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Chapter Six

Short-Run Capital Expenditure Anticipations and Realizations

INTRODUCTION

We turn now to the analysis of investment realization functions, beginning with the one year ahead, or short-run, capital expenditure anticipations. The picture that emerges is one of considerable forecasting inaccuracy in individual firm observations but substantial, if varying, accuracy in annual means or aggregates. For both individual firms and, a fortiori, for all firms of a given industry or a given year or both, the gap between actual capital expenditures and anticipations can be accounted for in part by changes in current sales, by the difference between current and anticipated sales, and by current and immediately past profits.

Capital expenditure plans expressed by each firm early in the year (generally in March) are related to the actual capital expenditures for that year (reported early the following year) as expected percent changes in sales were related, in Chapter 2, to the change in actual sales shown by later accounting data. Fourth quarter figures of the previous year are used for price deflation of capital expenditure anticipations, on the assumption that these were measured in prices prevailing at the time anticipations were formed. Expected sales changes are again taken as implicitly or explicitly expressed in physical terms and are not deflated for price changes from the year from which the sales change was expected. Depreciation charges and

Note: An earlier version of this chapter was presented to the Ninth CIRET (Centre for International Research on Economic Tendency Surveys) Conference in Madrid, September 1969.

capital stock are not price-deflated at all for the purposes of this section.

Observations incomplete because of missing information in the observation vector on any one variable are again omitted in cross section and time series regressions. Also, where the variables are ratios of either capital stock or sales, 1 or 2 percent of the observations are generally excluded because of their "extreme values" (values outside of the preset intervals for one or more of the variables, as listed in the appendix at the end of the chapter). The number of firms with usable information therefore varies from year to year as well as from regression to regression.

MEANS OF EXPENDITURES, ANTICIPATIONS, SALES, AND PROFITS CHANGES

In the most inclusive observation set (involving current and previous capital expenditures, previous anticipations of current capital expenditures, gross fixed assets at the end of 1953 and at the end of 1957, and 1953 depreciation charges), 4,698 observations were available, as indicated in Table 6-1. They show that over the fourteen

Table 6-1. Capital Expenditures, Change in Capital Expenditures, and Anticipated Change in Capital Expenditures, Measured as Ratios of 1957 Gross Fixed Assets, Firm Means by Year, 1955-1968

(1) Year	(2) Number of Observations	(3) i_t	(4) Δi_t	(5) $i_t^{t-1} - i_{t-1}$
1955	324	.073	.011	.005
1956	461	.094	.018	.014
1957	503	.092	−.003	.001
1958	399	.075	−.019	−.013
1959	359	.082	.004	.006
1960	363	.087	.006	.017
1961	361	.080	−.004	.002
1962	345	.084	.003	.008
1963	309	.091	.010	.012
1964	303	.108	.019	.019
1965	268	.132	.024	.022
1966	283	.150	.027	.031
1967	240	.142	−.004	.005
1968	180	.142	−.005	.005
All Years	4698	.098	.0056	.0087

Note: Table M5-8 appears only in microfiche.

years, the average annual increase in price-deflated capital expenditures amounted to 0.56 percent of 1957 gross fixed assets, while the corresponding mean anticipated increase in capital expenditures was 0.87 percent. This indicates that the ratios of capital expenditures to gross fixed assets for this data set, at least on the basis of the price deflation we have undertaken, tended to be less than anticipated. It is worth noting, however, that the differences between the actual and anticipated capital expenditure ratios were not consistently negative: In 1955, 1956, and 1965, mean capital expenditure-to-gross fixed assets ratios actually exceeded the ratios of anticipated expenditures, while in 1964 they were almost exactly equal.

These findings are generally, although not exactly, corroborated in Table M6-2, where figures are presented in millions of dollars (not divided by gross fixed assets) for 3,053 observations. Mean capital expenditures of $31,616,000 were about 5 percent less than mean capital expenditure anticipations, as against a difference of some 3 percent in Table 6-1. Rough visual inspection may suggest, further, that the difference between capital expenditures and capital expenditure anticipations is positively related to changes in sales and/or changes in profits.

Tables 6-1 and M6-2 suffer from certain deficiencies in their units of measurement. The former, dealing in ratios of 1957 gross fixed assets, has an obvious upward trend as capital expenditures of generally growing firms are taken as ratios of a fixed base; the latter, with no divisor at all, also shows some upward trend as well as substantial year-to-year fluctuation relating to variations in the proportions of large and small firms in the sample. When observations are normalized over firms and time periods (see Table M6-3) by dividing capital expenditures, capital expenditure anticipations, and profits by gross fixed assets at the end of the previous year, and when changes in sales are analogously deflated by the simple average of current, previous, and two years previous sales, the overall results again indicate an excess of anticipated over actual capital expenditures of between 3 and 4 percent. Also, capital expenditures again exceeded or kept roughly even with previously expressed anticipations in boom years such as 1955, 1956, 1964, 1965, and 1966, but were sharply under anticipations in recession periods such as 1958 and 1960.

DETERMINANTS OF ANTICIPATIONS AND EXPENDITURES

Short-run capital expenditure anticipations, as pointed out by the author (1958c, 1962, 1963a, and 1965) and Jorgenson (1963 and

1965), have essentially the same determinants as the actual expenditures they anticipate. In fact, in Table 6-4[1] we note a relation and sets of parameters for anticipations of subsequent capital expenditures very similar to those for actual capital expenditures presented earlier in Table 4-1. The sum of sales change coefficients (0.548) and values of *di/ds* (0.630) were both somewhat higher than those shown for the actual expenditures (0.486 and 0.559, respectively). This reflects the secular growth in capital expenditures and the fact that the anticipations relation refers to the subsequent year, along with some tendency for anticipations to exceed actual expenditures. The mean anticipations ratio was 0.106, while the mean expenditures ratio, i_t, was 0.096. (For those interested in pursuing the anticipations relations further, see Tables M6-10 and M6-11, comparable to Tables 4-4 and 4-6.)

Of course, anticipations or plans, and with them actual expenditures, may be presumed to adapt to changes in circumstances subsequent to the time of their formulation. We may hypothesize an adaptive mechanism whereby capital expenditure anticipations from year to year are adjusted to the experienced error in anticipations,[2] to sales changes in part or entirely subsequent to the time of anticipations, and particularly, to unexpected sales changes.

Results of these estimates, shown in Table 6-5, amply confirm the adaptive hypothesis suggested above. Anticipations shift rapidly indeed with actual expenditures and are generally tied more closely to them than to previous anticipations (as can be noted by subtracting b_2 from b_1 in the regressions reported). There is a greater residual role for the earlier anticipations in the cross sections, however, as may be expected in view of the greater component there of permanent variance of anticipations. Subsequent sales changes and, in the time series, the error in sales anticipations also emerge as significant variables. Their role will be noted again when realizations, or errors in anticipations, are analyzed below.

