesis E
Test 8: (a) $P_{21} < P_{23} < P_{24}$
(b) $P_{31} < P_{32} < P_{34}$
Test 9: (a) $P_{57} < P_{56} < P_{54}$
(b) $P_{67} < P_{65} < P_{64}$

as follows:

$$
\begin{bmatrix}
P_{41} \\
P_{42} \\
P_{43} \\
P_{44}
\end{bmatrix} =
\begin{bmatrix}
1 & 0 & 0 & 1 & X_1 & 0 & 0 & X_4 \\
0 & 1 & 0 & 1 & X_2 & 0 & X_4 \\
0 & 0 & 1 & 0 & 0 & X_3 & X_4 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & X_4
\end{bmatrix}
\begin{bmatrix}
DUMi \\
INT \\
SLPDUMi \\
SLOPE
\end{bmatrix}
+ \begin{bmatrix}
e_1 \\
e_2 \\
e_3 \\
e_4
\end{bmatrix}
\tag{14}
$$
\[ P_{4t} = 19 \times 1 \text{ vector of observations on the probability of being in profit class } i \text{ in time period } t \text{ conditional on being in profit class 4 in the initial period,} \]

\[ t = 19 \times 1 \text{ unit vector,} \]

\[ X_{1} = 19 \times 1 \text{ vector of values on the independent variable, } 1/TIME (T=2, 3, \ldots, 20), \]

\[ 0 = 19 \times 1 \text{ vector of zeros,} \]

\[ DUM_{i} = 3 \times 1 \text{ vector of dummy intercept variables estimates,} \]

\[ INT = \text{intercept estimate,} \]

\[ SLPDUM_{i} = 3 \times 1 \text{ vector dummy slope variable estimates,} \]

\[ SLOPE = \text{slope variable estimate,} \]

\[ e_{t} = 19 \times 1 \text{ vector of residuals.} \]

The intercept estimates corresponding to \( P_{4i} \) \((i<4)\) are found by adding the appropriate dummy variable estimate to \( INT \). A completely analogous procedure will determine individual slope estimates.

Joint tests of the Test 6, \( P_{ij}<P_{ik} \) (for \( \Pi_{ip} \)), were performed by testing the following hypotheses jointly:

\[ DUM_{2} - DUM_{1} = 0, \quad DUM_{3} - DUM_{2} = 0, \quad DUM_{3} = 0. \]

Individual \( t \)-tests can also be performed using the \( DUM_{i} \) estimates. For example, to test that \( P_{41} < P_{44} \), it is sufficient to test whether the \( DUM_{i} \) coefficient corresponding to \( P_{41} \) is negative against the alternative that it is zero. Similarly, to test whether \( P_{41} < P_{42} \), it is sufficient to test whether the difference between the respective \( DUM_{i} \) coefficients is negative against the alternative that the difference is zero.

5. Test results

Our hypotheses and test results are summarized in table 2. The strictest test of our hypotheses is for the case when the profit class interval is the smallest, namely half a standard deviation in length, because this makes the non-zero profit classes large relative to the size of the zero profit class. Our discussion will focus on the results from this construction of the profit classes. Interestingly and importantly, there are no qualitative differences between the results when the interval width is 0.50\( \sigma \) and when the profit class intervals are 0.75\( \sigma \) or \( \sigma \).

