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FACULTY WORKING
PAPER NO. 1183

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September, 1985

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Abstract

This study suggests that simulated mergers can be used to help evaluate the effects of diversification on corporate performance. The results, which are consistent with a risk-reduction motive for conglomerate diversification, imply that conglomerate strategies focused on fewer and larger units may be advantageous in terms of certain measures of risk and return. Forecast error is used here to measure strategic risk and return on equity is used to measure return.

Using Simulated Mergers to Evaluate Corporate Diversification Strategies

INTRODUCTION

The purpose of this paper is to suggest that simulated mergers of actual firms (Silhan, 1982) can be used to provide benchmarks for guaging corporate performance and evaluating alternative diversification strategies. To illustrate this point, the data of single-product firms are aggregated in various n-segment combinations to provide several accounting benchmarks.[1] This methodology, which is new to the strategy literature, avoids some of the measurement problems associated with composition differences and corporate synergies.[2]

For conglomerates it is demonstrated here that size effects, in addition to scope effects, should be considered when guaging corporate performance. First, however, some of the main issues associated with conglomerate diversification are identified. This is followed by a description of the simulated-merger approach and the design of the current study. Finally, some empirical results are presented which illustrate the usefulness of simulated mergers for strategy evaluation.

DIVERSIFICATION STRATEGIES

Diversification strategies create corporate entities having a variety of composition characteristics. Three of these characteristics, the size, the number, and the composition of business units, are particularly important with respect to strategy evaluation. Empirical research has found, for example, that strategies involving unrelated business units generally do not offer performance advantages relative

to other strategies (Bettis, Hall and Prahalad (1978), Bettis and Hall (1982), Christensen and Montgomery (1981), Dundas and Richardson (1982), Leontiades (1980), Montgomery (1979), Rumelt (1974, 1982), Salter and Weinhold (1979), and McDougall and Round (1984)). On the other hand, some conglomerates have been very successful with their acquisition strategies (Dundas and Richardson (1982)).

This paper suggests that simulated mergers can be used to provide accounting benchmarks which can be used to evaluate risk-return effects of nonsynergistic mergers, such as those of the pure unrelated variety. Its design has been influenced by (1) the plausibility of a risk-return rationale for conglomerate diversification, (2) the importance of incorporating managerial perceptions of risk in merger evaluation, and (3) the effects of alternative merger strategies on performance. These issues are discussed below.

Risk-Return Tradeoffs

It appears that risk-return tradeoffs are important to managers who make diversification decisions. Salter and Weinhold (1978), Dundas and Richardson (1982), Lewellen (1971), and Beattie (1980), among others, have investigated the strategy implications of a risk-return rationale for conglomerates. This rationale can be expressed in terms of the following two complementary propositions:

> Proposition I: Conglomeration provides an opportunity to increase market value when risk can be reduced while holding return at essentially the same level.

Proposition II: Conglomeration provides an opportunity to increase market value when return can be increased while holding risk at essentially the same level.

Smith (1976) and others have observed that manager-controlled firms tend to have smooth income streams relative to owner-controlled firms. This behavior would be consistent with a managerial attitude of risk aversion. Amihud and Lev (1981) suggest that risk averse managers would engage more actively in mergers which tend to stabilize earnings and perhaps even reduce any risk of bankruptcy. Song (1983) argues that mergers do indeed smooth sales and earnings; Marshall, Yawitz and Greenberg (1984) have found that conglomerates appear to diversify into industries which reduce profit volatility.

Most objections to a risk-reduction rationale come from those who argue that conglomeration would not benefit shareholders because they could always diversify away nonsystematic risks in an efficient capital market (for example, Levy and Sarnat, 1970; Copeland and Weston, 1979). Managers would therefore be expected to focus on returns.

Others, however, argue that imperfect markets provide opportunities to create value by making debt safer (Lewellen, 1971) and reducing bankruptcy risk (Higgins and Schall, 1975). Williamson (1975) suggests that the unrelated acquisition can be defended in terms of resource allocation. He argues that more favorable financial terms can be negotiated for the parent company than for the divisions acting alone. A conglomerate might thus serve as an internal capital

market which reduces the cost of capital and improves allocative efficiency.