Whatever the divergences between actual and anticipated capital expenditures relating to pervasive movements of the economy, a substantial amount of individual firm variation in capital expenditures is accounted for by capital expenditure anticipations, as is made clear in Table 6-6. In regressions based upon pooled individual firm time series of 4,674 observations, it is found that over 64 percent of the variance over time of the capital expenditure ratio is

[1] Tables M6-2 and M6-3 appear only in microfiche.

[2] I am again indebted to Paul Wachtel for this suggestion.

Table 6-4. Short-Run Capital Expenditure Anticipations as a Function of Sales Changes, Profits, and Depreciation, Firm Overall Regression, 1955-1968

$$i^t_{t+1} = b_0 + \sum_{j=1}^{7} b_j \Delta s_{t+1-j} + \sum_{j=8}^{9} b_j p_{t+8-j} + b_{10} d_{53} + u_t$$

(1) Variable or Statistic	*(2)* Regression Coefficients and Standard Errors	*(3)* Means and Standard Deviations and Products
Constant or i^t_{t+1}	.021 (.002)	.106 (.087)
Δs_t	.112 (.009)	.064 (.131)
Δs_{t-1}	.082 (.009)	.054 (.130)
Δs_{t-2}	.080 (.009)	.049 (.129)
Δs_{t-3}	.093 (.009)	.045 (.122)
Δs_{t-4}	.073 (.009)	.044 (.119)
Δs_{t-5}	.058 (.009)	.045 (.118)
Δs_{t-6}	.050 (.009)	.037 (.122)
p_t	.130 (.027)	.110 (.107)
p_{t-1}	−.008 (.028)	.105 (.102)
d_{53}	.826 (.041)	.053 (.028)
$\Sigma\Delta s$ coefficients	.548 (.023)	
Σp coefficients	.122 (.012)	
$di/d\Delta s$	.630	
$n(-244)$	4534	
r.d.f.	4523	
$\hat{R}^2$	.314	
F	208.28	

Note: Tables M6-2 and M6-3 appear only in microfiche.

Table 6-5. Short-Run Capital Expenditure Anticipations as a Function of Previous Anticipations, Error in Previous Anticipations, Sales Changes, and Sales Realizations, Firm and Industry Time Series and Cross Sections, 1955-1968

$$i_{t+1}^{t} = b_0 + b_1 i_t^{t-1} + b_2(i_t - i_t^{t-1}) + b_3 \Delta s_t + b_4 \Delta s_{t-1} + b_5(\Delta s_t - s_t^{t-1}) + u_t$$

(1)	*(2)*	*(3)*	*(4)*	*(5)*
	Regression Coefficients and Standard Errors			
Variable or Statistic	*Time Series*		*Cross Sections*	
	Firm	*Industry*	*Firm*	*Industry*
Constant	.052 (.002)	.029 (.013)	.022 (.002)	–.004 (.008)
i_t^{t-1}	.497 (.019)	.788 (.059)	.796 (.014)	1.035 (.049)
$i_t - i_t^{t-1}$	.374 (.027)	.647 (.143)	.405 (.025)	.645 (.136)
Δs_t	.056 (.012)	.013 (.039)	.065 (.012)	.130 (.054)
Δs_{t-1}	.030 (.008)	–.020 (.024)	.013 (.008)	–.020 (.035)
$\Delta s_t - s_t^{t-1}$	.046 (.014)	.203 (.044)	.017 (.013)	–.018 (.059)
$b_1 + b_2$	.870 (.038)	1.435 (.171)	1.201 (.032)	1.679 (.153)
$b_3 + b_4 + b_5$	.133 (.012)	.196 (.039)	.095 (.011)	.092 (.046)
n	3268	125	3329	125
$\hat{R}^2$	.283	.814	.536	.852
F	219	101	768	129

accounted for by the ratio of capital expenditure anticipations to 1957 gross fixed assets. By way of contrast, only 15 percent of the variance in capital expenditures over time is accounted for by previous capital expenditures. Further, the addition of lagged capital expenditures does nothing to improve the fit already obtained using capital expenditure anticipations, and its regression coefficient is virtually zero. The major role capital expenditure anticipations play in explaining time series variance in capital expenditures is further confirmed by a coefficient of determination of 0.664 in the relation between actual and anticipated changes in capital expenditures, also shown in Table 6-6.

The dominant role of capital expenditure anticipations as opposed

Table 6-6. Capital Expenditures and Change in Capital Expenditures as Functions of Previous Capital Expenditures, Capital Expenditure Anticipations, and Anticipated Change in Capital Expenditures, Measured as Ratios of 1957 Gross Fixed Assets, Pooled Individual Firm Time Series, 1955-1968

(A) $i_t = b_0 + b_1 i_t^{t-1} + u_t$

(B) $i_t = b_0 + b_1 i_{t-1} + u_t$

(C) $i_t = b_0 + b_1 i_{t-1} + b_2 i_t^{t-1} + u_t$

(D) $\Delta i_t = b_0 + b_1 (i_t^{t-1} - i_{t-1}) + u_t$

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Regression Coefficients and Standard Errors				
Variable or Statistic	*(A)*	*(B)*	*(C)*	*(D)*	*Means and Standard Deviations*
Constant or i_t	.018 (.001)	.060 (.002)	.018 (.001)	−.002 (.001)	.098 (.063)
i_{t-1}	– –	.412 (.015)	.001 (.011)	– –	.092 (.059)
i_t^{t-1}	.790 (.009)	– –	.790 (.011)	– –	.101 (.063)
$i_t^{t-1} - i_{t-1}$	– –	– –	– –	.880 (.010)	.009 (.062)
$n(-87)$	4674	4674	4674	4674	
r.d.f.	4108	4108	4107	4108	
$\hat{R}^2$	.642	.151	.642	.664	
F	7361	733	3680	8105	

to previous expenditures in explaining the variance of actual expenditures is further demonstrated in the pooled cross sections of Table 6-7. The coefficient of determination is markedly higher in the regression involving anticipations than in that involving previous capital expenditures, with the fit only trivially improved when lagged capital expenditures are added to anticipations. Further, the importance of the latter in explaining current expenditures is substantially due to the varying normal investment-to-capital stock ratio or replacement requirements across firms (see Table M6-8). The 1953 ratio of depreciation charges to gross fixed assets, a proxy for (the inverse of) durability or replacement requirements, is markedly significant and improves the fit otherwise obtained by anticipations alone by as much as does lagged investment.