Tables 4 and 5 contain the estimated probabilities of movement between the profit classes for the excess value and accounting profit measures, respectively. These tables might be compared to table I in Mueller (1977, p. 373). Because our tests do not focus on two-way comparisons of the probabilities, we leave further consideration of the two tables to the reader.
<table>
<thead>
<tr>
<th>Hypothesis/test</th>
<th>EVS results</th>
<th>Accounting profit results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F-ratio (d.f.)</td>
<td>Probability relations</td>
</tr>
<tr>
<td><strong>Hypothesis B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test 2: $P_{11} &lt; P_{22} &lt; P_{33} &lt; P_{44}$</td>
<td>13.26 (3, 64)</td>
<td>$P_{44} &gt; P_{11}, P_{22}, P_{33}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$P_{11} &gt; P_{33} &gt; P_{22}$</td>
</tr>
<tr>
<td>Test 3: $P_{44} &gt; P_{55} &gt; P_{66} &gt; P_{77}$</td>
<td>18.05 (3, 64)</td>
<td>$P_{44} &gt; P_{55} &gt; P_{66} &gt; P_{77}$</td>
</tr>
<tr>
<td><strong>Hypothesis C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test 4: (a) $P_{11} &lt; P_{12} &lt; P_{13} &lt; P_{14}$</td>
<td>2.52 (3, 64)</td>
<td>$P_{11} = P_{13} = P_{14} &gt; P_{12}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$P_{22} &lt; P_{23} &lt; P_{24}$</td>
</tr>
<tr>
<td>(b) $P_{22} &lt; P_{23} &lt; P_{24}$</td>
<td>16.35 (2, 48)</td>
<td>$P_{22} &lt; P_{23} &lt; P_{24}$</td>
</tr>
<tr>
<td>(c) $P_{33} &lt; P_{34}$</td>
<td>-4.61 (32)</td>
<td>$P_{33} &lt; P_{34}$</td>
</tr>
<tr>
<td>Test 5: (a) $P_{77} &lt; P_{76} &lt; P_{75} &lt; P_{74}$</td>
<td>12.79 (3, 64)</td>
<td>$P_{77} = P_{76} &lt; P_{75} = P_{74}$</td>
</tr>
<tr>
<td>(b) $P_{66} &lt; P_{65} &lt; P_{64}$</td>
<td>6.51 (2, 50)</td>
<td>$P_{66} &lt; P_{65} &lt; P_{64}$</td>
</tr>
<tr>
<td>(c) $P_{55} &lt; P_{54}$</td>
<td>-3.06 (33)</td>
<td>$P_{55} &lt; P_{54}$</td>
</tr>
</tbody>
</table>

*Tests 4c and 5c are one-tailed t-tests and the corresponding t-value will be negative under the null hypothesis.
Table 3

Results for Hypotheses D and E for EV/S and accounting profit measures.*

<table>
<thead>
<tr>
<th>Hypothesis/test</th>
<th>$EV/S$ results</th>
<th>Accounting profit results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F$-ratio (d.f.)</td>
<td>Probability relations</td>
</tr>
<tr>
<td><strong>Hypothesis D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test 6: (a) $P_{41} &lt; P_{42} &lt; P_{43} &lt; P_{44}$</td>
<td>43.51 (3, 64)</td>
<td>$P_{42} &lt; P_{41} &lt; P_{43} &lt; P_{44}$</td>
</tr>
<tr>
<td></td>
<td>(b) $P_{31} &lt; P_{32} &lt; P_{33}$</td>
<td>12.03 (2, 48)</td>
</tr>
<tr>
<td></td>
<td>(c) $P_{21} &lt; P_{22}$</td>
<td>5.59 (32)</td>
</tr>
<tr>
<td>**Test 7: (a) $P_{47} &lt; P_{46} &lt; P_{45} &lt; P_{44}$</td>
<td>44.97 (3, 64)</td>
<td>$P_{44} &lt; P_{46} &lt; P_{45} &lt; P_{44}$</td>
</tr>
<tr>
<td></td>
<td>(b) $P_{57} &lt; P_{56} &lt; P_{55}$</td>
<td>8.95 (2, 50)</td>
</tr>
<tr>
<td></td>
<td>(c) $P_{67} &lt; P_{66}$</td>
<td>$-0.47$ (33)</td>
</tr>
<tr>
<td><strong>Hypothesis E</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test 8: (a) $P_{21} &lt; P_{23} &lt; P_{24}$</td>
<td>12.45 (2, 50)</td>
<td>$P_{23} &lt; P_{22} &lt; P_{21}$</td>
</tr>
<tr>
<td></td>
<td>(b) $P_{31} &lt; P_{32} &lt; P_{34}$</td>
<td>40.05 (2, 48)</td>
</tr>
<tr>
<td>Test 9: (a) $P_{51} &lt; P_{52} &lt; P_{54}$</td>
<td>21.18 (2, 50)</td>
<td>$P_{52} &lt; P_{51} &lt; P_{54}$</td>
</tr>
<tr>
<td></td>
<td>(b) $P_{67} &lt; P_{65} &lt; P_{64}$</td>
<td>12.57 (2, 50)</td>
</tr>
</tbody>
</table>

*Tests 6c and 7c are one-tailed $t$-tests and the corresponding $t$-value will be negative under the null hypothesis.
Table 4
Estimated probabilities of profit class movement for classes 1–7 using excess value profit measure.*