Risk Perceptions

Unfortunately very little is known about how managers actually perceive risk. Therefore, even though risk is an ex ante concept, it is usually measured ex post (Bowman, 1982: 34). Armour and Teece (1978), Bettis and Hall (1982), Bowman (1980) and others have used income variability as a proxy for risk. This measure, however, may not properly reflect corporate risk perceptions (Litzenberger and Rao, 1971).

Barefield and Comiskey (1975) argue that only the unpredictable portion of earnings variability should have an effect on market returns. They suggest that forecast error might therefore be used to represent corporate risk. They have found a stronger association between forecast error and systematic risk than between earnings variability and systematic risk. In essence, forecast error can be viewed as the difference between expectations and realizations.[3]

Conglomerate Performance

Considerable research has been devoted to evaluating the financial performance of conglomerates. In general this research indicates that conglomerates do not outperform mutual fund portfolios (Smith and Schreiner, 1969; Mason and Goudzwaard, 1976; Smith and Weston, 1977). However, when compared to nonconglomerate firms, conglomerates do seem to reduce risk (Melicher and Rush, 1974; Beattie, 1980; Holzmann, Copeland and Hayya, 1975; Beedles, Joy, and Ruland, 1982).

In the strategy area Bettis and Hall (1982), Christensen and Montgomery (1981), Rumelt (1974, 1982), Salter and Weinhold (1979), and others have found that unrelated strategies have not provided superior risk-pooling opportunities when compared to related diversification strategies. Few studies, however, have investigated the effects of business unit size on conglomerate performance. Lubatkin (1983: 224) suggests that this issue should be examined further.

Treacy (1980) and Bowman (1980) have noted a strong negative correlation between firm size and the variability of return on equity for a sample of COMPUSTAT firms drawn from 54 industries, while Hall and Weiss (1967) and Pomfret and Shapiro (1978) have noted a strong positive relationship between firm size, scope of diversification, and profit stability. Kitching (1967, 1974), upon analyzing U.S. and U.K. mergers, has found a strong association between unsuccessful mergers and small relative size; Biggadike (1979) has found for new products that large-scale ventures appear to outperform comparable small-scale ventures.

RESEARCH DESIGN

Strategy Simulation

This study uses simulated mergers involving actual single-product firms to provide benchmark accounting data for evaluating diversification alternatives. Hall (1976) and Hall and Menzies (1983) have used simulation for strategy research. Hall (1979) examined strategic decision-making processes from two different perspectives: population ecology (Aldrich (1979)) and systems dynamics (Forrester (1968)).

Using these paradigms, insights and propositions about the effects of strategy evolution on the Saturday Evening Post were provided.

From an industrial organization perspective, Porter and Spence (1982) modelled decisions to expand capacity in the corn milling industry. A simulation methodology was used to examine the industry effects to carry out an analysis of strategy formulation.

Hertz and Thomas (1983, 1984) adopted "risk analysis" to examine risk-taking and risk-handling in strategic management. They provided an extensive set of case studies--involving capital investment, acquisition and diversification decisions--which depicted risk in terms of probabilistic scenarios of performance outcomes. They argue that such risk analyses and scenarios, which serve as "lenses" for strategic thinking, can be used as inputs for policy dialogues about strategy options and choices.

The above studies demonstrate how simulations can be used for business research. In this paper it is suggested that simulated mergers can be used in such research to evaluate alternative corporate strategies.

Simulated Mergers

Simulated mergers (Silhan, 1982) have been used for accounting research to investigate a number of financial reporting issues (Hopwood, Newbold, and Silhan, 1982; Silhan, 1983; Silhan, 1984). These studies examined the effects of data aggregation on predictions of conglomerate earnings.