Table 6-7. Capital Expenditures and Change in Capital Expenditures as Functions of Previous Capital Expenditures, Capital Expenditure Anticipations, and Anticipated Change in Capital Expenditures, Measured as Ratios of 1957 Gross Fixed Assets, Pooled Firm Cross Sections, 1955-1968

(A) $i_t = b_0 + b_1 i_{t-1} + b_2 i_t^{t-1} + u_t$

(B) $\Delta i_t = b_0 + b_1 (i_t^{t-1} - i_{t-1}) + u_t$

(1)	(2)	(3)	(4)	(5)	(6)
Variable or Statistic	Regression Coefficients and Standard Errors				Means and Standard Deviations
	(A)	(A)	(A)	(B)	
Constant or i_t	.016 (.001)	.040 (.001)	.013 (.001)	−.001 (.001)	.098 (.071)
i_{t-1}	– –	.624 (.013)	.108 (.011)	– –	.092 (.066)
i_t^{t-1}	.807 (.008)	– –	.747 (.010)	– –	.101 (.073)
$i_t^{t-1} - i_{t-1}$	– –	– –	– –	.800 (.010)	.009 (.061)
$n(-87)$	4697	4697	4697	4697	
r.d.f.	4558	4558	4557	4558	
$\hat{R}^2$	.700	.340	.706	.605	
F	10,656	2345	5488	6971	

Table 6-9[3] permits a somewhat closer examination of the underlying time series relation among capital expenditures, capital expenditure anticipations, and lagged capital expenditures. Here we have results of pooled time series—still of individual firms but pooled by each of our ten industry groups. While the broad outlines of the results already observed in the pooling of firms for all industries are confirmed, significant differences appear among industries. In each industry, the simple coefficient of determination between capital expenditures and capital expenditure anticipations is almost as high as that in the multiple regression. As might be expected, the coefficient of determination is highest among utilities, where capital expenditure plans are probably better formulated and involve firmer commitments.[4]

[3] Table M6-8 appears only in microfiche.

[4] That the differences in coefficients among regressions are significant is confirmed by the F ratio involving the reduction in residual variance from separate regression planes for each industry rather than a single regression plane for pooled observations of all industries.

Table 6-9. Capital Expenditures as a Function of Previous Capital Expenditures and Capital Expenditures Anticipations, Measured as Ratios of 1957 Gross Fixed Assets, Pooled Individual Firm Time Series by Industry, 1955-1968

$$i_t = b_0 + b_1 i_{t-1} + b_2 i_t^{t-1} + u_t$$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Regression Coefficients and Standard Errors										
Variable or Statistic	*Primary metals*	*Metal-working*	*Chemical process-ing*	*Other manu-factur-ing*	*Mining*	*Utili-ties*	*Petro-leum*	*Rail-roads*	*Stores*	*Communication and transportation (ex-cluding Railroad)*	*All indus-tries*
Constant	.006 (.003)	.021 (.002)	.012 (.003)	.018 (.003)	.009 (.005)	−.005 (.002)	.005 (.005)	.002 (.001)	.041 (.007)	.054 (.018)	.018 (.001)
i_{t-1}	.014 (.029)	.005 (.025)	−.062 (.025)	.070 (.028)	.054 (.049)	.043 (.022)	−.111 (.063)	.084 (.042)	.047 (.044)	−.109 (.067)	.001 (.011)
i_t^{t-1}	.831 (.028)	.761 (.022)	.875 (.023)	.762 (.025)	.775 (.058)	.988 (.019)	1.023 (.072)	.858 (.042)	.645 (.042)	.886 (.065)	.790 (.011)
$b_1 + b_2$	.846 (.033)	.766 (.021)	.814 (.024)	.832 (.028)	.829 (.056)	1.031 (.018)	.913 (.056)	.943 (.043)	.692 (.048)	.776 (.078)	.791 (.011)
$n(-87)$	330	1255	690	791	136	485	198	250	420	119	4674
r.d.f.	297	1099	599	684	117	440	169	222	360	102	4107
$\hat{R}^2$	.773	.633	.751	.638	.675	.914	.640	.721	.449	.644	.642
$\hat{r}^2_{i_t, i_t^{t-1}}$	.773	.633	.749	.635	.674	.913	.636	.718	.449	.639	.642
$r^2_?$	−.003	−.001	.008	.008	.002	.006	.012	.014	.000	.016	−.000
F	509	950	907	606	125	2345	153	291	148	95	3680

F (all-individual industries) = 4.74; $F_{.01}$ = 1.93.

Note: Table M6-8 appears only in microfiche.

REALIZATIONS FUNCTIONS

In Table 6-12[5] we find clearer confirmation of the prime explanatory role of capital expenditure anticipations and the further contribution of current values of sales change and profits variables that presumably postdate the anticipations. Both sales change and profits

Table 6-12. Capital Expenditures as a Function of Sales Changes, Profits, Capital Expenditure Anticipations, and Lagged Capital Expenditures, Measured as Ratios of Previous Year's Gross Fixed Assets or Previous Three Year Sales Average, 1955-1968

$$i_t^* = b_0 + b_1 \Delta s_t^* + b_2 p_t^* + b_3 i_t^{t-1*} + b_4 i_{t-1}^* + u_t$$

(1)	(2)	(3)	(4)	(5)
	Regression Coefficients and Standard Errors			
Variable or Statistic	*Firm time series*	*Industry time series*	*Aggregate time series*	*Means and Standard Deviations from Firm Time Series*
Constant	.003 (.001)	−.009 (.003)	−.013 (.004)	
i_t^*				.080 (.050)
Δs_t^*	.026 (.005)	.028 (.014)	.057 (.028)	.057 (.109)
p_t^*	.093 (.011)	.113 (.027)	.107 (.046)	.089 (.047)
i_t^{t-1*}	.823 (.011)	1.022 (.040)	.978 (.088)	.083 (.048)
i_{t-1}^*	−.016 (.010)	−.086 (.037)	−.005 (.088)	.082 (.051)
$b_1 + b_2$	.118 (.011)	.141 (.026)	.163 (.041)	
$b_3 + b_4$	.806 (.012)	.936 (.030)	.973 (.056)	
$n(-75)$	3766	139	14	
r.d.f.	3293	125	9	
$\hat{R}^2$	.687	.926	.983	
$r^2_{i_t^*, i_t^{t-1*}}$	.674	.903	.943	
$r^2_?$	.039	.244	.705	
F	1808	407	191	

[5] Tables M6-10 and M6-11 appear only in microfiche.

coefficients are positive and clearly significant in the firm and industry time series. The relative effect of sales change and profits variables, however, is not clearly indicated by the relative size of their coefficients, inasmuch as the variance of sales changes is considerably greater than that of profits in these time series relations.

The major role of capital expenditure anticipations is underlined by the very small, and negative, coefficients of lagged capital expenditures. It is clear that the substantial explanatory power of capital expenditure anticipations cannot be explained by viewing them as merely a projection of previous capital expenditures. And one may note again that the coefficient of determinations rises substantially if we move from observations involving individual firms to observations that are means of the individual firm observations within each industry. Along with this, it may be seen that the coefficient of capital expenditure anticipations in the industry time series is close to unity, perhaps again reflecting a washing out of errors of individual firm anticipations.