<table>
<thead>
<tr>
<th>Initial profit class</th>
<th>Terminal profit class</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>0.214</td>
<td>0.144</td>
<td>0.272</td>
<td>0.278</td>
<td>0.044</td>
<td>−0.002</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.07)</td>
<td>(8.35)</td>
<td>(9.64)</td>
<td>(4.52)</td>
<td>(4.32)</td>
<td>(0.72)</td>
<td>(0.51)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.974</td>
<td>0.026</td>
<td>0.246</td>
<td>0.584</td>
<td>0.039</td>
<td>0.004</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.35)</td>
<td>(0.75)</td>
<td>(3.18)</td>
<td>(8.87)</td>
<td>(1.28)</td>
<td>(0.44)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>−0.001</td>
<td>−0.001</td>
<td>0.164</td>
<td>0.695</td>
<td>0.132</td>
<td>0.007</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(−0.02)</td>
<td>(−0.29)</td>
<td>(5.06)</td>
<td>(8.71)</td>
<td>(2.83)</td>
<td>(0.33)</td>
<td>(0.44)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.075</td>
<td>0.060</td>
<td>0.110</td>
<td>0.620</td>
<td>0.130</td>
<td>−0.030</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.94)</td>
<td>(2.82)</td>
<td>(3.05)</td>
<td>(9.47)</td>
<td>(3.17)</td>
<td>(−2.34)</td>
<td>(0.31)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.044</td>
<td>0.054</td>
<td>0.111</td>
<td>0.544</td>
<td>0.115</td>
<td>−0.006</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.10)</td>
<td>(7.12)</td>
<td>(3.00)</td>
<td>(4.88)</td>
<td>(2.53)</td>
<td>(−0.42)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0.030</td>
<td>0.019</td>
<td>0.088</td>
<td>0.522</td>
<td>0.140</td>
<td>−0.012</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.55)</td>
<td>(2.69)</td>
<td>(6.62)</td>
<td>(3.13)</td>
<td>(1.87)</td>
<td>(−0.28)</td>
<td>(0.39)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>0.008</td>
<td>0.006</td>
<td>0.027</td>
<td>0.354</td>
<td>0.638</td>
<td>−0.108</td>
<td>−0.012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.16)</td>
<td>(2.36)</td>
<td>(2.59)</td>
<td>(2.69)</td>
<td>(5.94)</td>
<td>(−3.12)</td>
<td>(−0.17)</td>
</tr>
</tbody>
</table>

*Each probability was estimated from an autoregressive model of order 0–4 chosen through application of a likelihood ratio test for discriminating the appropriate order of the autocorrelation process. No cross equation constraints were employed. T statistics are reported in parentheses below the coefficient estimates. None of the firms which started in the second profit class were ever found in class seven which accounts for the zero in the table.

Table 5
Estimated probabilities of profit class movement for classes 1–7 using accounting profit measure.*

<table>
<thead>
<tr>
<th>Initial profit class</th>
<th>Terminal profit class</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>0.248</td>
<td>0.195</td>
<td>0.214</td>
<td>0.190</td>
<td>0.096</td>
<td>0.045</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.99)</td>
<td>(13.13)</td>
<td>(8.29)</td>
<td>(4.01)</td>
<td>(10.01)</td>
<td>(4.71)</td>
<td>(8.53)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.162</td>
<td>0.099</td>
<td>0.329</td>
<td>0.247</td>
<td>0.137</td>
<td>0.064</td>
<td>0.034</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.13)</td>
<td>(6.46)</td>
<td>(7.72)</td>
<td>(5.76)</td>
<td>(7.60)</td>
<td>(6.92)</td>
<td>(3.80)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>0.054</td>
<td>0.134</td>
<td>0.231</td>
<td>0.361</td>
<td>0.146</td>
<td>0.058</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.76)</td>
<td>(9.07)</td>
<td>(11.32)</td>
<td>(9.98)</td>
<td>(15.49)</td>
<td>(7.89)</td>
<td>(5.87)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.031</td>
<td>0.031</td>
<td>0.221</td>
<td>0.344</td>
<td>0.213</td>
<td>0.061</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.16)</td>
<td>(6.16)</td>
<td>(8.23)</td>
<td>(18.07)</td>
<td>(11.16)</td>
<td>(9.19)</td>
<td>(7.91)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.023</td>
<td>0.059</td>
<td>0.186</td>
<td>0.364</td>
<td>0.222</td>
<td>0.082</td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.74)</td>
<td>(8.75)</td>
<td>(4.09)</td>
<td>(18.40)</td>
<td>(4.14)</td>
<td>(6.23)</td>
<td>(7.45)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0.015</td>
<td>0.138</td>
<td>0.144</td>
<td>0.330</td>
<td>0.281</td>
<td>0.081</td>
<td>0.098</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.20)</td>
<td>(4.48)</td>
<td>(8.82)</td>
<td>(17.55)</td>
<td>(10.49)</td>
<td>(3.57)</td>
<td>(8.15)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>0.039</td>
<td>0.047</td>
<td>0.163</td>
<td>0.249</td>
<td>0.305</td>
<td>0.112</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.57)</td>
<td>(7.33)</td>
<td>(10.33)</td>
<td>(11.29)</td>
<td>(12.38)</td>
<td>(3.76)</td>
<td>(3.78)</td>
</tr>
</tbody>
</table>