In essence, a simulated merger generates hypothetically merged n-segment combinations of actual firms. While these combinations are

hypothetical, the underlying data are not. Only published accounting data are used.[4]

The current study focuses on the effects of conglomerate mergers on risks and returns. It concentrates upon nonsynergistic performance and is confined to mergers of single-product firms of approximately the same size. Average earnings are used to measure segment size (see Appendix A). The number of firms in a given conglomerate, i.e., the segment count, is used to measure diversification.[5]

As an accounting matter, these mergers were treated as poolings. Therefore the financial results of a given conglomerate are simply the sum of the results of its segments. Furthermore, by design, these n-segment conglomerates were not subject to intersegment transfers, common cost allocations, and changes in reporting entity due to acquisition and divestitures. By merging autonomous firms, intersegment allocations and transactions were avoided since there are no common costs or intersegment transactions.

While these conditions may seem overly restrictive, it has been noted that most conglomerates have small corporate staffs (Berg, 1973; Pitts, 1977) and tend to operate as an agglomeration of self-sufficient units (Dundas and Richardson, 1982). Furthermore, while conglomerate mergers represent nonsynergistic combinations, it is generally assumed that unrelated units would generate few, if any, synergies (see, for example, Amihud and Lev (1981)).[6]

Component Firms

Firms with complete income data (1967-I to 1978-IV) were screened to include only domestically registered corporations that were neither

holding companies nor owned subsidiaries. Each firm was required to have four or less 3-digit SIC codes.[7]

Next, combinations of firms were screened to ensure conglomerate diversification. Firms were ranked by size (measured in terms of average earnings) in descending order to produce subgroups that could be considered as potential segment portfolios. Only firms of approximately the same size were merged together in order to control for confounds due to segment proportions.[8]

Firms were reviewed sequentially from largest to smallest, and combinations of segments were screened for (1) industry diversification, (2) product singularity, and (3) reporting consistency. Each firm in a given n-segment conglomerate was required to have a set of SIC codes unique to the conglomerate (to ensure industry diversification); each firm was required to have nonsignificant product-line disclosures (to ensure product singularity); and each firm was reviewed for major acquisitions during the sample period (to ensure reporting consistency). After several iterations, 60 firms were selected for merging (see Appendix B).

Aggregation Criteria

Existent autonomous firms were aggregated to form nine sets of n-segment conglomerates.[9] Starting each time with the largest component firm in the 60-firm array, contiguous firms were merged in groups of ten, nine, eight, seven, six, five, four, three, and two to form six 10-segment, six 9-segment, six 8-segment, eight 7-segment, ten 6-segment, twelve 5-segment, fourteen 4-segment, twenty 3-segment and thirty

2-segment conglomerates. These conglomerates were partitioned by size and number of segments.[10]

Performance Measures

Mean absolute percentage error (MAPE) and return on equity (ROE) were used to measure risk and return, respectively. These measures were computed as follows:

$$MAPE = \frac{1}{3N} \sum_{i=1}^{N} \sum_{t=76}^{78} \frac{|\hat{ROE}_{it} - ROE_{it}|}{|ROE_{it}|} \times 100$$

$$ROE_{it} = \frac{NI_{it}}{E_{i,t-1}} \times 100$$

where

NI_{it} = net income of conglomerate i for period t,

$E_{i,t-1}$ = beginning stockholders equity of conglomerate i for period t,

$\hat{ROE}_{it}$ = predicted ROE of conglomerate i for period t,

ROE_{it} = actual ROE of conglomerate i for period t,

N = number of conglomerates indexed by i.

Univariate autoregressive-integrated-moving average (ARIMA) models were used to forecast net income deflated by beginning stockholders equity. This forecasting approach utilizes a family of models from which an appropriate model is identified that is specific to the data in each time series (Box and Jenkins, 1970). In essence, each time series is viewed as a system of inputs (past observations) and outputs

(future observations). The data are analyzed to determine a statistical model that describes the behavior of each time series.

MAPEs and ROEs were evaluated for a three-year holdout period (1976-78) in order to measure risks and returns. Errors were defined in terms of forecasting performance during this holdout period and all forecasts were based on 36 quarterly observations. Mean errors were computed for annual forecasts by adding together quarterly predictions. These forecasts were made for the first four quarters of each calendar year in the holdout period and the ARIMA models were re-identified and re-estimated for each set of predictions.[11] Conglomerate forecasts were derived by adding together the segment forecasts.