Finally, in Table 6-12, we may note the results of our "aggregate time series" regression. Here observations are the means for all individual firms for each year; we treat these in effect as fourteen weighted observations. The fit is good—the adjusted coefficient of determination is 0.983—and the parameter estimates are consistent with those obtained in the individual firm and industry time series relations. The underlying factors at work appear to be economywide in nature.

Table 6-13 treats cross section relations using the same data, but with the addition of the 1953 depreciation-to-gross fixed assets ratio, which, as a constant over time, could not be used in the time series. We may note first that in all cases, but particularly in the industry cross section, the great bulk of the variance in capital expenditures is accounted for by capital expenditure anticipations. Further, as we move from the firm cross section within industries to the industry cross section, the coefficient of capital expenditure anticipations rises sharply, to the neighborhood of unity. As we have noted previously, regressions on industry means may generally involve a washing out of errors or transitory factors found in variance within industries. The differences among regressions is highly significant, as indicated by the F ratio derived from the reduction of residual variance with separate planes for the within industry and across industry mean regressions.

Table 6-14 returns to time series analysis on an individual industry basis. While results follow a pattern fairly similar to that already noted in the pooled regressions for firms in all industries in Table

Table 6-13. Capital Expenditures as a Function of Sales Changes, Profits, Depreciation, Capital Expenditure Anticipations, and Previous Capital Expenditures, All Except Depreciation Measured as Ratios of Previous Year's Gross Fixed Assets or Previous Three Year Sales Average, 1955-1968

$$i_t^* = b_0 + b_1 \Delta s_t^* + b_2 p_t^* + b_3 d_{53} + b_4 i_t^{t-1*} + b_5 i_{t-1}^* + u_t$$

(1)	*(2)*	*(3)*	*(4)*	*(5)*
	Regression Coefficients and Standard Errors			*Means and Standard Deviations from Firm Cross Sections across Industries*
	Firm cross sections		*Industry cross section*	
Variable or Statistic	*Within industries*	*Across industries*		
Constant	.005 (.001)	.001 (.001)	−.003 (.002)	
i_t^*				.080 (.061)
Δs_t^*	.029 (.005)	.029 (.005)	.013 (.019)	.057 (.106)
p_t^*	.040 (.006)	.032 (.006)	.019 (.018)	.089 (.087)
d_{53}	.049 (.023)	.069 (.019)	−.035 (.058)	.053 (.029)
i_t^{t-1*}	.781 (.010)	.810 (.010)	1.046 (.049)	.083 (.062)
i_{t-1}^*	.035 (.010)	.040 (.010)	−.056 (.046)	.081 (.062)
$b_1 + b_2$	.069 (.007)	.061 (.007)	.032 (.025)	
$b_4 + b_5$	.816 (.010)	.850 (.010)	.991 (.032)	
$n(-75)$	3803	3803	139	
r.d.f.	3659	3784	120	
$\hat{R}^2$	.713	.774	.954	
$\hat{r}^2_{i_t^*, i_t^{t-1*}}$	.704	.766	.954	
$\hat{r}^2_\cdot$	.031	.035	.007	
F	1818	2603	520	

$F[(3) - (2) - (4)] = 15.61$; $F_{.01} = 3.02$.

6-12, differences between industries are statistically significant. As noted earlier in Table 6-9, coefficients of determination, along with the regression coefficients of capital expenditure anticipations, differ from industry to industry. Both are again high for utilities, and this time for primary metals and petroleum as well. Curiously, the utilities results include a high coefficient for current profits along with a coefficient of virtually zero for current sales change. For highly demand-motivated utility capital expenditure programs, changes in sales of a short-run nature might do little to modify predominantly long-run capital expenditure plans. The somewhat high current profit coefficient of 0.129 reflects the relatively low variance over time in profits, which also contributes to a large standard error; the coefficient of determination is no higher for the multiple regression than it is for the relation involving only capital expenditures and capital expenditure anticipations.

THE ROLE OF SALES EXPECTATIONS AND REALIZATIONS

Including the McGraw-Hill responses regarding expected sales changes permits us to test the hypothesis that the difference between capital expenditures and capital expenditure anticipations relates to the difference between actual and expected sales changes.[6] A comparison of columns (4) and (5) in Table 6-15, which summarizes the underlying data for these relations, lends credence to the assumption that there is a positive relation between these variables.

Failure to foresee future expenditures precisely is undoubtedly responsible for some of the differences between capital expenditures and their anticipations, particularly as to the timing of actual expenditures—partly an accounting matter and partly a question of the supply of capital goods or of the services used in construction. Aside from certain elements of consistent bias, anticipation errors of this type, along with possibly faulty reporting in the McGraw-Hill questionnaires on information that may not always be a matter of firm record, are likely to turn up as unexplained variance in our regressions.

Given our hypothesis that anticipated and actual capital expenditures have the same essential determinants, there should also be a systematic component of the differences between the two which we can explain by changes in the determining variables between the time that anticipations are expressed and the time that expenditures are actually made. Thus, if sales changes or profits are determinants of capital expenditures and of their anticipations, higher profits or greater increases in sales than originally expected should cause capital expenditures to exceed their anticipations. It is on these considerations that we focus in our estimation of realization functions.

Table 6-16 relates capital expenditure realizations to sales realizations—that is, the difference between capital expenditures and capital

[6] Eisner (1962 and 1965).

Table 6-14. Capital Expenditures as a Function of Sales Changes, Profits, Capital Expenditure Anticipations, and Previous Capital Expenditures, All Measured as Ratios of Previous Year's Gross Fixed Assets or Previous Three Year Sales Average, Firm Time Series, by Industry, 1955-1968

$$i_t^* = b_0 + b_1 \Delta s_t^* + b_2 p_t^* + b_3 i_t^{t-1*} + b_4 i_{t-1}^* + u_t$$