*See note for Table 4.
While our statistical tests are constructed so that an $F$- or $t$-value determines whether an hypothesis fails, much interesting information is contained in direct examination of the estimated probabilities.\textsuperscript{11} Study of these relationships leads to a modified assessment of the efficacy of the competitive market hypothesis compared to what would be concluded based on the joint hypothesis test statistics alone. Specifically, we find that while the competitive market hypothesis (in its weaker form) provides a reasonable description of behavior for profit classes 3–7, something different seems to be at work for profit classes 1 and 2. To highlight this our discussion of the tests focusses on broader trends in the results.

The results in Tables 2 and 3 strongly suggest that adjustment of positive profits toward zero does not proceed as predicted by our hypotheses. Half the tests of positive profit adjustment, Tests 2, 4a, 6c, and 8a, indicate it is less likely that profits move toward zero than persist or increase. Interestingly, no hypothesis about adjustment of positive profits toward zero involving the top two profit classes is confirmed by the data. Where we find support for the competitive market hypothesis (Test 4b, 4c, 6b and 8b), the tests primarily involve profit classes 3 and 4. Presumably, there is something special about the occupants of the top two profit classes which accounts for this outcome. Our study provides no direct evidence on the cause(s) of this but Mueller's recent work (1985) investigates the source of persistence.

By contrast, adjustment of negative profits toward zero works exactly as predicted by our hypothesis. Test 4 and each part of Test 5 are consistent with our predictions. These results may simply reflect the bias in sample selection: only firms which survive are in the sample. It seems just as likely, however, that exit barriers are relatively unimportant and do not prevent reallocation of capital away from low return uses.

Another set of tests (8 and 9) compares the probabilities of movement away from or toward zero profits for firms currently earning non-zero profits. The dichotomy of results for positive and negative profits continues. For firms initially earning positive profits, we find it is more likely profits will increase (Test 8a) in one case. In the other test (8b), the highest probability is for movement to the top profit class. By contrast, the hypothesized probabilities of movement for firms initially earning losses (Test 9) are confirmed almost exactly by the data.

\textsuperscript{11}There are nine equations estimated for each test for each profit measure. The basic model we estimated is given by (12) and includes a first-order maximum likelihood autocorrelation correction. We modified this model in three ways: (1) adding a wage/price control dummy as a right side variable; (2) including a dummy variable for the 'oil shock' that occurred in the early 70's; and (3) including both dummies as right-hand side variables. We also estimated the basic model using a second-order maximum likelihood autocorrelation correction. For the other four regressions, we transformed the dependent variable to correspond to a logit model. See Pindyck and Rubinfeld (1976, pp. 24-751) for a discussion of this. We then estimated the basic and the three dummy variable models just mentioned using a maximum likelihood first-order autocorrelation correction. All regressions were run using Version 4.1 of SHAZAM (White 1978).
Tests 6 and 7 provide some insights into other aspects of profit adjustment. Essentially, we find that firms which initially earn zero profits are more likely to continue earning zero profits than gain positive profits or suffer losses. For firms beginning in profit class 3, 5, or 7, our hypotheses about relative probabilities of movement are confirmed. As noted earlier, our test involving profit classes 1 and 2 (Test 6c) fails.