ILLUSTRATIVE RESULTS

The results presented here demonstrate how much the composition of a conglomerate can affect accounting measures of performance. There were sigificant performance differences between large-segment and small-segment firms.

Table 1, based on annual forecasts and depicted in Figure 1, indicates that the forecast errors associated with large-segment firms were generally smaller when compared with small-segment firms. This was true for conglomerates formed from two to ten segments. As expected, the mean errors declined as the number of segments increased. Since the ROEs were essentially equivalent across groups, Proposition I was supported.

INSERT TABLE 1 AND FIGURE 1 ABOUT HERE

IMPLICATIONS

Several implications can be drawn from these results. First, under conditions of no synergy, it appears that conglomeration, as expected, can be an effective risk-reduction strategy. Forecast errors decrease as the number of segments increases. This relationship supports the notion that improvements in predictability could underlie some diversification strategies.

Second, conglomerates with more segments appeared to improve their risk-return performance. That is, they achieved the same or similar ROE with less forecast error. Also, since there was little risk reduction beyond a given number of segments, a diversification strategy involving fewer segments might be strategically advantageous in some cases.

Third, consistent with the literature on size effects (for example, Gold (1981)), mergers formed from large units outperformed those formed from small units. This suggests that it may be better for acquiring firms to avoid small firms in merger situations since small-segment combinations tend to exhibit higher risk with essentially the same return. Also, since large-segment combinations are associated with lower risks and more predictable corporate earnings, less corporate monitoring might be needed.

CONCLUDING REMARKS

The use of the simulated merger approach to investigate the effects of pure conglomerate diversification appears worthwhile. The results provide benchmarks that can be used to evaluate the performance of

various business combinations. Evidence presented here supports a risk reduction rationale for unrelated mergers and suggests that absolute size may be an important variable in merger decisions.

This study used forecast error as a proxy for perceived strategic risk. Since shareholders may attribute improvements in forecasting performance to better planning and control, this method of measuring risk should be considered for future strategy research as well.

In the future, simulated mergers could be used next to investigate the risk-return characteristics of other types of mergers. Comparisons with conglomerate mergers could provide additional insights for evaluating the strengths and weaknesses of various diversification alternatives. Future studies might also attempt to model the effects of synergies and size matching. Lubatkin (1983:224) suggests that "there might be an optimum size for matching various types of business units."

In summary, simulated mergers provide a new approach for reexamining a wide variety of strategic issues. This methodology could provide new insights into the process of strategic planning and the task of policy evaluation.

Footnotes

[1]The terms segment and a business unit are used interchangeably throughout this paper.

[2]Synergistic effects can, of course, be factored in as adjustments. However, these adjustments would affect mean returns only.

[3]It has been noted by Slovic (1972), Baird and Thomas (1985), and others that the possibility of a below-target return may also be useful as a tradeoff parameter along with mean return.

[4]In some respects, this methodology is similar to the "pure play" technique which has appeared independently in the finance literature as a means for estimating the cost of capital (for example, Fuller and Kerr (1981), and Conine and Tamarkin (1985)). Its objectives, however, are quite different and the simulated-merger procedures are much less restrictive in their combinatorial assumptions.

[5]The number of segments can be viewed as a proxy for diversification. Berry (1971) devised a measure of diversification based on ratios of segmented sales to consolidated sales. This would give the same rankings across conglomerates as the segment count measure for conglomerates not having dominant segments. Gort (1962) and others have used similar measures.

[6]Even if positive results from synergy (due to such factors as tax savings, tight control systems and overhead reduction) were to exist, the simulated merger results for the non-synergistic case are important because they provide benchmarks, somewhat akin to lower-bounds, for conglomerate performance.