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Regression Coefficients and Standard Errors									
Variable or Statistic	*Primary metals*	*Metal-working*	*Chemical processing*	*All Other Manu-facturing*	*Mining*	*Utilities*	*Petro-leum*	*Rail-roads*	*Stores*	*Transportation and communication*
Aggregate Dummy	.001 (.002)	.000 (.002)	–.000 (.002)	.004 (.002)	.001 (.003)	.007 (.002)	.003 (.002)	.004 (.002)	.007 (.002)	.033 (.003)
Constant Term	–.002 (.003)	.003 (.003)	–.003 (.003)	.008 (.004)	.014 (.009)	–.005 (.003)	–.013 (.005)	.003 (.002)	.000 (.013)	.011 (.016)
Δs_t^*	.006 (.010)	.034 (.008)	.019 (.009)	.043 (.014)	.008 (.027)	–.001 (.005)	.024 (.015)	.016 (.006)	.009 (.036)	.105 (.079)
p_t^*	.092 (.043)	.094 (.017)	.079 (.030)	.072 (.023)	.046 (.077)	.129 (.100)	.152 (.095)	–.047 (.057)	.203 (.083)	.432 (.238)
i_t^{t-1*}	.826 (.024)	.790 (.025)	.840 (.026)	.760 (.030)	.737 (.075)	.946 (.018)	1.041 (.056)	.846 (.040)	.806 (.055)	.853 (.059)
i_{t-1}^*	.040 (.025)	–.022 (.022)	.024 (.024)	.006 (.030)	–.038 (.055)	.026 (.013)	–.059 (.043)	.100 (.040)	–.055 (.047)	–.046 (.059)
$b_1 + b_2$	.098 (.041)	.128 (.017)	.098 (.029)	.115 (.025)	.054 (.077)	.128 (.100)	.175 (.094)	–.031 (.055)	.213 (.085)	.537 (.219)
$b_3 + b_4$	.866 (.025)	.768 (.025)	.865 (.030)	.766 (.038)	.699 (.079)	.972 (.017)	.982 (.047)	.947 (.046)	.751 (.052)	.806 (.076)

$n(-75)$	306	948	580	554	101	460	169	239	294	115
r.d.f.	271	819	503	476	82	413	142	209	244	98
$\hat{R}^2$	.874	.661	.739	.636	.541	.902	.825	.752	.529	.723
$\hat{r}^2_{i_t^*, i_t^{t-1*}}$	.872	.634	.733	.622	.552	.902	.819	.744	.518	.707
r^2	.020	.072	.025	.039	−.023	.005	.031	.031	.022	.055
F	478	402	361	211	26	965	173	162	71	68

F(All Minus Individual Industries) = 2.34; $F_{.01}$ = 1.65.

Table 6-15. Capital Expenditures, Capital Expenditure Realizations, Sales Realizations, Sales and Profits Changes, Measured as Ratios of Previous Year's Gross Fixed Assets or Previous Three Year Sales Average, Means by Year, 1955-1968

(1) Year (t)	(2) n	(3) i_t^*	(4) $i_t^* - i_t^{t-1*}$	(5) $\Delta s_t^* - s_t^{t-1}$	(6) Δs_t^*	(7) Δp_t^*
1955	131	.101	.004	.028	.099	.019
1956	159	.122	.000	–.023	.065	–.013
1957	163	.109	–.007	–.040	.038	–.025
1958	133	.069	–.015	–.048	–.044	–.033
1959	264	.074	–.002	–.007	.089	.007
1960	203	.071	–.007	–.054	.024	–.016
1961	201	.057	–.005	–.019	.024	–.006
1962	263	.061	–.006	–.002	.075	.005
1963	254	.063	–.003	.015	.066	.005
1964	254	.072	–.000	.023	.085	.008
1965	213	.086	.002	.025	.087	.001
1966	240	.095	.000	.011	.085	.004
1967	143	.083	–.002	–.017	.043	–.018
1968	148	.073	–.004	–.012	.066	–.005
All Years	2769	.079	–.003	–.006	.061	–.003

expenditure anticipations is taken as a function of the difference between actual and expected sales changes. Results are compared for a considerable number of regressions involving firms in all industries, all industries in the economy, and all years in the sample. First, in the individual firm time series, there is a significant positive coefficient of 0.037 for the sales realization variable, but a very low coefficient of determination, 0.013. Only a small portion of the time series variance in capital expenditure realizations can be explained by sales realizations. The industry time series indicates both a somewhat higher coefficient of the sales realization variable and a higher coefficient of determination, 0.093. Finally, the aggregate time series shows a still higher coefficient of the sales realization variable, 0.123, and a higher coefficient of determination, 0.569.

Turning to cross sections, we find a significant but very small coefficient for sales realizations and a very small coefficient of determination. The coefficients are similarly small in the overall individual firm regression, but somewhat higher in the overall

Table 6-16. Capital Expenditure Realizations as a Function of Sales Realizations, Measured as Ratios of Previous Three Year Sales Average, 1955-1968

$$i_t^* - i_t^{t-1*} = b_0 + b_1 (\Delta s_t^* - s_t^{t-1}) + u_t$$

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
	Regression Coefficients and Standard Errors					
Variable or Statistic	*Time Series* *Firm*	*Time Series* *Industry*	*Aggregate*	*Firm cross section*	*Firm overall*	*Industry Overall*
Constant	−.003 (.001)	−.003 (.001)	−.002 (.001)	−.003 (.001)	−.003 (.001)	−.003 (.001)
$\Delta s_t^* - s_t^{t-1}$	.037 (.007)	.062 (.018)	.123 (.029)	.022 (.006)	.029 (.006)	.059 (.018)
$n(-70)$	2707	116	14	2769	2769	116
r.d.f.	2301	105	12	2754	2767	114
$\hat{R}^2$	.013	.093	.569	.004	.007	.077
F	31.48	11.85	18.16	11.80	21.38	10.57

industry regression, which again tends to wash out some of the errors or erratic components of the variables.

Further light is thrown on the relation, however, when we include actual sales changes and profits along with the sales realization variable. In the firm time series (Table 6-17) it is immediately evident that the positive role of the sales realization variable is now taken over by current sales changes and current and lagged profits. By way of a possible explanation, while it is the difference between actual experience and expectations regarding the determining variables that properly relates to the difference between actual and anticipated capital expenditures, there is some tendency to expect that "tomorrow will be like today." Given a fair amount of inaccuracy in the sales expectation variable, it is not very surprising that the differences between current and previous actual sales prove more relevant than those between the current level of actual sales and the previously announced expected level. Similarly, the positive coefficients of profits variables suggest that when profits are high they tend to be higher than expected, making capital expenditures turn out to be somewhat higher than anticipated.