A final important finding of our study concerns the inferences drawn from our stock market and accounting profit measures. The right-most columns of tables 2 and 3 contain results for the accounting profit measure and they are virtually identical to our results for the EVS measure. Accordingly, we are somewhat skeptical of the empirical importance of claims (reviewed earlier) about the unsuitability of accounting data for long-run analyses. While further work on the circumstances under which accounting and market value data yield the same inferences is certainly desirable, our findings suggest it is premature to eschew use of accounting data in industrial organization studies.

6. Conclusions

The results of our inquiry seem to paint the following picture of the competitive process. Economic profits are clearly not independent over time. For reasons we have not attempted to identify, the profits of a firm are not time independent even after nearly two decades. This result holds for market-value based and accounting profit measures. The causes of this dependence need further study.

In addition to evidence of dependence, our tests for the existence of the profit adjustment mechanism produce an interesting dichotomy according to whether positive or negative profits are involved. For negative profits, the predictions from the neoclassical profit adjustment model are generally confirmed by the data. By contrast, our hypotheses about positive profits meet with less success in explaining the data. The decline in the predictive power of the neoclassical model is more serious as profits increase. The fact that profits may persist in the two highest profit classes is not prima facie evidence of anti-competitive behavior. Our work does not discriminate between two possible (though conflicting) explanations for such persistence: structural barriers that protect profits versus greater efficiency.

Two important qualifications must be appended to our analysis. Where the market appears to work, it also appears to do so slowly. Complete adjustment of profits rarely occurs within a decade and in many cases is incomplete even after 20 years. This raises important questions about the vitality of market forces and obviously places a premium on understanding the reasons for profit adjustment behavior.

Since the reasons for persistence and slow adjustment are not known, this
analysis does not provide a foundation for arguing the redundancy of antitrust policy. Our results cannot be interpreted as evidence about the profit adjustment mechanism's vitality in specific industries and provides no evidence about those features of individual industries which aid or impede the market mechanism. These questions merit further study.

Appendix

In this appendix we describe the methods we employed to generate the different profit measures and associated samples. We also discuss how we established the profit class boundaries.

The excess value measure we used is given by \( EVS = \frac{(MV - BV)}{S} \) where we have normalized to eliminate firm size effects. Using COMPUSTAT data, \( MV \) is measured as the firm's closing stock price multiplied by the number of outstanding shares adjusted for stock splits. Book value was proxied by total assets minus the sum of common equity and preferred stock value. To find our sample we identified all those firms with the required data for our 20-year sample. There were 751 firms meeting this criterion. We also used a variant of the more traditional accounting profit measure used by Mueller in his original study. We divided after-tax income by total assets to produce this profit measure. There were 821 firms in this sample.

Table A.1 explains our profit rate classification scheme. For both of our profit rate measures, we calculated the probabilities for \( \varepsilon = 0.5, 0.75, \) and 1, thereby producing six sets of data for analysis. We reset the boundaries for each year using the relevant distributional moments for that year. Using the IBM 3081 system at the Triangle Universities Computation Center, it took approximately one hour of computer time per data set to convert the COMPUSTAT data to regression program input.

<table>
<thead>
<tr>
<th>Profit class</th>
<th>Profit class description</th>
<th>Profit class boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very high profits</td>
<td>+( \infty )</td>
</tr>
<tr>
<td>2</td>
<td>High profits</td>
<td>( Z_u + 2\sigma )</td>
</tr>
<tr>
<td>3</td>
<td>Modest profits</td>
<td>( Z_u + \sigma )</td>
</tr>
<tr>
<td>4</td>
<td>Zero economic profits</td>
<td>( Z_u )</td>
</tr>
<tr>
<td>5</td>
<td>Modest losses</td>
<td>( Z_L - \epsilon )</td>
</tr>
<tr>
<td>6</td>
<td>High losses</td>
<td>( Z_L - 2\sigma )</td>
</tr>
<tr>
<td>7</td>
<td>Very high losses</td>
<td>( Z_L - \epsilon )</td>
</tr>
</tbody>
</table>

\( Z_u = \mu + \sigma /2 \) where \( \mu \) is the mean of the economic profit rate distribution, \( \sigma \) = standard deviation of the particular profit rate distribution and \( \epsilon \) is a constant taking on values of \( 0.5, 0.75, \) and 1 alternatively. \( Z_L = \mu - \sigma /2 \).
References