[7]Since current accounting guidelines would sanction the treatment of these companies as industry segments, there was no reason to believe, a priori, that any of the sampled firms would not qualify as a potential segment. Indeed, eight of the 60 sampled firms did merge between 1978 and 1982. Executone, for example, was merged into General Telephone and was treated as a pooling of interests. Simmons became a division of Gulf and Western Industries; Season-All Industries became a subsidiary of Redland Braas Corporation; Pepcom became a subsidiary of Suntory International; Yates became a subsidiary of Square D; Belden became a subsidiary of Crouse-Hinds; Skaggs became a division of American Stores; Pittsburgh-Forgings combined with Ampco to become Ampco-Pittsburgh Corporation.

[8]It should be noted that this choice did not significantly affect the size rankings. Sales, assets and equity were all highly correlated with earnings. The rank order correlations between these alternative measures were .7535 (sales and earnings), .9041 (assets and earnings),

and .8586 (equity and earnings). Appendix A provides further descriptive evidence on the general equivalence of these alternative measures.

The Financial Accounting Standards Board (1976) and the Securities and Exchange Commission (1977, 1978) define segment size in terms of sales, assets, and earnings. Since the focus of the current study was on earnings prediction, the earnings definition was selected to mitigate potential confounds due to differing profit margins and turnover rates.

[9]The pooling-of-interests method was used to account for these mergers. In essence, poolings are accounted for by summing the results of the component firms. Thus it was possible to avoid various assumptions regarding valuations, exchange ratios and goodwill. Since all conditions for poolings could be assumed without undue conjecture, compliance with APB Opinion No. 16 (1970) appeared reasonable, realistic and appropriate for purposes of the research.

[10]The 8-segment and 4-segment samples were partitioned into subsamples of three and seven conglomerates, respectively. The median firms were excluded for the large versus small size-of-segment comparisons.

[11]Automated search procedures (Hopwood, 1980) were used to identify a seasonal ARIMA model for each segment. In all, there were 180 models identified for the 60 component firms over the three-year test period. McKeown and Lorek (1978) have demonstrated that re-identification and re-estimation tend to produce more accurate ARIMA forecasts.