In the industry time series, results are generally similar, except that the coefficient of capital expenditure anticipations and the coefficient of determination are higher. The firm cross section is

Table 6-17. Capital Expenditures or Capital Expenditure Realizations as a Function of Sales Changes, Sales Anticipations, Sales Realizations, Profits, and Capital Expenditure Anticipations, Measured as Ratios of Previous Year's Gross Fixed Assets or Previous Three Year Sales Average, Firm and Industry Time Series and Firm Cross Sections, 1955-1968

(F) $i_t^* = b_0 + b_1 \Delta s_t^* + b_2 \Delta s_{t-1}^* + b_3 s_t^{t-1} + b_4 p_t^* + b_5 p_{t-1}^* + b_6 i_{i_t}^{t-1*} + u_t$

(I) $i_t^* = b_0 + b_1 \Delta s_t^* + b_2 \Delta s_{t-1}^* + b_3 s_t^{t-1} + b_4 p_t^* + b_5 i_{i_t}^{t-1*} + u_t$

(H) $i_t^* - i_{i_t}^{t-1*} = b_0 + b_1 \Delta s_t^* + b_2 (\Delta s_t^* - s_t^{t-1}) + b_3 p_t^* + u_t$

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
	Regression Coefficients and Standard Errors								
Variable or Statistic	*Firm time series*			*Industry time series*			*Firm cross section*		
	(F)	*(I)*	*(H)*	*(F)*	*(I)*	*(H)*	*(F)*	*(I)*	*(H)*
Constant	–.002	.001	–.009	–.013	–.013	–.013	.004	.005	–.007
	(.002)	(.001)	(.001)	(.003)	(.003)	(.003)	(.001)	(.001)	(.001)
Δs_t^*	.034	.026	.026	.054	.056	.064	.030	.026	.022
	(.007)	(.007)	(.009)	(.022)	(.018)	(.022)	(.007)	(.006)	(.008)
Δs_{t-1}^*	.001	.005	–	.011	.010	–	.005	.007	–
	(.005)	(.005)	–	(.011)	(.011)	–	(.005)	(.005)	–
s_t^{t-1}	.003	.004	–	.010	.009	–	.015	.015	–
	(.009)	(.009)	–	(.026)	(.026)	–	(.009)	(.009)	–
$\Delta s_t^* - s_t^{t-1}$	–	–	.010	–	–	–.003	–	–	.000
	–	–	(.010)	–	–	(.026)	–	–	(.009)
p_t^*	.069	.114	.049	.102	.091	.068	.015	.047	.022
	(.016)	(.014)	(.013)	(.064)	(.035)	(.029)	(.015)	(.007)	(.008)
p_{t-1}^*	.080	–	–	–.014	–	–	.036	–	–
	(.016)	–	–	(.063)	–	–	(.014)	–	–
$i_{i_t}^{t-1*}$	.784	.801	–	.961	.958	–	.811	.815	–
	(.013)	(.013)	–	(.038)	(.034)	–	(.010)	(.010)	–
$\Sigma\Delta s^*$ coefficients	.035	.032	–	.064	.066	–	.034	.032	–
	(.009)	(.009)	–	(.023)	(.021)	–	(.008)	(.008)	–
Σp^* coefficients	.149	–	–	.089	–	–	.051	–	–
	(.015)	–	–	(.036)	–	–	(.008)	–	–
$n(-70)$	2707	2707	2707	116	116	116	2769	2769	2769
r.d.f.	2296	2297	2299	100	101	103	2749	2750	2752
$\hat{R}^2$	.691	.688	.024	.929	.930	.221	.734	.734	.010
$r^*_{i_t^*, i_t^{t-1*}}$	.671	.671	.671	.909	.909	.909	.725	.725	.725
$r_\cdot^2$	.062	.052	–	.218	.226	–	.035	.033	–
F	860	1016	19.60	232	281	11.01	1271	1521	10.04

fairly corroborative, with a somewhat lesser role for profits. This finding is roughly consistent with results noted elsewhere regarding arguments of the investment function itself, where past profits had less of a role in cross sections than in time series.

Comparisons of overall regressions involving various combinations of current and lagged sales change and profits variables and the depreciation ratio reveal that current rather than lagged sales changes improve the fit of the relation including capital expenditure anticipations (see Table M6-18). Lagged profits, however, while fairly substitutable for current profits, seem to perform at least trivially better. This may relate to a tendency for higher current capital expenditures to depress the accounting measure of current profits, with startup costs and initial depreciation charged against income. The 1953 depreciation ratio, taken as a measure of durability, apparently does little to improve the fit, although its significantly positive coefficient suggests some tendency for capital expenditures to be higher relative to anticipations to the extent that they involve capital of shorter than average life—perhaps equipment as opposed to plant.

Annual means of a larger set of observations excluding the sales expectations again show (in Table M6-19) capital expenditures slightly below capital expenditure anticipations, along with some positive relation between changes in sales and/or changes in profits and the excess of capital expenditures over capital expenditure anticipations.

This relation may be seen more clearly in the regressions summarized in Table 6-20.[7] Here the firm time series yield distinctly positive coefficients for current sales changes and current and (to a lesser extent) past profits variables. Higher coefficients of determination and higher regression coefficients are to be found in the industry time series. Even after adjustment for lost degrees of freedom, some 21 percent of the variance in capital expenditures not explained by capital expenditure anticipations is explained by the addition of current sales change and profit variables. The result is again less marked in the firm cross sections, but here, once more, the current sales change and profits variables contribute to the explanation of variance of capital expenditures beyond what can be accounted for by capital expenditure anticipations. Overall regressions analogous to those reported in Table M6-18, but excluding the sales realizations variable, generally confirm this contribution of current sales change and profits variables (see Table M6-21).

The utility of current sales changes as opposed to sales realizations in accounting for the difference between capital expenditures and

[7] Tables M6-18 and M6-19 appear only in microfiche.

Table 6-20. Capital Expenditures as a Function of Sales Changes, Profits, and Capital Expenditure Anticipations, Measured as Ratios of Previous Year's Gross Fixed Assets or Previous Three Year Sales Average, Firm and Industry Time Series and Firm Cross Sections, 1955-1968

(F) $i_t^* = b_0 + b_1 \Delta s_t^* + b_2 \Delta s_{t-1}^* + b_3 p_t^* + b_4 p_{t-1}^* + b_5 i_t^{t-1*} + u_t$

(I) $i_t^* = b_0 + b_1 \Delta s_t^* + b_2 \Delta s_{t-1}^* + b_3 i_t^{t-1*} + u_t$

(H) $i_t^* = b_0 + b_1 \Delta s_t^* + b_2 \Delta p_t^* + b_3 i_t^{t-1*} + u_t$

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
	Regression Coefficient and Standard Errors								
Variable or Statistic	*Firm time series*			*Industry time series*			*Firm cross section*		
	(F)	*(I)*	*(H)*	*(F)*	*(I)*	*(H)*	*(F)*	*(I)*	*(H)*
Constant	.000	.010	.002	−.012	−.007	−.012	.005	.008	.005
	(.001)	(.001)	(.001)	(.003)	(.003)	(.003)	(.001)	(.001)	(.001)
Δs_t^*	.028	.035	.021	.029	.060	.042	.032	.035	.030
	(.005)	(.005)	(.005)	(.017)	(.014)	(.014)	(.005)	(.005)	(.005)
Δs_{t-1}^*	−.000	.006	–	.009	−.002	–	.006	.010	–
	(.004)	(.004)	–	(.011)	(.012)	–	(.005)	(.005)	–
p_t^*	.086	–	.124	.190	–	.118	.021	–	.042
	(.014)	–	(.012)	(.059)	–	(.030)	(.013)	–	(.006)
p_{t-1}^*	.066	–	–	−.084	–	–	.022	–	–
	(.013)	–	–	(.061)	–	–	(.012)	–	–
i_t^{t-1*}	.779	.821	.793	.970	1.005	.951	.829	.841	.834
	(.011)	(.010)	(.011)	(.037)	(.030)	(.030)	(.008)	(.008)	(.008)
$\Sigma \Delta s^*$ coefficients	.027	.041	–	.038	.058	–	.038	.045	–
	(.007)	(.007)	–	(.020)	(.019)	–	(.007)	(.007)	–
Σp^* coefficients	.152	–	–	.107	–	–	.043	–	–
	(.013)	–	–	(.033)	–	–	(.006)	–	–
$n(-98)$	3715	3715	3715	139	139	139	3756	3756	3756
r.d.f.	3249	3251	3251	124	126	126	3737	3739	3739
$\hat{R}^2$	.678	.665	.676	.915	.904	.915	.763	.760	.763
$\hat{r}^2_{i_t^*, i_t^{t-1*}}$	.660	.660	.660	.891	.891	.891	.757	.757	.757
$r_{\cdot}^2$	.054	.016	.048	.215	.119	.214	.028	.015	.027
F	1373	2156	2264	277	407	461	2415	3957	4019

Note: Tables M6-18 and M6-19 appear only in microfiche.

capital expenditure anticipations is further confirmed by regressions using the same observations as Table 6-16. In firm time series, where the coefficients of determination are very low in the regressions involving either sales changes or sales realizations, there is little basis for choice between these two variables (see Table M6-22). In both the industry and aggregate time series, the fit is considerably better in the case of sales changes; in the industry time series, the sales change regression coefficient is somewhat higher, but in the aggregate time series, the coefficient of the sales change variable is somewhat lower than that of the sales realization variable. The sales change variable is trivially better in the firm cross section and firm overall regressions, where the fits are very poor, and somewhat better in the industry overall regression.

The fairly poor firm time series relation involving sales realizations is further explored for individual industries (see Table M6-23). The generally poor fits at the individual industry level do (barely) differ significantly at the 0.05 probability level, apparently because of the relatively high regression coefficient and coefficient of determination in the large group of metalworking firms.

ACCURACY OF ANTICIPATIONS, BY YEAR AND INDUSTRY

Some of the effects of pooling or averaging of substantial individual firm discrepancies between capital expenditures and capital expenditure anticipations are revealed in Table 6-24.[8] For each year and each industry, the mean difference between capital expenditures and capital expenditure anticipations is usually well under 1 percent of gross fixed assets and frequently very close to zero. Standard deviations and root mean squares, however, show substantial variation around those means.

A further measure of the accuracy of short anticipations as a forecast of actual expenditures is to be found in the Theil inequality coefficients for individual firms by years and industries, shown in Table 6-25. The overall coefficient was 0.538, varying by industry from a low of 0.280 in utilities to a high of 0.648 in stores. Differences by year varied from a recession low of 0.415 in 1958 to a Vietnam escalation high of 0.719 in 1965. Firms were perhaps better in anticipating cutbacks than booms. In only 6 of the 139 industry years for which observations were available were the inequality

[8] Tables M6-21, M6-22, and M6-23 appear only in microfiche.

Table 6-24. Means, Standard Deviations, and Root Mean Squares of Capital Expenditure Realizations, All Measured as Ratios of Previous Year's Gross Fixed Assets, 1955-1968

(1) Year	(2) Mean	(3) Standard Deviation	(4) Root Mean Square
1955	.006	.042	.043
1956	.001	.030	.030
1957	−.005	.032	.033
1958	−.009	.030	.032
1959	−.002	.031	.031
1960	−.009	.036	.037
1961	−.006	.029	.030
1962	−.006	.029	.030
1963	−.003	.033	.033
1964	.000	.029	.029
1965	.001	.035	.035
1966	.001	.032	.032
Industry			
Primary metals	−.007	.023	.024
Metalworking	−.004	.037	.037
Chemical processing	−.006	.030	.030
All other manufacturing	.003	.029	.029
Mining	−.004	.038	.038
Utilities	−.003	.008	.009
Petroleum	−.004	.015	.015
Railroads	.001	.008	.008
Stores	−.004	.052	.052
Transportation	.002	.065	.065
All years or industries	−.003	.033	.033

Note: Tables M6-21 through M6-23 appear only in microfiche.

coefficients greater than unity—that is, would a naive forecast that expenditures would remain the same in the coming year have been more accurate than the capital expenditure anticipations.

Departures from equality (unity) can be ascribed overwhelmingly to covariance components (see Table 6-26). Individual firm errors in anticipations were to a very considerable extent offsetting, however, so that means and variance components were low and inequality coefficients themselves lower when observations consisted of group means.

Table 6-25. Short-Run Capital Expenditure Realizations: Inequality Coefficients (U), by Year and Industry, 1962-1968

$$U = \left[\frac{\Sigma(a-p)^2}{\Sigma a^2} \right]^{1/2}, \text{ where } a = i_t - i_{t-1} \text{ and } a - p = i_t - i_t^{t-1}$$

(1) Year	(2) Primary Metals	(3) Metal-working	(4) Chemical Processing	(5) All Other Manufacturing	(6) Mining	(7) Utili-ties	(8) Petro-leum	(9) Rail-roads	(10) Stores	(11) Trans-portation	(12) All Industries
1955	.801	.801	.626	.584	.604	–	.479	.778	1.121	.305	.594
1956	.383	.521	.450	.507	.471	.371	.549	.507	.607	.244	.466
1957	.457	.513	.391	.323	.547	.419	.233	.511	.484	.318	.453
1958	.183	.465	.400	.681	.318	.385	.377	.231	.518	.470	.415
1959	.347	.637	.726	.863	.857	.272	.889	.343	.362	.387	.524
1960	.396	.780	.464	.509	.580	.129	.962	.658	.620	.617	.590
1961	.466	.614	.517	.486	.669	.465	1.458	.284	.703	.606	.605
1962	.366	.482	.430	.771	.708	.456	.937	.593	.652	.193	.519
1963	.656	.682	.659	.716	1.324	.571	.443	.714	.655	.707	.677
1964	.433	.686	.533	.682	.389	.390	.797	.351	.908	.634	.662
1965	.416	.812	.673	.654	.976	.462	.507	.647	.864	.702	.719
1966	1.107	.458	.553	.331	.311	.366	.568	.566	1.646	.384	.496
1967	.679	.530	.502	.555	.121	.417	.672	.325	.432	1.933	.460
1968	.517	.641	.511	.832	.184	.285	.309	.262	.760	.350	.582
All Years	.432	.592	.507	.588	.479	.280	.499	.478	.648	.439	.538