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Figure 1
Annual Performance

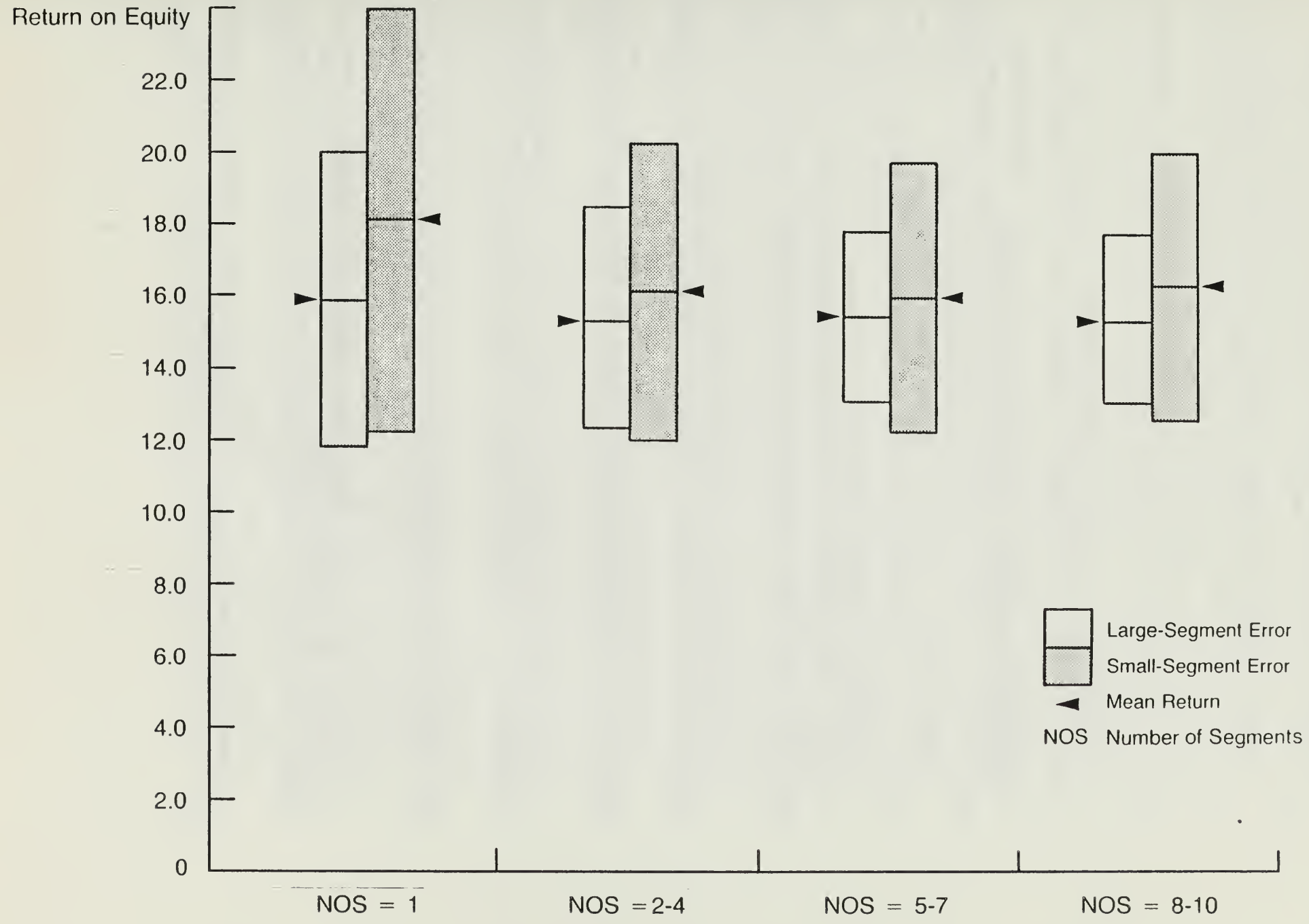

TABLE 1

Annual Performance (1976-78)

Number of Segments	Mean Absolute Percentage Error						Return on Equity					
	Large Firms	Small Firms	Diff.	t	df	Prob.	Large Firms	Small Firms	Diff.	t	df	Prob.
1	26.12	33.03	-6.91	-1.43	58	.080*	15.85	18.04	-2.19	-.66	514	.615
2	22.11	28.43	-6.32	-1.04	28	.154	15.48	15.96	-.48	-.27	28	.792
3	21.10	25.72	-4.62	-.93	18	.183	15.46	16.00	-.54	-.31	18	.758
4	16.64	23.44	-6.80	-1.83	12	.046*	15.61	16.09	-.48	-.28	12	.788
2-4	19.95	25.86	-5.81	-	-	-	15.52	16.02	-.50	-	-	-
5	14.23	24.08	-9.85	-2.68	10	.012*	15.38	15.98	-.60	-.52	10	.612
6	19.55	24.38	-4.83	-.82	8	.218	15.44	15.83	-.39	-.19	8	.857
7	12.60	22.76	-10.16	-2.65	6	.019*	15.43	15.93	-.50	-.54	6	.607
5-7	15.46	23.74	-8.28	-	-	-	15.42	15.91	-.49	-	-	-
8	17.67	22.17	-4.50	-1.12	4	.162	15.09	16.56	-1.47	-1.04	4	.358
9	16.48	21.07	-4.59	-1.42	4	.114	15.49	16.43	-.94	-.79	4	.475
10	13.16	24.09	-10.93	-2.65	4	.028*	15.48	15.81	-.33	-.46	4	.668
8-10	15.77	22.44	-6.67	-	-	-	15.38	16.27	-.92	-	-	-

*Significant at .05 level (one-tailed test)

Appendix A

Alternative Measures of Corporate Size
(Millions of Dollars)

Number of Segments	Large-Segment Conglomerates				Small-Segment Conglomerates			
	Sales	Assets	Equity	Earnings	Sales	Assets	Equity	Earnings
1	307.786	167.912	98.523	15.397	104.191	52.794	23.530	3.754
2	615.572	335.825	197.046	30.795	208.383	105.588	47.060	7.507
3	923.358	503.737	295.568	46.192	312.574	158.383	70.590	11.261
4	1282.611	699.930	409.762	63.965	371.101	167.874	84.554	13.731
2-4	940.514	513.164	300.792	46.984	297.353	143.948	67.401	10.833
5	1538.931	839.562	492.614	76.987	520.956	263.971	117.651	18.768
6	1846.717	1007.475	591.137	92.385	625.148	316.765	141.181	22.522
7	2244.569	1224.878	717.084	111.939	814.828	414.652	190.610	30.574
5-7	1876.739	1023.972	600.278	93.770	653.644	331.796	149.814	23.955
8	2808.456	1527.094	892.086	136.903	825.326	370.679	187.021	30.544
9	2963.018	1610.563	940.101	147.869	1031.941	560.286	262.562	41.540
10	3077.861	1679.124	985.228	153.975	1041.913	527.942	235.301	37.536
8-10	2949.778	1605.594	939.138	146.249	966.393	486.302	228.295	36.540

Appendix B

Single-Product Firms

Portfolio Position	Company	Ticker Symbol	SIC Codes
1	Maytag	MYG	3639, 3582
2	A. H. Robbins	RAH	2834, 2099, 2844
3	Wm. Wrigley, Jr.	WWG	2067
4	Hilton	HLT	7011
5	Trane	TRA	3585, 3433, 3443, 3564
6	Brockway Glass	BRK	3221, 2653, 3079, 3229
7	Simmons	SIM	2511-12, 2514-15, 2391-92
8	Clark Oil	CKO	2911
9	Weis Markets	WMK	5411
10	Foxboro	FOX	3823
11	New Process	NOZ	5961
12	Lukens Steel	LUC	3312
13	Faberge	FBG	2844
14	Jorgensen	JOR	5051, 3462
15	Rubbermaid	RBD	3079, 3041, 3069, 3496
16	Milton Bradley	MB	3944, 2531, 3952
17	Skaggs	SKG	5912
18	Bard	BCR	3841-42
19	Stone Container	STO	2651-53, 2631, 2649, 3569
20	Graniteville	GVL	2211, 2261
21	Burndy	BDC	3679, 3423, 3643-44
22	Morse Shoe	MRS	5661, 3143-44, 5139
23	Superscope	SSP	5064, 3651-52
24	Standard Register	SREG	2761, 3572, 3574, 3579
25	Betz Labs	BETZ	2899
26	Belden	BEL	3357, 5063
27	Swank	SNK	3961, 3172
28	Watkins-Johnson	WJ	3662, 3674
29	Hunt Chemical	HCC	3861, 2819
30	Pittsburgh Forgings	PFG	3462, 3523, 3743
31	North American Coal	NC	1211
32	Fisher Scientific	FS	3811, 2599, 2899
33	Means	MNS	7213
34	Cooper Tire	CTB	3011, 3069
35	Binney and Smith	BYS	3952, 2891

Appendix B (continued)

Portfolio Position	Company	Ticker Symbol	SIC Codes
36	Weyenberg Shoe	WEY	3143
37	Munsingwear	MUN	2341-42, 2253, 2321-22,
38	Great Lakes Chemical	GLK	2819, 2869, 2873, 2874, 2879
39	Oakite	OKT	2841
40	Standard Motor Products	SMP	3694
41	Yates	YES	3497
42	Monarch Machine Tool	MMO	3541, 3559
43	Pittsburgh-Des Moines Steel	PDM	3443, 1629, 3312
44	Pratt and Lambert	PM	2851, 2891
45	Castle	CAS	5051
46	Bayless Markets	BAYM	5411
47	Wackenhut	WAK	7393, 7369, 7399
48	Lynch Communications	LYC	3661
49	Pepcom	PCI	5149
50	Masland	MLD	2271
51	Franks Nursery	FKS	5912
52	La Mauer	LMR	2844
53	Braun Engineering	BEX	3714, 3465
54	O'Sullivan	OSL	3121, 3069
55	House of Vision	HOV	3851, 5086, 5699
56	Star Supermarkets	STR	5411
57	Esquire Radio	EE	3651
58	Season-All Indus.	SAI	3442
59	Speed-O-Print	SBM	3579
60	Executone	EXU	3662