Table 6-26. Short-Run Capital Expenditure Realizations: Inequality Coefficients (U) and Bias (U^m), Variance (U^s), and Covariance (U^c) Proportions, Individual Firms by Industry and Year and Group Means, 1955-1968

(1) Individual Firms	(2) U	(3) U^m	(4) U^s	(5) U^c
By industry				
Primary metals	.432	.086	.013	.901
Metalworking	.592	.013	.021	.966
Chemical processing	.507	.048	.000	.952
All other manufacturing	.588	.004	.000	.996
Mining	.479	.016	.017	.967
Utilities	.280	.086	.000	.914
Petroleum	.499	.052	.093	.855
Railroads	.478	.002	.000	.998
Stores	.648	.004	.044	.952
Transportation	.439	.001	.024	.975
By year				
1955	.594	.012	.039	.949
1956	.466	.001	.002	.997
1957	.453	.026	.000	.974
1958	.415	.082	.014	.904
1959	.524	.004	.001	.995
1960	.590	.056	.036	.907
1961	.605	.034	.001	.965
1962	.519	.037	.002	.960
1963	.677	.004	.009	.987
1964	.662	.000	.025	.975
1965	.719	.000	.008	.992
1966	.496	.000	.008	.992
1967	.460	.014	.014	.972
1968	.582	.020	.062	.917
All years and industries	.538	.009	.011	.980
Group means				
Industry years	.401	.122	.155	.722
Years	.368	.380	.286	.334

$$U = \left[\frac{\Sigma(a-p)^2}{\Sigma a^2}\right]^{1/2}, \quad U^m = \frac{(\bar{a}-\bar{p})^2}{\frac{1}{n}\Sigma(a-p)^2}$$

$$U^s = \frac{(\sigma_a-\sigma_p)}{\frac{1}{n}\Sigma(a-p)^2}, \quad U^c = \frac{2(1-r)\sigma_a\sigma_p}{\frac{1}{n}\Sigma(a-p)^2},$$

where $a = i_t - i_{t-1}$ and $p = i_t^{t-1} - i_{t-1}$.

SUMMARY AND CONCLUSIONS

Recapitulating briefly some of the major findings:

1. Short-run capital expenditure anticipations, sharing common determinants with the actual expenditures to which they relate, adapt to both errors in previous expenditure anticipations and to changes in sales and errors in expectations of sales.
2. Capital expenditure anticipations account for a major share of the variance in capital expenditures, far more than do previous capital expenditures or other variables.
3. Variance of capital expenditure realizations (the difference between capital expenditures and capital expenditure anticipations) is far greater on an individual firm basis than for means of observations within years or industries.
4. Perhaps because of the tendency for errors to wash out in aggregation, the time series regressions show generally higher coefficients of determination and higher regression coefficients of relevant variables the greater the degree of aggregation involved in the observations. Higher coefficients were thus found in the industry time series than in the firm time series, with the highest regression coefficients and coefficients of determination generally in the aggregate time series. Similar effects of aggregation were noted in cross sections and overall regressions.
5. While there was some general tendency for capital expenditure anticipations to exceed actual capital expenditures (although this conclusion should be tempered by recognition of its sensitivity to our methods of price deflation), there was some evidence that the capital expenditure realizations variable tended to be positively associated with favorable economic circumstances as measured by sales changes, sales realizations (the difference between actual and expected sales), and profits.
6. This last point was confirmed in various regressions, especially time series, in which current sales change, sales realizations, and profits had significantly positive coefficients in relations where capital expenditures or capital expenditure realizations were dependent variables. Variables reflecting conditions that should have been taken into account in capital expenditure anticipations usually had coefficients that were close to zero or slightly negative. Current variables, which postdated the information entering into anticipations, generally contributed significantly to

the explanation of capital expenditure realizations. To the extent that firms experienced conditions in sales or profits that were better than at the time anticipations were formed, or better than expected, capital expenditures tended to exceed capital anticipations.

We may see in all this confirmation of the realizations function proposed by Modigliani.[9] The confirmation, while small in terms of predictive power for individual firms, is distinct even there, and takes greater weight at more aggregative levels.

APPENDIX
DEFINITIONS AND SOURCES OF VARIABLES AND INTERVALS FOR ACCEPTABLE VALUES

Symbol[a]	*Description*	*Source*[b]	*Acceptable Interval*[c]
$i_t = \frac{I_t}{K_{57}}$	Capital expenditures in 1954 dollars as ratio of 1957 gross fixed assets	MH/FD	[0.6, 0)
$i_t^* = \frac{I_t}{K_{t-1}}$	Capital expenditures in 1954 dollars as ratio of previous gross fixed assets	MH/FD	[0.6, 0)
$i_t^{t-1} = \frac{I_t^{t-1}}{K_{57}}$	Capital expenditure anticipations for the year t, in 1954 dollars, as ratio of 1957 gross fixed assets	MH/FD	[0.6, 0)
$\Delta s_t = \frac{3(S_t - S_{t-1})}{S_{56}+S_{57}+S_{58}}$	Relative sales change ratio, price-deflated, 1956-1958 denominator	FD	[0.7, —0.6]
$\Delta s_t^* = \frac{3(S_t - S_{t-1})}{S_t+S_{t-1}+S_{t-2}}$	Relative sales change ratio, price-deflated, previous three year denominator	FD	[0.7, —0.6]

[9] See Modigliani and Hohn (1955), Modigliani and Cohen (1958 and 1961), Modigliani and Sauerlender (1955), and Holt and Modigliani (1961).

Symbol[a]	*Description*	*Source*[b]	*Acceptable Interval*[c]
$p_t = \frac{P_t}{K_{57}}$	Net profits in 1954 dollars as ratio of 1957 gross fixed assets	FD	[0.7, –0.4]
$p_t^* = \frac{P_t}{K_{t-1}}$	Net profits in 1954 dollars as ratio of previous price-deflated gross fixed assets	FD	[0.7, –0.4]
$d_{53} = \frac{D_{53}}{K_{53}}$	1953 depreciation charges as ratio of 1953 gross fixed assets	FD	[0.2, 0]
$s_t^{t-1} = \frac{S_t^{t-1} - S_{t-1}}{S_{t-1}}$	Short-run sales expectations for the year t = expected percent change in physical volume of sales from McGraw-Hill surveys, converted to pure decimal	MH	[0.7, –0.6]

[a] All flow variables (I, I_{t+1}^{t}, S, and P) except depreciation charges (D) are price-deflated.

[b] MH = McGraw-Hill surveys.
FD = Financial data, generally from Moody's.
MH/FD = Numerator from McGraw-Hill and denominator from financial data.

[c] [U, L] = Closed interval, including upper and lower bounds.
[U, L) = Interval including upper bound but not lower bound.